New elements of operative surgery / by Alf. A.L.M. Velpeau, carefully revised, entirely remodelled, and augmented with a treatise on minor surgery ; illustrated by over 300 engravings, incorporated with the text, accompanied with an atlas in quarto of twenty-two plates, representing the principal operative processes, surgical instruments ; translated by P.S. Townsend. Augmented by the addition of several hundred pages of entirely new matter, comprising all the latest improvements and discoveries in surgery, in America and Europe, up to the present time. Under the supervision of, and with notes and observations by Valentine Moth.

Contributors

Velpeau, A. 1795-1867.
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Emory University. General Libraries

Publication/Creation

1845-1847

Persistent URL

https://wellcomecollection.org/works/k7hyarb3

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NEW ELEMENTS

OF

OPERATIVE SURGERY:

BY

ALF. A. L. M. VELPEAU,

Professor of Surgical Clinique of the Faculty of Medicine of Paris, Surgeon of the Hospital of La Charité, Member of the Royal Academy of Medicine, of the Institute, &c.

CAREFULLY REVISED, ENTIRELY REMODELLED, AND AUGMENTED WITH

A TREATISE ON MINOR SURGERY.

ILLUSTRATED BY

OVER 300 ENGRAVINGS, INCORPORATED WITH THE TEXT:

ACCOMPANIED WITH

AN ATLAS IN QUARTO OF TWENTY-TWO PLATES,

REPRESENTING THE PRINCIPAL OPERATIVE PROCESSES, SURGICAL INSTRUMENTS, &C.

FIRST AMERICAN, FROM THE LAST PARIS EDITION.

TRANSLATED BY

P. S. TOWNSEND, M. D.

Late Physician to the Seamen's Retreat, Staten Island, New York.

AUGMENTED BY THE ADDITION OF

SEVERAL HUNDRED PAGES OF ENTIRELY NEW MATTER,

COMPRISING ALL THE LATEST IMPROVEMENTS AND DISCOVERIES IN SURGERY, IN AMERICA AND EUROPE, UP TO THE PRESENT TIME.

UNDER THE SUPERVISION OF, AND WITH NOTES AND OBSERVATIONS BY

VALENTINE MOTT, M. D.

Professor of the Operations of Surgery with Surgical and Pathological Anatomy, in the University of New York; Foreign Associate of the Académie Royale de Médecine of Paris, of that of Berlin, Brussels, Athens, &c.

IN THREE VOLUMES.

EMORY UNIVERSITY
THE A. W. CALHOUN MEDICAL LIBRARY

VOL. I.

NEW YORK:

HENRY G. LANGLEY, 8 ASTOR-HOUSE.

M DCCC XLV.

Entered, according to Act of Congress, in the year 1845, by
HENRY G. LANGLEY,
In the Clerk's Office of the District Court of the Southern District of New York.

Stereotyped by
RICHARD C. VALENTINE,
45 Gold-street, New York.

HENRY LUDWIG, Printer,
Vesey-street, N. Y

PREFACE

TO THIS

FIRST TRANSLATION AND FIRST AMERICAN EDITION

OF

VELPEAU'S OPERATIVE SURGERY.

BY

P. S. TOWNSEND, M. D.

If I were addressing myself to those who have read and studied the great work of Professor Velpeau on Operative Surgery, it would be quite superfluous to dilate upon its merits. For its general reception as a classical production, written with a faultless purity of style, and the unqualified approbation which has been bestowed upon it by those of the profession in Europe, and in this and other countries, who can peruse it in the language in which it is written, are a sufficient evidence and guarantee of the estimation which is attached to it.

I believe it may be safely asserted that there was no work more wanted, than one precisely of this description; for none written upon the plan that the Professor of Paris has adopted, has, as far as I am acquainted, ever before been offered to the public. For the most part, general works on surgery, whether issued from the English, French, or German press, have the fault of being either too voluminous and unsystematized for common use, as elementary treatises either for students or practitioners, or they are too circumscribed and exclusive in their objects, being in most cases confined to *specialities*, as, for example, to certain branches or departments only of surgery, to general views on the anatomy of relations, surgical anatomy, surgical pathology, monographs on this or that disease, &c., all of which, however, are extremely useful in their place, and requisite to be completely mastered in detail by all those who wish to arrive at any distinction in their profession.

There was wanted a work which should embrace all the general axioms, precepts, and facts of Operative Surgery and of Surgical Anatomy, absolutely essential to an elementary treatise, and systematized and arranged upon some natural and well-defined principles, which should be in perfect concordance with the known laws and structure of the human organization.

Such a work is that of M. Velpeau, as contrasted with all others.

In this work the author has shown how requisite it is that in every book on a vast scientific subject like that of Operative Surgery, the whole fabric should be constructed and sustained upon some approved philosophical plan, conformable to the received axioms of anatomy, physiology, and pathology, and the different parts or subdivisions of which should grow out of, or be developed, one from the other, so that the entire edifice should form a perfect whole in itself; while all the details should be in such necessary connection, harmony, and proportion with each other, that as in the study of the living human organization itself, each one should in some sort be an exponent or co-relative of all the rest.

We conceive that M. Velpeau has happily and fully attained this desideratum—and that but very little is wanting to make his work one of such standard value that no public school or university in medicine, and no individual practitioner or student, can hereafter possibly dispense with it.

The peculiar fitness which the author possesses for such an undertaking, is seen in the sound and well-disciplined mind with which he is gifted by nature—his ample

education—his great professional ability and distinction as a practical operator and teacher of surgery—his practised pen as a man of extensive literary acquirements, together with his habits of untiring industry, patient research, and lastly, what is perhaps fully as important as all the rest, the clear judgment, the dignified impartiality, amenity of temper, and spirit of thorough philosophical investigation which he brings to every disputed or difficult question, or point, which is presented to his notice.

The fruits of these rare intellectual and moral endowments, which are perhaps infinitely more desirable, certainly in general far more serviceable in society, than the irregular sallies and random efforts and effusions of mere isolated genius, are encountered upon every page of his work. As for example, whatever others may say to the contrary, the exact and full descriptions which he gives in all the first portion of this volume in relation to MINOR SURGERY, or those common and indispensable operations, manipulations, dressings, &c., of a general though not difficult nature, which it is nevertheless important to be thoroughly conversant with as the rudiments of our art, and the only secure basis of all correct knowledge to be attained afterwards. The student cannot place too high a price upon this part of the volume. And we particularize these matters because, though to the practitioner who has passed through this ordeal these minutiæ may at first sight seem prolix or tedious, he will, on closely inspecting them, find that they are in fact a perfect and admirably systematized condensation (instead of a diffuse or verbose amplification) of every thing of any utility whatever upon this subject that has been known in past times, or been proposed or invented by the moderns, and that the whole is not only absolutely essential to be known by the student, and re-perused and re-studied by the practitioner himself, but has also the rare merit of being imparted in the clear and agreeable style peculiar to the author; and which of itself gives a charm even to a subject naturally, and we may say necessarily, dry and destitute of attraction.

The professional reader also, whoever he may be, if imbued with the proper zeal and enthusiasm which should belong to him, will have reason to thank Professor Velpeau for the mass of valuable erudition which he has brought to bear, by his unconquerable application and assiduity, upon the *true* history of every operative surgical process, principle, or discovery, which adorn or can illustrate the annals of the science, fortified as the whole also is by direct and specific references to every name, authority, or work, ancient or modern, upon which the proofs of his assertions and citations rest.

We consider that this vein of rich, and much of it new historical contributions in surgery, and which so steadily courses or threads its way through the pages of the work, constitutes as it were the natural woof upon which the whole superstructure is woven, and thus forms to it a substratum of inappreciable value. Because it not only shows what has been done, and what has stood and still stands the test of time, and will doubtless continue to be approved of and recognised as of established utility; but it points out also as dangerous, if not forbidden paths to future explorers, those fruitless speculations and experiments that are to be avoided as not only a destructive waste of time to the student, but as exposing his mind to be seduced by visionary pursuits, and thereby into researches which will be liable to end in the repetition of similar abortive results.

Another advantage that we acquire, by having always thus at hand in the course of our endeavors, to add some new improvement to surgical science, an exact transcript of what others have done before us, and of what has failed and what succeeded, and why and wherefore such have been the results, is this, that we are so much the better enabled, as before observed, to economize our time, to husband our resources, and to concentrate the full force of our investigations upon the point or points which it is desirable to elucidate.

Professor Velpeau has thus also rendered a grateful service to the whole profession, vindicated the silent and unprotected dead, as he has rebuked the ambitious and reckless living, by according to each his appropriate claims and property, and by stripping of their spurious honors all that class of persons who, actuated by moral principles that sit loosely upon their consciences, have always, in every age and in every clime, been constantly addicted to the pernicious habit (which to them seems to be a source of morbid pleasure) of decorating themselves with the plumes which righteously belong to the reputation of others.

We repeat, that we think M. Velpeau, by assigning to every distinguished man, who has ever adorned the annals of surgery, the exact measure of gratitude which the world owes to him for his services and discoveries, has done a real and great good to the profession, and especially to the rising youth who intend to embrace this pursuit. For who of them would be inspired with an ardent zeal and elevated desire to strike out new routes, and to associate their names with brilliant discoveries and improvements in operative surgery, whether for personal fame, or for the cause of humanity and philanthropy; who, I repeat, would be ambitious to make new triumphs and farther conquests upon the domain of our art, if he felt assured that, in a few years, the evil spirit of a grasping cupidity and rapacity would, by misrepresentation, suppression of the truth, false and fabricated statements, and personal detraction, defamation, and persecution, combine to rob him of these cherished possessions, which he had fondly hoped would reward his years of laborious study and of painful toil?

What will also strike the reader, and particularly the student, in this great elementary work on operative surgery, as a portion that possesses intrinsic excellence, are the perspicuous and condensed anatomical and pathological details which are judiciously made to precede all the different operative processes practised upon the various regions of the body.

What renders this present volume one which will generally be considered of higher interest in many respects than any other part of the work, is the fact that it contains nearly all the latest discoveries and processes in that most important branch of the art which has not inaptly been called New Surgery; since it has sprung up, or rather, made such astounding advances within the last *ten years* only, that it may almost be said to date its very birth and existence within that short period of time. The reader will readily anticipate that we allude to the entire departments of, 1. Anaplasty, or, as some call it, Autoplasty, or the restoration of destroyed parts and reparation of deformities, as of the nose, lips, neck, &c.; 2. Subcutaneous Surgery, or Tenotomy and Myotomy, meaning the subcutaneous section or division of tendons, muscles, bridles, aponeuroses, fasciæ, synovial capsules, articular ligaments, cartilages, bones, &c.; also, directed for the most part against deformities proceeding from abnormal muscular contractions, alterations, and distortions of the limbs, feet, hands, neck, spine, &c., and now already promising to cover, on its great fundamental principle of *occlusion* of the external air from the divided parts, a far greater extent of ground than had ever been anticipated, by being adopted with even more consideration than the illustrious Hunter attached to it, for the basis upon which almost every surgical process should hereafter be conducted.

We have, in various parts of the work, it will be seen, expressed our own views and those of others freely, in relation to the earnestness with which the *division of parts under the skin*, so as to effect as perfect *occlusion of* the external *air* as possible, has been advocated by some distinguished surgeons, whose reputation is much identified with subcutaneous surgery. Some *qualifications* to such sweeping utilitarian doctrines are undoubtedly desirable as guards and precautions against allowing ourselves to be too much carried away by the absorbing impulse, which naturally presses every one into the service of a cause whose march has been attended with such uninterrupted and dazzling, but, nevertheless, for the most part, we are free to add, solid, triumphs, as has been that of those two great modern and most important of all acquisitions to the treasures of our art. And in this opinion we are sustained by the judgment of Dr. Mott. All this surgery in itself, however, is of immense value, and especially of inconceivable utility by the facility with which the operations which it comprises can in general be performed, and by its special adaptation to the relief of the great masses of the poorer classes, who are most frequently the subjects of these, to them, more particularly distressing infirmities. But we repeat that we should guard ourselves against being too much seduced by these *utilitarian* popular views, and the éclat which is elicited from the world without, when they see a cripple, by a sudden plunge of a bloodless tenotome, instantly raised, as from the dead, upon his feet, the distorted eye, or twisted neck, righted to their just position, and a becoming and natural nose in the place of one that is lost, made to adhere and to perform all the necessary offices, upon a face that shortly before presented a hideous and disgusting aspect.

But while we express ourselves thus candidly, we would not be thought to take

away in any one iota from the immense benefits which this branch of our *new surgery*, under proper limitations and in skilful hands, and with persons of sound anatomical knowledge, has conferred, and is, as we firmly believe, destined to confer upon mankind in every part of the earth.

We have not found it possible or practicable, step by step, in the course of the translation, to incorporate in its proper place all the NEW MATTER which it has been thought necessary to add, and some of which would perhaps have found a more appropriate location under each particular head to which it belongs. The student as well as the practitioner, however, will find himself compensated in some measure for the detention which has attended the progress of this volume through the press, by the valuable communications which, through this accidental delay, it has thus been in our power to embody in the work. Among these acquisitions, will be recognised those which have been transmitted to us from Paris, for this American edition, from the distinguished author, M. Velpeau himself; of which none will be read with greater pleasure and instruction than his interesting letter to Dr. Mott; also some excellent treatises from his industrious pen, published recently, and since his last edition of this work, viz., that on the new treatment of *erysipelas;* his complete history of *strabismus* up to the year 1843, and the account of the late *discussion on tenotomy* in the Royal Academy of Medicine at Paris, 1842, in which last our estimable author, it will be seen, took, as was to be expected from him, a leading part; all of which publications have been carefully translated and abridged, in such manner as to adapt them more conveniently to the limits of this volume, to which they belong, without, however, omitting any thing whatever of value or interest to surgery contained in those treatises. The principal reason, however, why a large portion of the *new matter* added has not been found in the body of the text, is that most of these materials were not made public in Europe or America until after the work had nearly passed through the press.

We have, therefore, in addition to what is scattered throughout the pages of the text, on anaplasty, on tenotomy, myotomy, &c., preferred to consign the principal part of what we had to say on these subjects to the form of a brief historic summary in the CONCLUDING AMERICAN APPENDIX, which contains every thing, as will be seen, belonging to the branches treated of in this volume, booked up to the last moment. In that also we have endeavored to do full justice to our *own countrymen*, for all they have contributed in this great department of surgery; and it is with pride we say, that they have not been behind-hand in following the example of our trans-Atlantic brethren of France, Germany, and England. Two communications of this nature, of a very instructive character, have been inserted in that Appendix, from Drs. Watson and A. C. Post, both surgeons of the New York Hospital. We have also in that Appendix drawn copiously from the recent valuable works of MM. Serre, Malgaigne, Pancoast, Mütter, &c.

A very useful table in the beginning of the volume, and showing the names of the muscles of the human body, as adopted, on the one hand, by the French, and, on the other, by the English and American surgeons, the differences of which terms (some French, and mostly Latin) lead to much embarrassing confusion, at this time particularly, when the whole subject of *myology* is rapidly acquiring enhanced importance, has been kindly communicated to me by Dr. William Darling, prosector in surgery to Dr. Mott.

To Dr. Darling I am also much indebted, in the course of the translation, for the assistance he has rendered me, in giving a just interpretation to many of the epithets, exclusively technical, in those parts of the work which touch upon the anatomy of the various regions. His accuracy as an anatomist, and his attainments as a scholar, are a guarantee of the correctness of his judgment in those particulars.

I have to say but a few words in respect to the motives which led to this undertaking, and of the manner in which it has been executed.

I confess, that the intrinsic value of the work, as one especially adapted for the classes at our medical colleges and universities, had often struck both my friend Dr. Mott and myself, in various conversations; but there was a feeling beyond this, which attached us both to all that concerned the great school of medicine at Paris, and its noble band of professors. He had been for years resident there, and knew intimately most of those contemporaneous surgeons who now occupy the more promi-

nent positions in the profession, and who have added, or are now adding, so much lustre to surgery.

I had also, in two different sojourns at Paris and Montpellier, in 1821–22, and at Paris again in 1827–28, had the happiness to become acquainted with, or to follow upon the clinical lessons of, some of the most illustrious of these men, as well as of their predecessors. It was natural that I should recur back with satisfaction of hours agreeably, if not profitably, spent under the instructions of such men as the Barons Larrey, Dubois the elder, Percy, and Dupuytren, Cuvier, Lacepède, Delpech, Richerand, Thenard, Gay-Lussac, Boyer, Roux, Lallemand, Civiale, Lisfranc, Cloquet, Velpeau, &c. &c.* And if, in the preparation of this volume, with the constant advice and supervision of my long respected and much honored friend and former preceptor, Dr. Mott, our united efforts shall have succeeded in conveying a just interpretation of the spirit and language of our mutual and estimable friend, M. Velpeau, and in thereby helping, by means of this English dress in which he now for the first time appears, to give wider circulation on this as on the other continent, to the important truths in surgery his elaborate work embraces, it will be but a slight return for the gratification and benefits which we (speaking for myself, at least) have personally derived from his instructive lessons, and those of the illustrious men with whom he is and has for so many years been honorably associated, in the most eminent walks of our profession.

Of the translation itself, and its general merits, I will briefly say, that it has been revised and re-revised, both by Dr. Mott and myself, and constantly collated with the original text of M. Velpeau, as the only sure guide to direct us. If labor, therefore, and devotion the most unremitting, can have imparted any value or accuracy to this the purely mechanical and most fatiguing part of our duty, the work is entitled to a full share of both.

As to the absolute correctness and fidelity, therefore, of this English version of M. Velpeau's work, we venture, from the pains that have been bestowed upon it, and from some knowledge which we think we possess of both languages, to assert that we pride ourselves upon this production, as adhering as closely and rigidly as possible to the original text of the author, *verbum verbo*, at the risk of appearing, at times, to be speaking in an idiom somewhat Gallican.

We preferred to err on this safer side, rather than to run the hazard, in a work devoted to one of the exact sciences, as we consider operative surgery to be, of making ourselves obscure, or perverting the true meaning of our author by any attempted circumlocution or improvement upon his pure and elegant diction.

Like all other works of human labor, it doubtless possesses imperfections; none, however, we feel assured, of a grave character, and *not one blunder*, we almost venture to assert, in the matter of strict and legitimate grammatical translation. To which we should add, that the publishers have, in every thing that relates to the typography and to the engravings, both in the body of the work and in the atlas, quite surpassed our most sanguine anticipations.

I have been the more particular in a work of this extreme value, destined, as we hope, from its own merits, to be adopted generally in our schools, because the American press and the standard of American education and character have, of late years, all been not a little discredited and depreciated, by the *book-making* attempts of certain adventurers in the profession, who, having one object solely in view, that of pecuniary gain, have given to the world pretended translations of French, German, and other works, on anatomy, surgery, &c., the inexcusable and gross blunders contained in which, while they spread error and confusion to an interminable extent, indicate the utter incapacity of the individuals in question to undertake a task of this description.

We profess to have been actuated by a higher feeling and purer motives in this labor, and we therefore consign it to the public without asking any other favor than that of a just and unbiased searching criticism upon its merits as well as demerits.

P. S. Townsend.

New York, December, 1844.

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* At the same sitting of the Institute, in my first visit to Paris, could be seen assembled in familiar discourse, not only some of the older of the above illustrious *savans*, but also such as the venerable La Place, Counts Berthollet and Chaptal, Barons Portal and Desgenettes, Legendre, &c., &c.

PREFACE

TO

THIS AMERICAN EDITION.

BY VALENTINE MOTT, M.D.

The reasons which have induced me, in connection with my friend, Dr. Townsend, to undertake the laborious yet agreeable task of placing for the first time before the profession, a complete and faithful English translation (with all the required additions) of the last Paris edition (1839) of M. Velpeau's celebrated work on Operative Surgery, are so fully set forth in my letter to that eminent surgeon, and so kindly and satisfactorily responded to and approved of by the author's valuable reply, that I must, at the risk of incurring the charge of personal vanity, be permitted the privilege of inserting them both in this place, as embracing nearly all that I would wish to say in a distinct preface to this edition.

I would remark, that the whole of this volume (constituting over 900 octavo pages, and being the first of the three which the translation will make) has been several times carefully and thoroughly revised under my immediate supervision. The notes and additions on the subjects embraced in it, designed to bring the whole work up to the improvements and discoveries in Operative Surgery at the present moment, (1845,) have been also carefully prepared by Dr. Townsend, and meet with my entire sanction and approval. They have been incorporated with the text, or more fully given in detail in the *concluding appendix*.

New York, May 24th, 1843.

My Dear Sir,—

It is with much pleasure that I announce to you the intention of the Messrs. Langleys, publishers of this city, to bring out at my suggestion, as speedily as possible, a complete and faithful English translation of the last Paris edition (1839) of your invaluable standard work in four volumes, octavo, on Operative Surgery, together with the folio atlas of plates belonging thereto, and the nearly 300 engraved illustrations that are incorporated with the body of the work. I have for several years past sensibly felt the want of a *standard* work on Surgery in the English language, and which should be properly systematized and classified, upon

the philosophical principles upon which the basis of this greatest department of the healing art now, thanks to the brilliant march of surgical discovery within the past thirty years, firmly and triumphantly reposes.

It is true that we have the elaborate dictionary of my friend, Mr. S. Cooper, of London, as a most inestimable archive of surgical knowledge, and an indispensable historical record for reference. It is also true that, both in England and in America, there have been from time to time published, for some few years past, excellent compendiums of a limited character. But there was still wanting a great philosophical system and practical treatise upon every branch, more especially of Operative Surgery, and I have unhesitatingly recommended your work as the one which comes nearest, in my view, to the objects desired, and which, on that account, I have constantly referred to as the one most suitable to be adopted as a text-book in the University in which I am a professor. To effect this object more thoroughly, I have, in association with my friend, Dr. P. S. Townsend, of this city, made the necessary arrangements to prepare with him a faithful and exact version of the same, and to have incorporated with this *first American edition*, all such new surgical matter of interest or value as may have been contributed to the general fund in Europe as well as in America, since the publication of your last edition in 1839. I shall also herein present a more minute and authentic detail than has ever yet been anywhere published, of all that relates to what I myself may be justly and conscientiously entitled to claim as my own property, in the *entirely new operations and new classes of operations*, as well as new improvements and views, such as they have been projected and carried out into successful practice and execution by myself, as the fruits of more than forty years almost incessant occupation and labors in all the different departments of Operative and Pathological Surgery.

I have taken thus the liberty to enter my name as a *compagnon de voyage* with you, upon the great high-road of the science, where it has been so long our cherished pride, fortune, and pleasure to travel. Because I felt that in associating my labors with those which have received the approbation of your judgment, and which your genius and untiring industry have wrought out in your estimable work, as an enduring monument to your fame, I might find an appropriate place and guarantee for indulging the ambition that I, like others, must naturally have of seeing legitimately transmitted, through an orthodox and approved organ, for the judgment of an impartial posterity, an authentic account at least (if only at best but an abrégé one) of my *stewardship* also in the great field of surgical science. This, so far as concerns myself, (and independent of perhaps paramount considerations, to give wider diffusion upon this continent to your great and useful work,) I felt admonished by the time of life at which I have arrived, to be due as well to myself and my own reputation, as to my country and profession.

As such, then, my dear sir, I have ventured thus, while life is so short and art so long, to ask for myself a niche in the great edifice of surgical facts and truths of which you are the constructor and owner. I have to ask of you the privilege that I may be allowed within this storehouse, containing so much of the treasures of our science, to make safe deposite and registration of the detached fragments of the scaffolding at least, of that extended work of my own on Operative Surgery, which, as you are aware, I have for so long a time meditated, and of which these offerings must for the present be received as the pledge.

For the fidelity of the translation of Dr. Townsend I feel satisfied, from carefully collating with him the part of the work he has already finished, that I may safely stand as his sponsor; as but few, also, from his travel and residence several years abroad, have had better opportunities than he has profited of, to become familiarly and critically conversant with the French and other foreign tongues. To these, permit me to add the additional pledge that you will have of not receiving any disparagement at his hands, by having him for your interpreter, from the fact of his own personal and extensive experience in the practice of physic and of surgery, and the distinguished and well-deserved reputation he has for many years enjoyed, both in Europe, in the West Indies, and in this his native country, by his medical works on various subjects.

I write you thus opportunely upon the subject, with the hope that it may be agreeable to you to signify your commendation to this proposed undertaking, and under the possible contingency that it might be your wish to suggest some alterations or additions to this *American edition* of your work. Whatever may be agreeable to you in these particulars, will be rigidly conformed to, and your intentions in that respect, or whatever contributions you may be pleased to favor us with, will arrive in time for the first volume, (the first *one-third* of your work,) if they reach here when that volume complete is placed in the hands of the publishers, which it will be on September 1st ensuing. My correspondents, Messrs. Green & Co., bankers, Place St. George, Paris, will, with pleasure, give safe and quick conveyance to whatever you may place in their hands for me. The second volume (or *second third* of your work) will, it is hoped, be ready for the press Jan. 1, 1845, and the last or third volume (the last *third* of your work) not until May or June, or perhaps August, 1845, as you perceive, and can readily imagine, it must and ought to require time, to put into a perfect English, or rather Anglo-American dress, with the addition of *two hundred pages* or more of *new matter*, and in the beautiful style of typography, paper, and plates, that it is contemplated and intended it shall be executed with, a work of such magnitude as your last edition (Paris, 1839) of over 3000 octavo pages.

It affords me great satisfaction to have an occasion like this, (that I cannot but believe, from the substantial good that it offers for both of us to do,

should be mutually acceptable to both,) of recalling to mind the years of unalloyed gratification which I enjoyed in the society of yourself and my other friends, during my residence in your justly renowned capital.

With every consideration of professional respect and personal esteem, I am, my dear sir, your devoted friend,

V. MOTT.

P. S. As anxious inquiries are made here, be pleased to inform me when you contemplate a new edition of your *Anatomie Chirurgicale*.

To M. VELPEAU,
Professor, &c., Paris.

(TRANSLATION.)

TO DR. VALENTINE MOTT, NEW YORK.

MY VERY DISTINGUISHED FRIEND,

I have learned, with very great pleasure, that a complete translation of my work on OPERATIVE SURGERY is to appear at New York, under your able supervision; in associating your numerous labors with mine, in selecting this translation as a repository for all the discoveries and improvements which you have introduced into surgical practice, you will obviously make my work an important treatise, of unquestionable utility, for our old Europe especially, where your labors, in spite of my efforts, are still but imperfectly known.

If your characteristic modesty induces you to suppose that my work may serve as a *passport* to your name, you will permit me to add, with greater exactness, that my feeble authority will be more than doubly enhanced by being sustained upon your high reputation.

Thus assured of being put in possession of all your labors, of being enabled to consult them every day and on every occasion, I myself shall enjoy the pleasure of having it in my power to reproduce them in our own tongue, and in a shape perfectly authentic, both for students and for practitioners.

Persuaded that I have assembled in my work almost the entire amount of scientific and practical details, indispensable for those who have occasion to consult a didactic treatise on operative surgery, I feel no hesitation in saying, that your proposed publication will assist in rendering this branch of human knowledge popular

on both sides of the Atlantic. It would have been unfortunate, too, that an experience so extensive as yours, during a practice of forty years, and that the reflections of the most celebrated and distinguished surgeon of America, should have been nowhere found embodied together in the same work.

I was already in part acquainted with what you say of Dr. Townsend: he has a reputation which was not unknown to me. I have read many articles from his pen, and I had already formed to myself a high opinion of his talent. I am therefore much gratified that he has undertaken the task, as you so well express it, of investing me in an Anglo-American dress.

As to the changes, corrections, and additions, which you speak of, and which it might be advisable to introduce into the work while it is in the press, I have been seriously occupied with them, and it is on this account that I have not sooner replied to your kind letter of the 24th of May last.

The corrections in relation to certain names of authors, and certain dates, must necessarily be numerous in a work of this description, so numerous, in fact, that I have not the courage to point them out. I flatter myself, moreover, with the hope that Dr. Townsend will rectify the greater portion of them.

Thus, in the paragraph at page 31, of the Appendix of the first volume, M. Fearn should be substituted in the place of M. Morrisson, while the numbers at the quotations at the foot of the page are for the most part misplaced as to their figures or in the titles of the journals. At page 33 of the same Appendix, No. 4, and not No. 5, must be placed after the name of M. Gagnebé. Especially is it desirable not to omit to correct in volume IV.* pp. 228 and 229, [French text,] the phrase relative to M. *Parcet* y Venualés, which must be inserted in place of *Purcel;* moreover, that it was in 1807 and not in 1788 that the work of this physician was published.

I have thought, moreover, that in order to enable you to select from my labors what may appear to you to be of value, I could not do better than to send you some copies of the notice recently published for my candidateship to the Institute. You will see in this notice what I have published since 1838, and consequently such as I could not avail myself of for the last edition of my work.

The *Dictionnaire de Médecine*, or *Répertoire des Sciences Médicales*, commonly known under the name of the *Dictionnaire de Béchet*, comprises the greater part of the articles enumerated near

* Vol. III. of this translation, not yet published.—*V. M.*

the conclusion of my notice, and this Dictionary may be found, as I presume, in the bookstores of New York.

The Journal entitled, *Les Annales de la Chirurgie*, embraces many of my articles: for example, my treatise on *Amputation at the lower third of the Leg*, on *Sulphate of Iron in Erysipelas*, on a *New Species of Hernia*, on *Glossotomy* in stammering, on *Strabismus*,* &c. Having preserved some copies of this last essay, and of my memoir on *Shut Cavities*, I hasten to transmit them to you, and I regret that I have not kept also those of my other articles.

In the possibility that you do not receive the *Bulletin* of the Royal Academy of Medicine, I send you also an extract from a long discussion on *Tenotomy*, inserted by M. Vidal (de Cassis) in the *Annales de Chirurgie*.† You will also find in the pacquet a short explanation in relation to certain of my labors, the authenticity of which had been called in question by certain charitable and interested persons, while I was a candidate for admission into the Institute. I take the liberty of pointing out to your notice, in this sheet, the question relative to the *Ligature upon Veins*, either for varices or varicocele, and to that also upon the *Torsion of Arteries*, the article on *Erectile Tumors*, *Immoveable Bandages*,‡ &c.

A point which I deem important is that which relates to my *new* processes for *Extirpation of Tumors*, the *Amputation of the Jaws*, and *Exsections*. Persuaded that you must perceive at a glance all the advantages to be derived from the CURVED INCISION, substituted for the straight, in the extirpation of tumors which may be removed without trenching also upon the integuments, I will make no further remarks on this subject in addition to those which you will find in my notice.

Have the goodness to recollect only that I have now made use of this incision in a great number of instances, in the extirpation of tumors of every description, situated under the jaw, or in the parotid region, above the clavicle, upon the shoulder, and different points of the trunk and limbs; also in exsections of all the articulations, of the bones of the metacarpus and metatarsus, of the carpus and tarsus, the astragalus, olecranon, acromion, and great trochanter, and in the long *sequestra* from necrosis in the body of the limbs, &c. And add to this, if you are so disposed, that amputation of

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* See Abrégé of the author's treatises on Erysipelas and Strabismus, in the text of this volume.—*V. M.*

† See Abrégé of this brochure in the text of this volume.—*V. M.*

‡ Not received.—*V. M.*

the fingers and toes, with the corresponding bones of the metacarpus or metatarsus, without making any incision into the palmar or plantar region of the part, have, by the aid of Liston's scissors, afforded me results of the most satisfactory nature.

My process for amputation of the lower jaw now consists in a *curvilinear* incision, which enables us to lay bare the whole disease without dividing the lips, and leaves a cicatrix only in the supra-hyoidean region. Suppose it should be required to remove one of the halves of the jaw? Having commenced near the chin, under the lower lip, the incision is continued under the jaw, backwards, in form of an arc, which is prolonged as far as the volume of the tumor may require, towards the angle of the jaw and to near the temple in front of the ear, or only merely to the anterior border of the mastoid process; dissected from below upwards, the flap, circumscribed in this manner, may be raised up on the face as high as we wish, and enables us to lay open fully the entire corresponding half of the jaw. The bone is then sawed by means of the chain saw of Jeffrey, first in front, then behind, after which the soft parts that have been preserved fall again by their own weight to close up the wound, leaving altogether intact the circumference of the lips.

You are too much familiarized with the great operations of surgery, to make it necessary for me to enter into more full details upon a subject of this nature; and I have no need of adding what should be done when we apply this method to the amputation of the chin, or of any other part of the maxillary bone.

In the upper jaw I require also but one incision, whose curvature scarcely exacts as much depth as for the lower jaw; carried from the commissure of the lips to above the attachment of the ear and to the temporal region, this incision, which avoids the canal of Sténon, enables us to raise upon the forehead the entire teguments of the face, and the whole corresponding half of the nose; we then proceed to the section of the bones in front from above backwards and then outwards; that is to say, in passing the chain saw, 1. Through the nasal passage to bring it out of the mouth, in cutting through the soft parts of the palate, and sawing the entire palatine and maxillary vault from behind forwards; 2. In cutting the root of the nose with Liston's scissors, or, what is as well, with the chain saw passed from the inner side of the orbit into the nasal passage to divide from behind forwards the base of the ascending process of the maxillary bone; 3. In passing also from the orbit into the temporal fossa in order to cut the su-

perior angle of the cheek bone, either with the chain saw, or with Liston's scissors; 4. Finally, in acting in the same manner on the zygomatic arch, and with the same scissors, or, what is as well, in sawing this arch with Jeffrey's saw.

All these sections, which are effected without embarrassment, and with sufficient rapidity, being finished, it requires only a slight effort made with the aid of a lever, applied in some of the cuts of the saw, to detach the bone, the separation of which is completed by dividing with the bistoury the soft parts which still hold to it. A single wound only remains, which a few stitches of suture soon convert into a linear cicatrix.

When the *whole* breadth of the lower or upper jaw is not involved in the disease, the operation, which consists only in removing the affected portion of bone, affords me results which are more and more gratifying. If it is the dental border, the curved scissors, carried beyond the insertions of the gums, removes the tumor with one cut, without making any wound in the face, and places the patient in the same position required for a person who is to undergo the operation of having some of his teeth extracted. If we are operating upon the lower border of the bone, the curved incision enables us to lay it bare, and to remove it by a cut of the saw applied horizontally above it.

You are at liberty to make such use of these details as shall seem agreeable to you, and you will change or criticise them with the greatest degree of freedom, and conformably to the estimate which your excellent judgment may put upon them.

A thousand thanks and a thousand kind wishes.

Paris, the 16th of August, 1843. VELPEAU.

For the reasons doubtless alluded to by M. Velpeau, that the work which I had long since contemplated on those *capital operations and new processes* in surgery, of which I consider myself the legitimate author, has never yet appeared, he is unacquainted with the fact, that in all my operations for the removal of the lower jaw, and which go back to the year 1821, (see this case, with the plate accompanying it, American Journal of the Medical Sciences, Aug., 1830, p. 553,) I have invariably, from the first, always made use of the *curvilinear incision*, to which he justly attaches so much importance. His description of its advantages and superiority over every other mode of reaching the osseous structures to be exsected by the saw or nippers, is so clear and graphic, that I have nothing to add to it whereby I could impress upon the mind of the surgeon its decided preference over every other mode.

A very recent case of osteo-sarcoma, for which I have operated within a few days past, and while these last sheets of the work were going through the press, opportunely presents itself in illustration of my practice in the employment of the curvilinear incision. W. E. B——, a young gentleman

of New York, aged twenty-five, of sanguine temperament, robust form, and strictly regular in his habits, was attacked, last April, with a swelling in the middle part of the lower jaw of the right side, and, as usual in these affections, without any pain, except occasionally, and then slight only. About four months since he applied to me, when I found the tumor possessing a degree of hardness, accompanied, however, with a certain elasticity on pressure peculiar to those osteo-sarcomatous growths. The face was generally enlarged on that side, the hardness extending down to the os hyoides, and so around beyond the posterior angle of the jaw. Upon inspecting it carefully, the tumor was found to reach to the cuspidatus tooth in front, and as far up on the ascending ramus of the jaw under the parotid gland as could be felt from without and within the mouth. From circumstances, I was led also to believe that it reached, in fact, near or quite up to the temporo-maxillary articulation.

I apprized him at my first interview of its nature, and of the necessity which I believed there would be of a surgical operation to remove it. I, however, stated to him that it would be satisfactory to try what benefit might possibly be derived from local and general treatment. He accordingly, by my directions, applied several leeches once a week to the tumor, within the mouth, and used internally the alterative treatment of the hydriodate of potash, and compound sirup of sarsaparilla with decoction of our indigenous yellow dock root. I enjoined upon him, at the same time, a mild light diet. This course was carefully and faithfully persevered in for at least about four months; but, finding that the disease sensibly augmented rather than diminished, I stated to him that the operation of exsecting the entire mass was his only alternative. This he soon became sensible of himself, and fully made up his mind to submit to.

On Saturday, at half-past one, P. M., November 23d, 1844, I performed the operation. Being satisfied that it would be necessary to remove the jaw at the temporo-maxillary articulation, I tied the primitive carotid in the middle third of the neck, as the first step, and as I had done in other similar cases, and as long ago as in the year 1821. I then commenced an incision a little in front of the meatus auditorius, over the tumor, and carried it downward behind the posterior angle of the jaw, traversing the lower front of the tumor, and thence proceeding upward upon the chin to within near three quarters of an inch of the vermilion border of the lower lip, terminating at a point opposite the second incisor tooth. An opening was thus readily made into the mouth. The soft parts were detached a short distance upon the chin, to determine that the bone there was perfectly sound. The second incisor tooth was now extracted, and through an opening made close to the bone within by a sharp-pointed curved bistoury, a chain-saw was conveyed, by means of an eyed probe, from within downward, and thus brought out below the chin, and the bone immediately sawed through from below upward.

The *flap* of integument was now dissected off the tumor from below upward, until the upper part was exposed and the cheek extensively opened. The bone was now laid hold of where it was sawed through, and the diseased mass carefully dissected from the subjacent parts on the side of the tongue and pharynx, sometimes detaching it from below and sometimes from above, with a view constantly to keep such vessels as should be cut accessible to the ligature, instead of cutting in one direction only, which, though it might make the operation appear to be more rapidly executed, would, in our judgment, be less surgical, because it would be, frequently, cutting in the dark, and at the risk of dangerous loss of blood.

The masseter was now entirely detached; and as it was very much thickened and degenerated where attached to the diseased mass, it was necessary to divide it very high up. The last external incision was now made, extending from a little above the glenoid cavity, over the condyle and through the parotid gland, directly downward, to unite with the first incision. The parotid gland was now detached in front from over the condyle, carrying with it the upper portion of the masseter, so as to expose the root of the coronoid process, which latter was now followed up, and the temporal muscle completely detached from it. This gave much mobility to the diseased mass, which was turned over towards the ear. A few strokes of the scalpel now enabled me to open the articulation, and to separate the condyloid extremity by cutting as closely as possible to this process anteriorly, so as to avoid the internal maxillary artery. The diseased mass was found to have extended as far up as to the neck of the condyle.

In this extensive dissection there were a number of vessels tied. All the arteries cut bled with a continuous stream. The vessels being all secured, the flap was turned down, and a cloth wet with warm water applied in the wound, so as to invite any bleeding from arteries that had not been tied.

After waiting half an hour, and refreshing the patient, and doing every thing to contribute to his comfort, and promote the warmth of his lower extremities by warm blankets and a bottle of warm water, the wound was dressed by a number of interrupted sutures, adhesive plasters, lint, a compress, and a double-headed roller.

The dressing being completed, the patient was conveyed into a warm bed and placed on the sound side. He bore the operation with extraordinary fortitude, though it was severe and necessarily somewhat tedious. He was much less exhausted than many persons are after operations comparatively trivial. In a short time he fell into a very tranquil sleep, and passed a very comfortable night, without the necessity of any anodyne, except twenty drops of Magendie's solution of morphine, which had been given an hour before the operation was commenced. A gentle reaction soon came on, and at the time of writing this, (Dec. 11th, *eighteen* days after the operation,) not the slightest untoward symptom has appeared, and all the ligatures have come away.

The wounds, up to this time, have been regularly dressed, and the agglutination of the borders of the incision appears to have been wholly completed by the first intention. Not the least hemorrhage has shown itself since the wound was first dressed.

This subject, however, will be again recurred to by me, when we reach that part of the work which treats of exsections of bones. In the mean time, without arrogating any particular merit for the *very large additions of new matter* which have been made, by Dr. Townsend and myself conjointly, to this edition of the author, we will confine ourselves to recommending, especially to all who wish to obtain an exact and perfect knowledge of *operative surgery*, the subject matter of the text of M. Velpeau himself, as well as the contents of those important and recent treatises embraced in this first volume, which he has had the kindness to transmit to us from Paris. In the hope that this American edition of this admirable work may receive the full share of approbation by the profession, which I candidly believe it entitled to over all others, I have but to add, that I cordially recommend it to be adopted as a TEXT-BOOK for *surgical classes*, not only in our American colleges and universities, but in all other institutions where the English language is spoken.

New York, December, 1844. V. MOTT.

MUSCLES OF THE HUMAN BODY,

ARRANGED ACCORDING TO THEIR REGIONS,

WITH THEIR CORRESPONDING NAMES IN FRENCH AND ENGLISH AUTHORS,

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MUSCLES OF THE CRANIUM.

Name in French Authors.	*Name in English Authors.*
Occipito-frontal,	Occipito-Frontalis.
Auriculaire supérieur,	Superior Auris.
Auriculaire antérieur,	Anterior Auris.
Auriculaire postérieur,	Posterior Auris.

MUSCLES OF THE FACE.

Orbiculaire des Paupières,	Orbicularis Palpebrarum.
Sourcilier,	Corrugator Supercilii.
Pyramidal du nez,	Pyramidalis Nasi.
Orbiculaire des lèvres,	Orbicularis Oris.
Transversal, ou triangulaire du nez,	Triangularis Nasi.
Elévateur commun de l'aile du nez, et de la lèvre supérieure,	Levator Labii Superioris Alæque Nasi.
Elévateur propre de la lèvre supérieure,	Levator Labii Superioris.
Canin, ou élévateur de l'angle des lèvres,	Levator Anguli Oris.
Grand Zygomatique,	Zygomaticus Major.
Petit Zygomatique,	Zygomaticus Minor.
Abaisseur de l'aile du nez, ou myrtiforme,	Depressor Labii Superioris Alæque Nasi.
Triangulaire, ou abaisseur de l'angle des lèvres,	Depressor Anguli Oris.
Carré du menton, ou abaisseur de la lèvre inférieure,	Quadratus Genæ, vel Depressor Labii Inferioris.
Muscle de la houppe du menton,	Levator Menti, vel Levator Labii Inferioris.
Buccinateur,	Buccinator.
Masseter,	Masseter.
Crotaphyte, ou temporal,	Temporalis.
Pterygoïdien interne, ou grand ptérygoïdien,	Pterygoideus Internus.
Pterygoïdien externe, ou petit ptérygoïdien,	Pterygoideus Externus.

MUSCLES OF THE ORBIT.

Name in French Authors.	*Name in English Authors.*
L'élévateur de la paupière supérieure,	Levator Palpebræ Superioris.
Droit supérieur, ou élévateur de l'œil,	Rectus Oculi Superior, vel Attollens Oculum.
Droit inférieur, ou abaisseur de l'œil,	Rectus Inferior, vel Depressor Oculi.
Droit interne, ou adducteur de l'œil,	Rectus Internus, vel Adductor Oculi.
Droit externe, ou abducteur de l'œil,	Rectus Externus, vel Abductor Oculi.
Oblique supérieur de l'œil, ou grand oblique,	Obliquus Oculi Superior.
Oblique inférieur, ou petit oblique,	Obliquus Oculi Inferior.

MUSCLES OF THE EAR.

Interne du marteau, ou tenseur du tympan,	Internal muscle of the Malleus, or Tensor Tympani.
Externe du marteau,	External Muscle of the Malleus, or Laxator Tympani.
Muscle de l'étrier,	Stapedius.

MUSCLES OF THE NECK.

Peaucier,	Platysma Myoides.
Sterno-cléido-mastoïdien,	Sterno-cleido-mastoideus.
Omoplat, ou scapulo-hyoïdien,	Omo-hyoideus.
Sterno-hyoïdien,	Sterno-hyoideus.
Sterno-thyroïdien,	Sterno-thyroideus.
Thyro-hyoïdien,	Thyro-hyoideus.
Digastrique,	Digastricus.
Stylo-hyoïdien,	Stylo-hyoideus.
Mylo-hyoïdien,	Mylo-hyoideus.
Genio-hyoïdien,	Genio-hyoideus.
Hyo-glosse,	Hyo-glossus.
Génio-glosse,	Genio-glossus.
Stylo-glosse,	Stylo-glossus.
Lingual,	Lingualis.

MUSCLES OF THE PHARYNX AND PALATE.

Constricteur inférieur,	Constrictor Pharyngis Inferior.
Constricteur moyen,	Constrictor Pharyngis Medius.
Constricteur supérieur,	Constrictor Pharyngis Superior
Stylo-pharyngien,	Stylo-pharyngeus.
Peristaphylin externe,	Circumflexus Palati.
Peristaphylin interne,	Levator Palati Mollis
Palato-staphylin,	Levator Uvulæ.
Pharyngo-staphylin, ou palato-pharyngien,	Palato-pharyngeus.
Glosso-staphylin,	Constrictor Isthmi Faucium, vel Palato-Glossus.

DEEP MUSCLES OF THE NECK.

Long du cou,	Longus Colli.
Grand droit antérieur de la tête,	Rectus Capitis Anticus Major.
Petit droit antérieur de la tête,	Rectus Capitis Anticus Minor.
Droit lateral de la tête,	Rectus Capitis Lateralis.
Scalène antérieur,	Scalenus Anticus.
Scalène postérieur,	Scalenus Posticus.

MUSCLES OF THE BACK.

Name in French Authors.	*Name in English Authors.*
Trapèze,	Trapezius.
Grand dorsal,	Latissimus Dorsi.
Rhomboïde,	Rhomboideus.
Angulaire de l'omoplate,	Levator Anguli Scapulæ.
Petit dentelé postérieur supérieur,	Serratus Posticus Superior.
Petit dentelé postérieur inférieur,	Serratus Posticus Inferior.
Splénius,	Splenius.
Long du dos,	Longissimus Dorsi.
Sacro-lombaire,	Sacro-lumbalis.
Long épineux,	Spinalis Dorsi.
Transversaire du cou,	Transversalis Colli.
Petit complexus,	Trachelo-mastoideus.
Grand complexus,	Complexus.
Transversaires épineuses,	Semi-spinalis Colli, Semi-spinalis Dorsi, and Multifidus Spinæ.
Interépineux du cou,	Interspinales Cervicis.
Inter-transversaires du cou,	Intertransversales Colli.
Inter-transversaires des lombes,	Intertransversales Lumborum.
Grand droit postérieur de la tête,	Rectus Capitis Posticus Major.
Petit droit postérieur de la tête,	Rectus Capitis Posticus Minor.
Oblique inférieur de la tête,	Obliquus Capitis Inferior.
Oblique supérieur de la tête,	Obliquus Capitis Superior.

MUSCLES OF THE THORAX.

Grand pectoral,	Pectoralis Major.
Petit pectoral,	Pectoralis Minor.
Sous-clavier,	Subclavius.
Grand dentelé,	Serratus Magnus.
Intercostaux externes,	Intercostales Externi.
Intercostaux internes,	Intercostales Interni.
Surcostaux et souscostaux,	Levatores Costarum.
Petit dentelé antérieur, ou triangulaire du sternum,	Triangularis Sterni.

MUSCLES OF THE SHOULDER.

Deltoïde,	Deltoideus.
Sus-épineux,	Supra-spinatus.
Sous-épineux,	Infra-spinatus.
Petit rond,	Teres Minor.
Grand rond,	Teres Major.
Sous-scapulaire,	Subscapularis.

MUSCLES OF THE ARM.

Coraco-brachial,	Coraco-brachialis.
Biceps humeral,	Biceps Flexor Cubiti.
Brachial antérieur,	Brachialis Internus.
Triceps brachial,	Triceps Extensor Cubiti.

MUSCLES OF THE FORE-ARM.

Rond Pronateur,	Pronator Radii Teres.
Radial antérieur ou grand palmaire,	Flexor Carpi Radialis.
Petit palmaire,	Palmaris Longus.

Name in French Authors.	*Name in English Authors.*
Cubital antérieur,	Flexor Carpi Ulnaris.
Fléchisseur superficiel ou sublime,	Flexor Digitorum Sublimis.
Fléchisseur profond,	Flexor Digitorum Profundus.
Long fléchisseur du pouce,	Flexor Longus Pollicis Manus.
Carré pronateur,	Pronator Radii Quadratus.
Long supinateur,	Supinator Radii Longus.
Premier, ou long radial externe,	Extensor Carpi Radialis Longior.
Second, ou court radial externe,	Extensor Carpi Radialis Brevior.
Extenseur commun des doigts,	Extensor Digitorum Communis.
Extenseur propre du petit doigt,	Extensor Proprius Minimi Digiti.
Cubital postérieur,	Extensor Carpi Ulnaris.
Anconé,	Anconeus.
Court supinateur,	Supinator Radii Brevis.
Long abducteur du pouce,	Extensor ossis Metacarpi Pollicis.
Court extenseur du pouce,	Extensor Primi Internodii Pollicis.
Long extenseur du pouce,	Extensor Secundi Internodii Pollicis.
Extenseur propre de l'index,	Extensor Proprius Indicis, vel Indicator.

MUSCLES OF THE HAND.

Court abducteur du pouce, ou scaphoïdo-phalangien,	Abductor Pollicis Manus.
Opposant du pouce, ou trapézo-métacarpien,	Opponens Pollicis.
Court fléchisseur du pouce, ou trapézo-phalangien,	Flexor Brevis Pollicis.
Adducteur du pouce, ou métacarpo-phalangien,	Adductor Pollicis.
Palmaire Cutané, ou peaucier de la main,	Palmaris Brevis.
Opposant du petit doigt, ou unci-métacarpien,	Abductor Minimi Digiti, vel Opponens Minimi Digiti.
Court fléchisseur du petit doigt, ou pisi-phalangien,	Flexor Brevis Minimi Digiti.
Adducteur du petit doigt, ou pisi-phalangien,	Adductor Minimi Digiti.
Lombricaux,	Lumbricales.
Interosseux dorsaux,	Dorsal Interossei.
Interosseux palmaires,	Palmar Interossei.

MUSCLES OF THE ABDOMEN.

Grand oblique, ou oblique externe de l'abdomen,	Obliquus Abdominis Externus.
Petit oblique, ou oblique interne de l'abdomen,	Obliquus Abdominis Internus.
Crémastre,	Cremaster.
Transverse de l'abdomen,	Transversalis Abdominis.
Grand droit de l'abdomen,	Rectus Abdominis.
Pyramidal,	Pyramidalis.
Diaphragme,	Diaphragma.
Carré des lombes,	Quadratus Lumborum.
Grand Psoas,	Psoas Magnus.
Petit Psoas,	Psoas Parvus.
Iliaque,	Iliacus Internus.

MUSCLES OF THE PERINÆUM.

Sphincter,	Sphincter Ani.
Transverse du périnée,	Transversus Perinei.
Ischio-coccygien,	Coccygeus.
Releveur de l'anus,	Levator Ani.

Name in French Authors.	*Name in English Authors.*
PECULIAR TO MAN.	
Ischio-caverneux,	Erector Penis.
Bulbo-caverneux,	Accelerator Urinæ.
Pubio-urethral,	Sling Muscle of Wilson.
Ischio-bulbaire,	Transversus Perinei.
PECULIAR TO WOMAN.	
Ischio-caverneux,	Erector Clitoridis.
Constricteur du vagin,	Constrictor Vaginæ.

MUSCLES OF THE HAUNCH.

Grand fessier,	Glutæus Maximus.
Moyen fessier,	Glutæus Medius.
Petit fessier,	Glutæus Minimus.
Pyramidal,	Pyriformis.
Jumeau supérieur,	Gemellus Superior.
Obturateur interne,	Obturator Internus.
Jumeau inférieur,	Gemellus Inferior.
Obturateur externe,	Obturator Externus.
Carré de la cuisse,	Quadratus Femoris.

MUSCLES OF THE FORE AND LATERAL PARTS OF THE THIGH.

Muscle du fascia lata,	Tensor Vaginæ Femoris.
Couturier,	Sartorius.
Droit antérieur,	Rectus Femoris.
Vaste externe,	Vastus Externus.
Vaste interne,	Vastus Internus.
Crurale,	Cruralis.
Droit interne,	Gracilis.
Pectiné,	Pectineus.
Deuxième adducteur superficiel,	Adductor Longus.
Petit adducteur profond,	Adductor Brevis.
Grand adducteur profond,	Adductor Magnus.

MUSCLES OF THE POSTERIOR PART OF THE THIGH.

Biceps femoral,	Biceps Flexor Cruris.
Demi-tendineux,	Semitendinosus.
Demi-membraneux,	Semimembranosus.

MUSCLES OF THE LEG AND DORSUM OF THE FOOT.

Jambier, ou tibial antérieur,	Tibialis Anticus.
Long extenseur commun des orteils,	Extensor Longus Digitorum Pedis.
Extenseur propre du gros orteil,	Extensor Proprius Pollicis Pedis.
Péronier antérieur,	Peroneus Tertius.
Pédieux,	Extensor Brevis Digitorum Pedis.
Long péronier lateral,	Peroneus Longus.
Court péronier lateral,	Peroneus Brevis.
Jumeau externe,	Gastrocnemius Externus.
Jumeau interne,	Gastrocnemius Internus.
Soléaire,	Soleus.
Plantaire Grêle,	Plantaris.
Poplité,	Popliteus.
Jambier ou tibial postérieur,	Tibialis Posticus.
Long fléchisseur commun des orteils,	Flexor Longus Digitorum Pedis.
Long fléchisseur du gros orteil,	Flexor Longus Pollicis Pedis.

MUSCLES OF THE SOLE OF THE FOOT.

Name in French Authors.	*Name in English Authors.*
Abducteur oblique du gros orteil,	Abductor Pollicis Pedis.
Court fléchisseur commun des orteils,	Flexor Brevis Digitorum Pedis.
Abducteur du petit orteil,	Abductor Minimi Digiti Pedis.
Accessoire du long fléchisseur commun des orteils,	Musculus Accessorius, vel Massa Carnea Jacobi Sylvii.
Lombricaux,	Lumbricales.
Abducteur transverse du gros orteil,	Transversus Pedis.
Court fléchisseur du gros orteil,	Flexor Brevis Pollicis Pedis.
Court adducteur du gros orteil,	Adductor Pollicis Pedis.
Court fléchisseur du petit orteil,	Flexor Brevis Minimi Digiti.
Interosseux plantaires,	Plantar Interossei.
Interosseux dorsales,	Dorsal Interossei.

TABLE OF CONTENTS

OF

THE FIRST VOLUME.

Page.

PREFACE to the Translation of this American Edition, by P. S. Townsend, M. D., iii
PREFACE to this edition, by *Valentine Mott*, M. D., containing a letter of Dr. Mott to M. Velpeau, and M. Velpeau's reply, .. ix
TABLE of French and Latin names of all the muscles of the human body; by Wm. Darling, M. D., ... xix
PREFACE of the Author to the First Edition, xxxv
" " " " Second " xxxix
SUPPLEMENTAL APPENDIX, by M. Velpeau, xliii
DEFINITION AND DIVISION, ... 1

TITLE FIRST.—OPERATIONS IN GENERAL, ... 2

CHAPTER FIRST.—CLASSIFICATION, ... ib.

CHAPTER SECOND.—NATURE OF OPERATIONS, ... 4

ARTICLE I.—Systematized Operations, and such as are without rules, ... ib.
ART. II.—Operations on the Dead Body, ... 5
ART. III.—Methods, ... 6

CHAPTER THIRD.—THE CARE REQUIRED IN OPERATIONS, ... 7

ART. I.—*Indications*, ... ib.
ART. II.—Various Precautions, ... 9
§ I.—Hygienic Precautions, ... ib.
§ II.—Moral Precautions, ... 11
§ III.—State of the System, ... 13

CHAPTER FOURTH.—THE CONDITIONS THAT ARE ACCESSORY TO OPERATIONS, ... 16

ART. I.—Before the Operation, ... ib.
§ I.—The locale, ... ib.
§ II.—Assistants, ... 17
§ III.—The Instruments and Dressing, ... ib.
ART. II.—During the Operation, ... 18
§ I.—Position of the Patient, Assistants, and Surgeon, ... ib.
§ II.—To arrest the course of the blood in the Diseased Part, ... 20
§ III.—To prevent Pain, ... 22
§ IV.—Accidents, ... 24
A. Hemorrhage, ... 25
B. Nervous Accidents, ... 26
C. Entrance of Air into the Veins, ... 30
§ V.—Sang-froid of the Surgeon, ... 40

Page.

ART. III.—After Operations, ... 42
§ I.—To arrest Hemorrhage, ... ib.
§ II.—The Dressings, ... 52
§ III.—Union of the Wound, ... 54
A. Indirect Union, or by Second Intention, ... ib.
B. Immediate Reunion, or by First Intention, ... 55
C. Relative estimate of Dressings by the First and Second Intention, ... 58
D. Conclusions on the Relative Value of the two kinds of Reunion, ... 59
E. Secondary Immediate Union, ... 61

CHAPTER FIFTH.—CONSEQUENCES OF OPERATIONS, ... 62

ART. I.—Natural Consequences, ... ib.
§ I.—Regimen for those operated upon, ... 63
§ II.—Separation of the Ligatures, ... 65
ART. II.—Accidents, ... ib.
§ I.—Spasms, ... ib.
§ II.—Hemorrhage, ... ib.
§ III.—Various Inflammations, ... 67

Erysipelas.—NEW AND SUCCESSFUL TREATMENT OF ERYSIPELAS, BY SULPHATE OF IRON, ... 67
1. Nature and march of Erysipelas, ... ib.
2. Treatment of Erysipelas, ... 68
3. Special local application, ... 69
Mode of application of the Sulphate of Iron, ... 71

§ IV.—Purulent Infection, ... 75

TITLE SECOND.—MINOR SURGERY, 88

Part First.—ART OF DRESSING, ... 89

CHAPTER FIRST.—INSTRUMENTS REQUIRED FOR DRESSING, ... 90

ARTICLE I.—Forceps, ... ib.
§ I.—Dressing Forceps, ... ib.
§ II.—Artery or Dissecting Forceps, ... 91
ART. II.—Scissors, ... 92
ART. III.—Razor, ... 93
ART. IV.—Spatulas, ... ib.
ART. V.—Porte-Crayon, ... 94
ART. VI.—Probes, ... ib.
§ I.—Ordinary Probes, ... ib.
§ II.—The Chest Sound, ... 95

Page.

ART. VII.—Catheters or Sounds, ... 95
§ I.—Female Catheter, ... 96
§ II.—Male Catheter, ... ib.
ART. VIII.—Director, ... 97
ART. IX.—Porte-Mèche, ... 98
ART. X.—Needles and Thread, ... 99

CHAPTER SECOND.—LINT, ... 100

ART. I.—Pledgets and Layers, (*Plumasseaux and Gâteaux,*) 101
§ I.—Plumasseaux, ... ib.
§ II.—Gâteaux, ... 102
ART. II.—Different Rolls of Lint, ... ib.
§ I.—Boulettes, or Small Balls, ... ib.
§ II.—Rolls, properly so called, ... 103
§ III.—Dossils, or Bourdonnets, ... ib.
§ IV.—Pelotes, ... ib.
§ V.—Plugs, or Tampons, ... 104
ART. III.—Mèches and Tentes, ... ib.
§ I.—Tentes, ... ib.
§ II.—Mèches, ... 105
ART. IV.—Scraped Lint, ... ib.
ART. V.—English Lint, ... 106
ART. VI.—Filasse, ... ib.
ART. VII.—Cat-Tails, ... 107
ART. VIII.—Cotton, ... ib.
ART. IX.—Substitutes for Lint, ... 110

CHAPTER THIRD.—LINEN, ... 111

ART. I.—Dry or Wet Linen, ... 112
ART. II.—Perforated and Fringed Linen, ... ib.
ART. III.—Linen spread with Ointment, ... 113

CHAPTER FOURTH.—COMPRESSES, ... 114

ART. I.—Form of Compresses, ... ib.
ART. II.—Divided Compresses, ... ib.
ART. III.—Folded Compresses, ... 115

CHAPTER FIFTH.—BANDS, ... 116

ART. I.—Linen Bandages, ... 117
ART. II.—Bandages of Cambric Muslin, or Calico, ... 118
ART. III.—Woollen Bandages, ... ib.
ART. IV.—Caoutchouc Bandages, ... ib.
ART. V.—Thread-Riband Bandages, ... 120
ART. VI.—Roller Bandages, ... 121
ART. VII.—Wet Bandages, ... 122
ART. VIII.—Glutinous Bandages, ... ib.
Dr. Van Buren on Glutinous, Starch, and Dextrine Bandages, ... 123

CHAPTER SIXTH.—ADHESIVE PLASTERS, ... 127

ART. I.—Plasters of Vigo or Diapalme, ... ib.
ART. II.—Adhesive Plaster, ... ib.

CHAPTER SEVENTH.—VARIOUS ARTICLES, . 129

ART. I.—Fanons, ... ib.
ART. II.—Cushions, ... 130
ART. III.—Splints, ... 132
ART. IV.—Trough-Boxes, ... 133
ART. V.—Hand-Board and Foot-Board, ... ib.
ART. VI.—Tapes, ... 134
ART. VII.—Surgical Beds, ... ib.
ART. VIII.—Hoops, ... 136

Page.

CHAPTER EIGHTH.—BANDAGES, ... 137

ART. I.—General Bandages, ... ib.
§ I.—Containing Bandage, ... 138
§ II.—Compressing Bandage, ... 139
§ III.—Circular Bandage, ... ib.
§ IV.—Roller Bandage, ... 140
Rules which should govern in the application of Bandages in general, ... ib.
§ V.—Tail Bandages, ... 146
§ VI.—T Bandages, ... 148
§ VII.—Square and Triangular Bandages, . 149
ART. II.—Special Bandages, or such as are adapted to those regions of the body in which they are required, ... 153
§ I.—Bandages for the Cranium, ... ib.
§ II.—Bandages for the Face, ... 156
A. Bandages for the Eyes, ... ib.
B. Bandages for the Nose, ... 158
C. Bandages for the Lips and Chin, ... 159
D. The Mask, ... 160
E. Bandages for the Region of the Ear, ib.
§ III.—Bandages for the Neck, ... 163
A. Uniting and Dividing Bandage, ... ib.
B. Redressers of the Head, ... 164
§ IV.—Bandages for the Thorax, ... 165
§ V.—Bandages for the Abdomen, ... 169
§ VI.—Bandages for the Genital Organs, .. 171
§ VII.—Bandages for the Scrotum, ... 173
§ VIII.—Bandages for the Diseases of the Anus and Perinæum, ... 176
§ IX.—Bandages for the Upper Part of the Limbs, ... 177
§ X.—Bandages for the Hand, ... 180
§ XI.—Bandages for the Lower Extremities, 182
§ XII.—Bandages for Fractures, ... ib.
A. Fractures of the Hand, ... 183
B. Fractures of the Fore-Arm, ... ib.
C. Fractures of the Humerus, ... 184
D. Fractures and Luxations of the Clavicle, ... 185
E. Fractures of the Ribs and Sternum, . 187
F. Fractures of the Lower Extremity, .. ib.

CHAPTER NINTH.—PROVISIONAL DRESSING FOR FRACTURES, ... 191

ART. I.—Bandages for the Head, ... ib.
ART. II.—Bandages for the Face, ... 192
ART. III.—Sling for the Lower Jaw, ... ib.
ART. IV.—Bandages for the Neck, ... 193
ART. V.—Bandages for the Axilla, ... 194
ART. VI.—Bandages for the Thorax and Abdomen, ... 195
ART. VII.—Bandages for the Pelvis, ... 196
ART. VIII.—Bandages for Amputations, ... ib.
ART. IX.—Scarfs. 198
ART. X.—Uniting Bandages, ... 199
ART. XI.—Bandages for Fractures, ... ib.

CHAPTER TENTH.—HERNIA BANDAGES, ... 200

CHAPTER ELEVENTH.—VARIOUS KINDS OF DRESSINGS, ... 202

ART. I.—Dressing with Cerate, ... ib.
ART. II.—Dressings with Pomades, ... 203
ART. III.—Dressings with Plasters, ... 205
§ I.—Adhesive Strips, ... 206
§ II.—English Court Plaster, ... 207
§ III.—Strips of Adhesive Plaster employed as a Topical or Compressing Bandage, ... ib.
ART. IV.—Dressings with Cataplasms, ... 211
§ I.—Cataplasms applied bare, ... 212
§ II.—Cataplasms between two pieces of linen, ... 213
§ III.—Remarks on the Use of Cataplasms, ib.

Page.
ART. V.—Dressings saturated with various Liquids, ... 215
ART. VI.—Irrigations, ... 216
ART. VII.—Application of Hot Air, ... 219
ART. VIII.—Application of Liniments, ... ib.
ART. IX.—Employment of Embrocations, ... 220
ART. X.—Fomentations, ... ib.
ART. XI.—Lotions, ... ib.
ART. XII.—Gargles, ... 221
ART. XIII.—Collutories, ... ib.
ART. XIV.—Fumigations, ... ib.
ART. XV.—Injections, ... 222
ART. XVI.—Enemata, ... 224
ART. XVII.—Douches, ... 227
ART. XVIII.—Baths, ... 228
ART. XIX.—Precautions required in Dressing, .. 229
§ I.—Action of the Air, ... ib.
§ II.—Treatment of the Wound at the First Dressing, ... 230
§ III.—Removal of the First Dressing, ... 231
§ IV.—Hours for Dressing, ... 232
§ V.—Dressings at Long Intervals, ... 233

TITLE THIRD.—ELEMENTARY OPERATIONS, ... 235

CHAPTER FIRST.—BLEEDING, OR SANGUINEOUS EMISSIONS, ... ib.

ART. I. 236
§ I.—Bleeding at the Arm, ... ib.
§ II.—Bleeding in the Neck, ... 254
§ III.—Bleeding in the Foot, ... 258
§ IV.—State of the Blood drawn from the Veins, ... 261
§ V.—Bleeding in certain particular regions of the Body, ... 262
ART. II.—Arteriotomy, ... 263
ART. III.—Local Bleeding, ... 264
§ I.—Leeches, ... ib.
A. The kind to be preferred, ... ib.
B. Application, ... 265
C. To stop the bleeding from Leeches, .. 267
D. Preservation of the Leeches, ... 268
E. Regions of the body where Leeches may be applied, ... 269
F. Leeches internally, ... 270
§ II.—Bird-peck Punctures, and Scarifications, ... ib.
A. The Bird-peck Puncture, ... ib.
B. Scarifications, ... 271
§ III.—Cupping-Glasses, ... 273
A. Dry Cupping, ... ib.
B. Scarified Cuppings, ... 274
C. Air-Pump Cupping-Glasses, ... 275
D. Cupping-Glass of M. Toirac, ... ib.

CHAPTER SECOND.—CUTANEOUS IRRITATIONS, ... 277

ART. I.—Frictions, ... ib.
ART. II.—Massage, ... ib.
ART. III.—Rubefaction, ... 278
ART. IV.—Vesication, ... 279
§ I.—Temporary Blisters, ... 281
§ II.—Permanent Blisters, ... 282
ART. V.—*Drains*, ... 284
§ I.—Issues, ... 285
§ II.—Setons, ... 288
§ III.—Accidents from Drains, ... 292
§ IV.—Suppression of Drains, ... 293

Page.
CHAPTER THIRD.—CAUTERIZATION, ... 294

ART. I.—Potential Cauteries, ... ib.
§ I.—Nitrate of Silver, or Lapis Infernalis, .. ib.
§ II.—Nitrate of Mercury, ... 295
§ III.—Other Caustics, ... 297
ART. II.—Actual Cauteries, ... 299
§ I.—Moxa, ... ib.
§ II.—Metallic Cauteries, ... 302

CHAPTER FOURTH.—VACCINATION, ... 305

ART. I.—Operation, ... ib.
ART. II.—Progress of the Vaccine, ... 307
ART. III.—Anomalies of the Vaccine, ... 308
ART. IV.—Preservation and Transmission of the Vaccine, ... 309

CHAPTER FIFTH.—PERFORATION OF THE EAR, ... 313

CHAPTER SIXTH.—OPERATIONS THAT ARE PERFORMED ON THE TEETH, ... 315

ART. I.—Incision of the Gum to favor the egress of the Teeth, ... ib.
ART. II.—Straightening of the Teeth, ... 316
ART. III.—Cleaning the Teeth, ... 317
ART. IV.—Filing the Teeth, ... 319
ART. V.—Filling the Teeth. 320
ART. VI.—Cauterization of the Teeth, ... 321
ART. VII.—Of Extraction of the Teeth, and the Instruments that are used in this Operation, ... 322
§ I.—The Key of Garengeot, ... ib.
§ II.—The Straight Tooth Forceps, ... 324
§ III.—The Curved Davier, ... ib.
§ IV.—The Elevator, or Carp's Tongue, ... 325
§ V.—Dog's Foot, ... ib.
ART. VIII.—The Straight and Curved Cutting-Pincers, ... 326
ART. IX.—General Remarks, ... ib.

TITLE FOURTH.—GENERAL, OR COMMON OPERATIONS, ... 327

Part First.—SIMPLE, OR ELEMENTARY OPERATIONS, ... ib.

CHAPTER FIRST.—DIVISIONS, ... ib.

SECTION FIRST.—*Cutting Instruments*, ... ib.

ART. I.—Manner of holding the Bistoury, ... 328
§ I.—First Position. The Bistoury held as a knife, the edge downward, ... ib.
§ II.—Second Position. The Bistoury held as a knife, with the edge upward, ... ib.
§ III.—Third Position. The Bistoury held as a pen, the edge downward, the point forward, ... ib.
§ IV.—Fourth Position. The Bistoury held like a writing-pen, with the point backward, ... 329
§ V.—Fifth Position. The Bistoury held as a pen, the edge upward, ... ib.
§ VI.—Sixth Position. The Bistoury held as a drill-bow, ... ib.
ART. II.—Manner of holding the Scissors, ... 330

Page.
SECTION SECOND.—*Incisions*, ... 330
ART. I.—Simple Incisions, ... 331
ART. II.—Compound Incisions, ... 335
ART. III.—Incisions applicable to Deposites, ... 338
§ I.—Opening of Abscesses from within outward, ... 339
§ II.—Opening of Abscesses from without inward, ... 340
§ III.—Opening of Abscesses by Complex Incisions, ... 342
ART. IV.—Incisions applicable to the Dissection of Tumors and Cysts, ... 343
§ I.—Form of the Incision, ... ib.
§ II.—Dissection of Flaps, ... 344

SECTION THIRD.—*Punctures*, ... 346
ART. I.—Acupuncture, ... ib.
ART. II.—Exploring Punctures, ... 347
ART. III.—Puncture with the Trochar, ... 348

CHAPTER SECOND.—REUNION, ... 349
ART. I.—Sutures, ... ib.
§ I.—Interrupted Suture, ... 351
§ II.—The Loop Suture, ... 354
§ III.—Continuous Whip, or Glover's Suture, ... ib.
§ IV.—Zig-zag, or Basting Suture, ... 355
§ V.—Twisted Suture, ... 356
§ VI.—Quilled Suture, ... 357
§ VII.—General Remarks on Sutures, ... 358

Part Second.—COMPLEX OPERATIONS, ... 359

Section First.—OPERATIONS WHICH ARE PERFORMED FOR DISEASES OF THE CUTICULAR SURFACE OF THE INTEGUMENTS, ... ib.
ART. I.—Operations required for Warts, Corns, and Diseases of the Nail, ... ib.
§ I.—Warts, ... 359
§ II.—Corns upon the Feet, ... 361
§ III.—Callosities, ... 362
§ IV.—*Diseases of the Nail*, ... 363
A. Runround, ... ib.
B. *Nail imbedded in the Flesh*, ... ib.
I. Destruction of the Nail, ... 364
a. Destruction of the imbedded part of the Nail, ... ib.
b. Tearing out the Nail, ... 365
c. Destruction of the Nail by Caustics, ... 367
d. Appreciation, ... 368
II. Destruction of the Fungosities only, ... 369
III. Re-adjustment and Reduction of the Nail, ... 370
IV. General Remarks, ... 372
§ V.—Exostosis, with Sub-Ungual Fungosities of the Toes, ... 375

Section Second.—OPERATIONS WHICH MAY BE REQUIRED FOR DEFORMITIES, ... 377
CHAPTER FIRST.—MORBID CICATRICES, ... ib.
ART. I.—Anatomy of Cicatrices, ... ib.
ART. II.—Treatment, ... 378
§ I.—Excision, ... ib.
§ II.—Incision, ... 379
§ III.—Extirpation, ... 380

Page.
CHAPTER SECOND.—SUB-CUTANEOUS BRIDLES, ... 381
ART. I.—Anatomy of Sub-Cutaneous Bridles, .. ib.
ART. II.—Treatment, ... 382
§ I.—Section of the Abnormal Bridle, ... ib.
§ II.—Extirpation of the Bridle, ... 384
ART. III.—Operations according to the Region in which the Bridle is situated, ... 385
§ I.—The Hand, ... ib.
§ II.—Fore-Arm, ... 391
§ III.—Arm, ... 392
§ IV.—Toes, ... 393
§ V.—Legs, ... 394
§ VI.—Thighs, ... ib.
§ VII.—Abdomen and Genital Organs, ... 395
§ VIII.—Trunk, ... 396

CHAPTER THIRD.—DEFORMITIES FROM ALTERATIONS OF THE TENDONS, OR MUSCLES, ... 399
SECTION FIRST.—ACCIDENTAL DIVISIONS, ... ib.
ART. I.—Tendons in general, ... 400
§ I.—Pathological Anatomy, ... ib.
§ II.—Treatment, ... 401
A. Position, ... 405
B. Suture, ... ib.
ART. II.—*Tendons in particular*, ... 407
§ I.—Tendons of the Fingers, ... ib.
§ II.—Tendons of the Hand, ... 412
§ III.—Tendons of the Elbow, ... 413
§ IV.—Tendons of the Foot, ... 416
A. Tendons of the Tarsus and Metatarsus, ... ib.
B. Tendo-Achillis, ... 418
§ V.—Tendons of the Femoro-Tibial Region, ... 422
§ VI.—Tendons and Muscles of the Thigh, 426
ART. III.—Deformities by the Retraction of the Tendons, or Muscles, ... ib.
§ I.—Treatment, ... ib.
A. Topical, ... ib.
B. Tenotomy, ... ib.
I. Tenotomy in General, ... 428
a. Tenotomy in cases of Wounds, . ib.
b. Tenotomy, properly so called, .. 429
c. Appreciation of the Methods, ... 431
d. Pathological Anatomy, ... 434
II. Tenotomy in Particular, ... 438
a. Hand, ... ib.
b. Elbow, and Bend of the Arm, .. 440
c. Tendons or Muscles of the Axilla, ... 442
d. Tendons of the Toes, ... ib.
e. Tendons of the Foot, ... 443
1st. Plantar Surface of the Foot, 444
2d. Section of the Tendo-Achillis, ... 445
3d. Talipes, or Club-Foot Forward, or Talus, ... 449
4th. Club-Foot Inward, or Varus, 450
A. Section of the Tibialis Anticus, ... 451
B. Section of the Tibialis Posticus, ... ib.
Tendons of the Great Toe, . 452
5th. Section of the Peroneus Longus and Brevis in Club-Foot Outward, or Valgus, . ib.
GENERAL REMARKS ON CLUB-FOOT, ... 454
f. Tendons of the Leg, ... 462
g. Tendons of the Head—Torticollis, or Wry-Neck, ... 465
h. Section of some other Muscles of the Neck, in cases of Deviation of the Head, ... 473

Page.
CHAPTER FOURTH.—Deformities in consequence of Alteration of the Deep-seated Ligaments, or Aponeuroses, ... 474

CHAPTER FIFTH.—Deformities from Alteration in the Skeleton, ... 478

Art. I.—Anchylosis, ... ib.
§ I.—Fracturing the Anchylosis, ... ib.
§ II.—Excision of Bone, ... 479
§ III.—Supplementary Articulations, ... 483
A. The Upper Extremities, ... 484
B. The Lower Extremity, ... 485
Art. II.—Deformities from Deviation in the Body of the Bones, ... 486
§ I.—Breaking of the Callus, ... ib.
§ II.—Excision of the Angular Callus, ... 488
Art. III.—Appendix, ... 489
Late Discussion on Tenotomy in general, and particularly on Tenotomy of the Flexors of the Fingers, at the Academy Royal of Medicine, Paris, ... 490
New Operations in Tenotomy and Myotomy, ... 511
General Remarks on Myotomy and Anaplasty in America, including Dr. Schmidt's Division of the *Masseter*, 517

Strabismus, ... 523

Art. I.—History, ... 524
Art. II.—Anatomy, ... 528
Theory of Vision, and Action of the Muscles of the Eye; by the late Professor David Hosack, of New York, ... ib.
§ I.—Muscles of the Orbit, ... 534
§ II.—Globe of the Eye, ... 535
§ III.—Nerves, ... ib.
§ IV.—Vessels, ... 536
§ V.—Aponeuroses, ... ib.
Art. III.—*Operative Methods*, ... 539
Art. IV.—Comparative value of the Operative Processes, ... 547
Art. V.—Treatment, ... 550
Art. VI.—Consequences of the Operation, ... 551
Art. VII.—Inconveniences of the Operation, .. 556
Art. VIII.—State of the Parts after the Operation, ... 559
Art. IX.—Counter Indications, ... 560
Art. X.—Advantages of the Operation, ... 565
Art. XI.—Amelioration of Vision, ... 573
Art. XII.—Section of the Muscles of the Eye, to remedy other diseases, ... 576
Art. XIII.—New varieties of the Operation, .. 580
Strabismus in Great Britain, and on the Continent of Europe, ... 581
Strabismus in America, ... 584

Section Third.—ANAPLASTY, OR AUTOPLASTY, ... 588

PART FIRST.—Anaplasty in General, ... ib.

CHAPTER FIRST.—Anaplasty by Restitution, ... 589

Art. I.—Restitution of Organs partially divided, ... ib.
Art. II.—Restitution of Organs completely separated, ... ib.
§ I.—The Nose, ... ib.
§ II.—The Fingers, ... 595

Page.
CHAPTER SECOND.—Anaplasty by Heterogeneous Transplantation, ... 599

Art. I.—Transplantation of Analogous Parts, . ib.
Art. II.—Transplantation of Parts that are different, ... 601

CHAPTER THIRD.—Anaplasty by Transposition, ... 602

Art. I.—Anaplasty by remote Flaps, or the Italian Method, ... 603
§ I.—The Italian Process, ... ib.
§ II.—Process of Graefe, ... 604
Art. II.—Anaplasty by Flaps from Neighboring Parts, ... 605
Art. III.—Anaplasty by Separation of the Tissues, ... 606
§ I. Process of Franco, ... ib.
§ II. Anaplasty by Internal Incisions or Scorings, or the Process of Celsus, ... 608
§ III. Anaplasty by External Incisions or Scorings, or the Process of Thévenin, ib.
§ IV.—Anaplasty by Simple Lateral Incisions—Process of Dieffenbach, ... ib.
§ V.—Anaplasty by Transportation of a Cutaneous Bridge, ... 609
§ VI.—Anaplasty by raising an Arcade of the Integuments, ... ib.
§ VII.—Anaplasty in the manner of a Drawer, ... ib.
§ VIII.—Anaplasty by Invagination, ... 610

PART SECOND.—Anaplasty in Particular, ... ib.

CHAPTER FIRST.—Anaplasty of the Cranium, ... ib.

CHAPTER SECOND.—Otoplasty, (Anaplasty of the Ear,) 611

CHAPTER THIRD.—Rhinoplasty, (Anaplasty of the Nose,) 613

Art. I. 614
Art. II.—Operative Processes, ... 615
§ I.—Rhinoplasty by Transplantation, ... ib.
§ II.—Rhinoplasty by Transposition, ... 616
A. The Italian Method, ... ib.
I. Process of Tagliacozzi, ... ib.
II. Process of Graefe, ... ib.
III. Appreciation, ... 617
IV. By means of a Cutaneous Flap from the Breech, ... 618
V. By Transplantation of a Nose, ... ib.
B. The Indian Method, ... 618
C. The French Method, ... 622
D. Relative Value of the different Methods, ... 623
Operation for a new Columna, by Mr. Liston, ... 625
Rhinoplasty in America, ... 626

CHAPTER FOURTH.—Blepharoplasty, (Anaplasty of the Eyelids,) 627

Art. I.—History and Indications, ... ib.
Art. II.—Operative Methods, ... 629
§ I.—Process of M. Fricke, or the Indian Method, ... ib.
§ II.—The Author's Method, ... 630
§ III.—Blepharoplasty by Sloping of the Flap, ... ib.
§ IV.—Process of M. Jones, ... 631
Art. III.—Appreciation, ... 632
Blepharoplasty in America, ... ib.

Page.
CHAPTER FIFTH.—Keratoplasty, or Making of a New Cornea, ... 633

CHAPTER SIXTH.—Anaplasty of the Lachrymal Sac,..... 634

CHAPTER SEVENTH.—Cheiloplasty, or Anaplasty of the Lips,..... 635
Art. I.—The *French Method*, ... ib.
Art. II.—*Indian Method*,..... 640
Art. III.—Cheiloplasty by a Hem of the Mucous Membrane, ... 641

CHAPTER EIGHTH.—Genoplasty, or Anaplasty of the Cheek,..... 644

Art. I.—The Indian Method, ... 645
Art. II.—The French Method,..... 646
Cheiloplastic Operation by Dr. Mott,.... 648

CHAPTER NINTH.—Staphyloplasty, or Anaplasty of the Uvula and Velum Palati, ... 650

CHAPTER TENTH.—Palatoplasty, or Anaplasty of the Vault of the Palate, ... 651
Mütter's Process of Anaplasty for Cicatrices from Burns,..... 652

CHAPTER ELEVENTH.—Bronchoplasty, or Anaplasty of the Larynx and of the Trachea,..... 654

Art. I.—Anatomy,..... ib.
Art. II.—Indications,..... 655
Art. III.—*Operative Process*, ... 657
§ I.—Process of the Author,..... ib.
§ II.—Ancient Processes,..... 661

CHAPTER TWELFTH.—Anaplasty of the Thorax,..... 662

CHAPTER THIRTEENTH.—Anaplasty of Stercoral Fistulas, and Artificial Anus,..... 664

CHAPTER FOURTEENTH.—Anaplasty of the Scrotum and Penis,..... 666

CHAPTER FIFTEENTH.—Uretroplasty, or Anaplasty of the Urethra, . 667

CHAPTER SIXTEENTH.—Vaginal Anaplasty, or Elytroplasty,..... 669

CHAPTER SEVENTEENTH.—Anaplasty of the Perinæum,..... 674

CONCLUDING AMERICAN APPENDIX,..... 675

Acupuncture, ... ib.
Electro, or Galvano-Puncture,..... 676
Page.
Hemostatic Means,..... 676

SUB-CUTANEOUS SECTIONS IN TENOTOMY AND MYOTOMY,..... 678

Strabismus, ... ib.
Proposed Excision of a Portion of Elongated or Paralyzed Rectus, [by P. S. T.,] ... 679
Division of the Tendo-Achillis,..... ib.
Division of the Muscles of the Face,..... 680
Pancoast on Talipes, or Club-foot,..... 681

ANAPLASTY, ... 684

Pancoast's Processes of Rhinoplasty, ... ib.
Pancoast on Cheiloplasty, ... 694
Pancoast's Process of Posthioplasty, or Anaplasty of the Prepuce,..... 696
Pancoast's Process of Chalinoplasty, or the Making of a New Frenum Preputii, . ib.
Mütter's Anaplastic Operations for the Reparation of Deformities from Burns,..... 697
Guerin on Optical Strabismus,..... 701
Treatment of Erysipelas by Nitrate of Silver,.. 703
Blepharoplasty for Nævus Maternus,..... ib.
Dr. Mott's Process for the Cure of Nævi, ... ib.
The Red-Hot Iron for Phlebitis, ... 704

Early Operations for Geno-Cheiloplasty, or Anaplasty of the Cheek and Lips, by Dr. Mott, ... 706
Case I.—By Displacement, ... ib.
Case II.—By Displacement and Flaps,..... 707

Metopoplasty—*Anaplasty of the Forehead.* By Dr. Jno. Watson, ... 711
Anaplastic Operations and Sub-Cutaneous Sections. By Dr. Alfred C. Post, .. 714
Tiemann's Improved Eye Speculum,..... 723

General Review of the Progress of Sub-Cutaneous Sections and Anaplastic Surgery, since the Last Edition of Velpeau, ... 724

THE SUB-CUTANEOUS SECTION, ... 725

Strabismus, ... 726
Myotomy of the Levator Palpebræ, ... 757

Torticollis, and Proposed Division of the Splenius Capitis,..... 759

Dorsal or Rachidian Myotomy, (*Myotomie Rachidienne,*) for Lateral Curvature of the Spine,..... 760
M. Jules Guérin's views thereon, ... ib.
Professor Robert Hunter's Process,..... 767
M. Malgaigne's Objections to Dorsal Myotomy,..... 768
M. Guérin's Table of Diseases, to which Sub-Cutaneous Sections and Punctures may be or have been applied,..... 774
M. Doubovitski's Case, as related by himself,... 776
Diagnosis and Treatment of Contraction of the Fingers of both Hands, from Contraction of the Fascia Palmaris. By Cæsar Hawkins, of London, ... 777
Section of the Flexor Longus Pollicis,..... 779

Page.
DIVISION OF MUSCLES, TENDONS, ETC. OF THE LOWER EXTREMITY, ... 779

Sub-Cutaneous Kelotomy, ... ib.
Division of Muscles of the Thigh for Contracted Hip, ... 781
Ditto in ununited Fractures of the Patella, .. ib.
Rupture of the Tendon of the Triceps Femoris, ... ib.
Fracture-Box for Rupture of the Tendon of the Triceps Femoris, and of the Ligamentum Patellæ, ... 782
Division of the Ham-Strings, ... ib.
Division of the Flexor Muscles of the Leg, .. 783

Club-Foot, ... 784
Section of the Tendo-Achillis in recent compound Fractures and Dislocations of the Leg, Ankle, &c. ..... ib.
Section of the Tendo-Achillis in Fractures of the Malleoli, ... 785
Ditto in certain luxations of the Ankle-joint, . 786
Division of the Tendon of the Flexor Longus Digitorum Pedis, ... ib.
Sub-Cutaneous Incision of Joints, ... ib.
Sub-Cutaneous Section in Congenital Luxations, by M. Guérin, ... 788
Ditto for Psoas Abscess, Buboes, Tumors, &c., . 790
Division for Bursal Tumors, Cysts, &c., by M. Velpeau, ... 791
M. Guérin's great Operation, ... 792
Proposed Division of the Hyo-glossus and Stylo-glossus Muscles for Stammering, by M. Velpeau, ... 793
Contraction of the Limbs in Inflammatory Softening of the Brain, ... 794
Diseases for which Prof. Robt. Hunter suggests the Sub-Cutaneous Operation, ... 795

ANAPLASTIC OPERATIONS, ... 796
Blepharoplasty, ... ib.
New Suggestions for Rhinoplasty, ... 798
Cheiloplasty in Cancerous Lips, ... ib.
Early Geno-Cheiloplastic Operation, by M. Lisfranc, ... 799
Anaplasty applied to the Operation for Compound Hare-Lip, by M. Malgaigne, ... 800
DR. MOTT'S Remarks on ditto, ... ib.
Anaplasty for Ranula, ... 801
Anaplasty for the Cure of Cicatrices from Burns, as first performed by Mr. Carden, ... ib.
Uretroplasty, ... ib.
Episcoplasty, ... 805
Penoplasty, by Dr. Mettauer, of Virginia, ... ib.

Page.
ARTIFICIAL JOINTS.—EXSECTION OF THE ARTICULATIONS—ELBOW AND KNEE, .. 806
Operation of Exsecting the Elbow Joint in Anchylosis, as first perfected by Mr. Syme, ... 807
Exsection of the Elbow Joint, by Dr. Gurdon Buck, of New York, ... 808
Exsection of the Entire Knee Joint, by Dr. Gurdon Buck, of New York, ... 809

ANAPLASTY AS APPLIED TO THE DEFORMITIES OF THE FACE, by PROFESSOR SERRE, of Montpellier, ... 810

FACIAL ANAPLASTY, ... 815

Cheiloplasty, ... 819
Dr. Mott's Views as to *Cancerous Degeneration* of the Mucous Buccal Lining of the Lips, ... 821
Anaplasty of the Commissure of the Lips, .. 825
Restorations of the Upper Lip, ... 827
Restoration of an Entire Mouth, ... 828
Rhinoplasty, ... 830
Genoplasty, ... ib.
Anaplasty in Immobility of the Lower Jaw, ... 831
Dr. Mott's Process, ... ib.

M. MALGAIGNE'S LAST EDITION (1843) OF HIS MANUAL OF OPERATIVE SURGERY, . 833
The Sub-Cutaneous Incision, ... ib.
Caustics and Cauteries, ... 834
The Sub-Cutaneous Principle for the Cure of GOITRE, ... ib.
Compression of the Arteries and Veins for Hemorrhage, ... 836
Cauterization with the Hot Iron, ... 837
Ligatures, ... ib.
Torsion, ... ib.
Application of Adhesive Plasters, ... 838
Leeches and Leeching, ... ib.
New and Prompt Mode of arresting Bleeding from Leech-Bites, ... 840
Venesection over the Brachial Artery, ... ib.
Electro-Puncture for the Cure of *Goitre*, ... ib.
M. Amussat's Process to prevent the re-adhesion of Inodular Cicatrices, ... ib.
Division of the Masseter, ... ib.
Division of most of the Muscles of the Coxo-Femoral Articulation, by M. Guérin, . ib.
Division of the Tendo-Achillis, ... 841
Morbid Cicatrices, ... 842
M. Goyrand's Process of Extracting Foreign Bodies from the Joints, ... ib.
Artificial Joints, ... 844
Tarsoraphy, ... ib.

MYOTOMY FOR STRABISMUS, ... 845
Section of the Superior Oblique, ... 846
Section of the Inferior Oblique, ... 847
M. Bonnet's Process, ... ib.
M. Malgaigne's Process for Cheiloplasty, ... 848
Uretroplasty, ... 850

ERRATA.

For ART. IV. p. 104, ART. V. p. 105, and so on down to ART. X. p. 110, inclusive, read ART. III. IV. V. VI. VII. VIII. and IX.

For TITLE II. p. 235, read TITLE III.

For CHAPTER VI. p. 305, read CHAPTER IV.

For TITLE III. p. 327, read TITLE IV.

For § IV. p. 375, read § V.

For "Alterations of the Ligaments," &c., heading of Chapter IV. p. 474, read "Alterations of the Deep-Seated Ligaments," &c.

For Section II. p. 573, read Article XI.

WORKS OF M. VELPEAU,

[IN FRENCH,]

REFERRED TO BY HIM IN THIS WORK ON OPERATIVE SURGERY.

Complete Treatise on the Art of Midwifery, or Theoretic and Practical Tocology, etc.
Embryology, or Human Ovology.
Convulsions in Women during Pregnancy and Labor, and after Parturition.
A Small Treatise on the Diseases of the Breast.
On the Operation of Trephining in Wounds of the Head.
A Complete Treatise on the Surgical, General, and Topographic Anatomy of the Human Body.
Manual of General and Topographic Surgical Anatomy.
Description of a Remarkable Case of Cancerous Disease.
Researches on the Spontaneous Cessation of Traumatic Hemorrhages.
Contusion in all the Organs.
Laryngeal Fistulas and Bronchoplasty.
Amputation of the Leg at the Articulation of the Knee.
Mercurial Frictions in Peritonitis.
Memoir on the Membrana Decidua, (*Caduque.*)
On Artificial Anus, (*Contre Nature.*)
On the Treatment of Burns.
On Diseases of the Lymphatic System.
On Luxations of the Shoulder.
Letters on the Introduction of Air into the Veins.

PREFACE

TO

THE FIRST EDITION.

In publishing the first edition of this treatise, in 1832, my object was to satisfy a want generally felt. That which M. Roux promised in 1813, has not been effected. The work of M. Sabatier had already become old. A crowd of neglected operations, scarcely known in the time of this author, and which to-day engage the attention of the learned world, had not yet found a place in classical works. Rhinoplasty, cheiloplasty, blepharoplasty, otoplasty, bronchoplasty, staphyloraphy, torsion, puncture of the arteries, lithontrity, cauterization of the urethra, amputation of the uterus, extirpation of the ovary, and of the anus, and many exsections, were of this number; and we may say that a review of operative surgery entire, had really become indispensable.

The course of instruction which I have undertaken since 1823, made me recognise, at the very outset, the species of void of which I speak, and would have induced me at an early occasion to have attempted to remedy it, had I not been fearful of undertaking a task beyond the measure of my strength. I limited myself at first to the idea of a simple manual; but the researches into which I naturally found myself drawn on this occasion, soon convinced me that, to be truly useful, not only a manual, but a complete treatise was necessary. Many chapters were already completed with this view, when the journals announced, in 1825, a work of the same kind which would immediately appear, but which has not yet been published. I thought it proper to arrest my course and wait. Other motives encouraged me to this delay. Sustained only upon the demonstrations of the amphitheatre, my assertions would have been but of feeble value. The processes essayed upon the dead body cannot be definitively adopted but after having been submitted to the test of the Hospitals. My position at this epoch, would not then have given me the right to appeal, with a sufficient degree of confidence, to my personal experience.

Four years of practice at the Hospital of Perfectionnement, the service of the Hospital of St. Antoine, with which I have been intrusted for nearly two years, and the wards of which I have had the direction at La Pitié, procured me at length the opportunity of applying frequently to the living body, the processes which I had so often repeated on the dead subject. To set out from that point, I thought it might be permitted me to express an opinion on the propriety, absolute or relative, of the different methods which should be examined in a treatise like the present.

Writing in the sole interest of truth, I accepted thus the labors of all, without distinction of country, school, or persons, reserving to myself the right to discuss

their merits with independence, and of stating, without prejudice, what, in my opinion, they might offer of useful or defective. Our epoch presents, under this point of view, difficulties which can only be appreciated fully by him who should undertake to make an impartial history of it. While men are living, they are rarely just towards one another.

The improvements for which we are indebted to the greater number of practitioners who share the domain of science, being unpublished by their authors and unknown but by tradition, it was indispensable to make a conscientious examination of them, and to seek out with care their true sources. No work having been composed in this spirit, and the history of surgery of the nineteenth century being a task yet unattempted, I have been under the necessity of consulting an infinity of periodical collections, particular memoirs, and monographs of every description.

A work of great application, where every thing is to be in some sort mathematical, treating of dates, of inventions, and of processes which have given birth to so many discussions, and to controversies so multiplied, the subject and each one of the objects of which have been presented in so many different forms, and so differently interpreted, exacted in this respect an attention, a care, and a labor, which few persons would suspect, and an amount of researches of which it is, in reality, difficult to form an idea, except by one who has himself undertaken it.

In short, in order to be sure of omitting nothing essential, I frequently addressed myself to the persons themselves, to those especially whose researches were unpublished, or have been written by a third party. It was thus, in order to know what Dupuytren had done on certain operations, I believed it my duty to make inquiry of M. Marx, his special pupil. I have in this manner learned, through M. Moulinié, that the success attributed to the refrigerant method in the treatment of aneurisms, was far from being well established; that all, or almost all of it, was due to other means concurrently employed, for which no allowance was made in the detail of the observations.

As to what relates to the epochs that are past, I have done all in my power to go back to those sources. When I have not been enabled to do so, either from the scarcity of works or owing to the language in which they are written, I have relied for my authority upon Sprengel, confirmed by that of Le Clerc, Freind, Dujardin, and Peyrilhe.

Having scarcely anywhere given the title or passages of the works that I have drawn from, I might have dispensed also with giving the name of the authors. One may thus neglect all historical research, and have no need of contradicting, personally, any one, whoever he may be; but nothing appears to me more contrary to the true interests of science. Seeing thus no name in the text they read, students, unjust without knowing it, constantly impute to the author whom they have in their hands, ideas which often date many ages back, or that twenty others have already originated. Hence comes that credulity so adroitly experimented upon in all times, and now more so than ever, by the inventors of new methods; hence so many of those academic mystifications, and that currency which the fabricators of discoveries obtain among numerous practitioners, who, in this respect, are scarcely less difficult to be imposed upon than pupils. In collecting upon each subject upon which I treat, the principal names that belong to it, I in the first place acquitted myself of a strict sense of justice; and have also thought that my assertions gained by this means a support and an authority which it would have been wrong to have deprived them of. In a word, I find also here the advantage of showing to the reader, that

the object with which he is occupied is or is not new, or that such and such persons have already spoken of it. To persons who would reproach me that I have thereby rendered it impossible for them to verify the exactitude of my citations, I would reply, that in reproducing the opinion of others, I have in general given it as I understand it, without pretending in any manner to render them responsible for my interpretations. Addressing myself, as I do, to pupils, I have desired, in pointing out things, to lead them to suppose that there is a history of them, and thus to give them, in advance, some taste for scientific literature.

No one has ever called in question the importance of anatomy in the practice of operations. Nevertheless, as it was not possible to introduce but a small number of its details in a treatise on operative surgery, I have thought it advisable to look to those only that are indispensable, and to choose the form which is best adapted to their abridged exposition.

Sabatier, who was capable of giving the state of the science with so much clearness, has, nevertheless, from his want of descriptive details, the defect of not satisfying any but those who are already acquainted with it, or who are content with studying it in their closet, and of being, therefore, insufficient for those who operate in amphitheatres. Seeing this rock, I have endeavored to shun it, without losing sight of the opposite inconvenience, knowing how fatiguing by their aridity, and how irksome by their multiplicity, are those long and interminable manual directions that are found in some publications of our time.

As for the rest, in order to satisfy all on this point, I have, under the title of *operative process*, given, as often as the extent of the subject has permitted me to do so, the details purely mechanical and practical that are absolutely required for the performance of the operation, whether on the living body or on the dead subject. The history, the examination, the discussion, the appreciation of the methods, the accidents, the consequences, the indications, forming the subject of so many distinct titles, will always be easy to consult separately by those who would not desire to read the article entire. I have not applied these divisions, however, except to the operations somewhat complicated, and have not thought it necessary to adopt them in those which may be conveniently described in a few pages. Not having made up my mind to treat exclusively of operative processes, nor wishing, on the other hand, to make a book on surgical pathology, I have confined myself on this point to the discussion of the indications, setting aside, except in cases of special necessity, whatever relates to the nature, to the development, symptoms, and general treatment of the diseases. The comparison of the methods, and the results that they have furnished, formed another point too much neglected up to the present time, and one too unquestionable in its utility, not to require from me every attention possible.

If I have often adverted to processes long since forgotten, or justly proscribed; if I have, also, not omitted a crowd of recent inventions, which may not have any value in themselves, and that science can derive no advantage from; it is because, on the one hand, there is no method, however extravagant we may suppose it to be, which does not run some risk of being reproduced at some future time by some new inventor, and that, on the other hand, it is indispensable to enlighten students, not only on what they ought to adopt, but also on what they ought to reject, when the subject is the cotemporary history of assertions and of opinions that they are every day accustomed to hear unjustly praised or censured. Although I may have done all this, in order to follow out, under this double relation, the march of mind, and to

represent with exactitude and impartiality the actual state of the science; and that I have neglected nothing which might enable me to procure correct information on its most modern improvements, I nevertheless apprehend that I may have forgotten some things that are useful, and I make no pretension of having described every thing. As to the rest, I shall receive with gratitude the advice which the judgment of learned men may be pleased to furnish me with.

The engravings annexed to the descriptions are not as numerous as the nature of the subject would seem to render necessary; but the price of the book is already so much enhanced by them, that I have not thought it proper to extend them further. All have been taken from nature with the greatest care. Though for the most part considerably reduced, the objects will be found represented with neatness and precision. I have chosen, as much as possible, new points of view, and those which permit us to seize at a glance the ensemble of the operation.

Their only object being to replace tedious written details, I have looked less to their finish than to the accuracy and clearness of the design. The execution of them was, moreover, confided to one of our most distinguished artists, M. A. Chazal, Professor of Iconography at the Museum of Natural History, who, as is well known, possesses great skill in this particular branch. Such instruments as I have not been able to find in the collections of the faculty, have almost all been procured for me by M. Charrière, the most extensive and skilful manufacturer in this branch at Paris.

Paris, 1832.

PREFACE

TO

THE SECOND EDITION.

A more extended practice, the service of a large hospital, and the requirements of teaching, have made it a more and more imperious duty for me to submit to the crucible of experience, almost the whole round of surgical operations. Led by these means to compare the various resources of surgery with each other, I have thought it proper to consign to the present edition of this work the conclusions to which I have arrived from the researches which I have made, and never to shrink from giving a positive appreciation and judgment, when the questions have appeared to me susceptible of it.

In this respect I have had to divest myself more than ever of opinions deduced from the dissections of the amphitheatre. Habituated, like my cotemporaries, to judge of the importance of operations by the processes on the dead body, I had at first attached too much value to a great number of methods and precepts of which I now recognise the insignificance or puerility. In imitation of surgeons who, taking for serious the approbation of some young students, have believed that they could remodel operative surgery by directing the incision of tissues at so many lines or inches from such or such a groove, under an angle of such or such a degree, following out, as they say, the rules of geometry, I had abandoned myself also to the innocent pleasure of extolling the superiority of methods that were altogether inapplicable, or utterly useless. I now know, that on living man it is less important to act quickly than to act properly; less important to establish regular wounds, and geometrical incisions, than to follow the line indicated by the diseased tissues; less important to give to the divisions a ready approximation, than to place them in conditions which offer the greatest possible security.

Believing that I have the right, at the present time, to modify and to change what has been erroneously said or done by others, I have not hesitated, as formerly, to declare what I have found best, or least objectionable, in the processes which I have tested or projected. After having pointed out and described the different processes, I have taken upon myself to propose a choice among them to students and to surgeons, and to designate those which appeared to me to merit the preference, by whatever title it may be. Considering that the dressings, bandages, and the small operations which are generally known under the title of minor surgery, exercise the greatest influence on the subsequent success of operations, and are not, in fact, sufficiently studied, neither by students nor by the mass of practitioners, I have believed it my duty to treat of them at length in this edition.

The books that science possessed already on this subject, it is true, are numerous and sufficiently complete; but as they form treatises apart, few persons attach any value to them, and they thus attain but imperfectly the object in view.

Having perceived that long descriptions were not equal in value to a few figures, I have thought that designs on wood would here be of true service. In place of forming an atlas of them, or separate tables, I have believed that this was a suitable occasion to intercalate them with the text, in the manner of the ancients, and as has been the practice for some years past in England and America.

Wishing thus to embrace all operative surgery, I have thought it necessary to add numerous chapters to my first work. An entire new class of operations has been created in our days, that of operations relative to deformities. I have consecrated a long article to it. The section of cicatrices, bridles, tendons, and retracted muscles, thus demanded a place in a systematic treatise. Neither could I neglect the operations relative to the maladies of the nail, and those of the epidermis and teeth. The operations which concern kinepock, the application of cupping-glasses, moxas, leeches, the cautery, bleeding, etc., could not, for the same reasons, be passed over in silence. The restorations of organs have led me to establish the great class of anaplasties; so that, in adding also what relates to abscesses, fractures, and the generalities of operative surgery, I have out of the whole composed the first volume and the half of the second, of all of which there is no trace in the first edition.

As special operations, which I likewise had to treat anew, or on a more enlarged plan, I mention those which comprise the numerous series of tumors, and those of exsections. Other diseases, the openings in the perinæum, vesico-vaginal fistulas, and polypi in the urethra, are likewise made the subject of articles almost entirely new; so that the entire book is in reality completely recast, and increased to double its size.

The reasons that I had given for not indicating the sources from which I have derived materials, have not appeared satisfactory to most of those who have occupied themselves with my work. Yielding to a wish that has often been expressed by them, I have on this occasion followed the opposite course. Nevertheless, this new plan has encroached so much on the space destined to the text, that I have found it necessary to modify it a little in the two last volumes; I have abstained, for example, from subjects which I have treated of elsewhere, whether in the Dictionary of Medicine, in my Tocology, or my Anatomy, or in the particular memoirs whose titles are seen at the head of this work. Under this point of view I ought to recall, as in 1832, the fact that my intention never has been to give a history of surgery; and that, if I often cite the labors of others, it is solely out of a spirit of equity, to enable those who read me to be capable of understanding what has been done by the ancients as well as by the moderns, and also by myself, in order that, after having read me, both the student and the practitioner may know what are the true merits of the question under consideration.

Not always having it in my power to verify the facts announced by certain authors, I have, therefore, not made myself the guarantee of their declarations, but have made them incur all the responsibility. My quotations, then, have no other end than to awaken the attention of the reader, and to apprize him, that whether right or wrong, such a fact has been mentioned or such an opinion advanced. I had perceived, indeed, that writers from whom I borrowed in this manner materials of a certain description, were often inexact. I may on this subject refer to the

researches of Jaeger on Exsections. The suspicions of inaccuracy which I had in regard to this writer have been since fully confirmed in the Thesis of M. Vulfrand Gerdy.

Convinced that in order to be useful to students and to other readers, in a classical work, it is necessary to make an examination and review as complete as possible of the riches that science possesses; and persuaded that the name of a man, or the locality of a place, does not change the nature of facts faithfully narrated, I have addressed myself to every one, in order to obtain precise information. Not being able to bring myself to believe that whatever is interesting in surgery is exclusively confined to Paris, I have received with satisfaction what many practitioners of the departments have had the kindness to communicate to me. It is thus that I have obtained materials from Messieurs Castara, surgeon of the Hospital of Lunéville; Chaumet and Moulinié, surgeons of the Hospital of Bordeaux; Caffort of Narbonne, Buret of Caen, Haime and Tonnelé of Tours, Philippe of Reims, Stoltz of Strasbourg, Lallemand and Serre of Montpellier, Pichausel of Cleirac, Fristo of Sierck, Jacquier of Evry, Robert of Chaumont, Lefèvre of Joinville, Loreau of Valenciennes, de Mazières of Bergues, Jozzet of Vannes, L'Herminier et Rufz of Guadaloupe, and from many others. At Paris even, to be more exact, I have thought it right to apply to M. Roux for the exsections that he has practised; to M. Le Roy d'Etiolles, M. Laugier, M. Robert, M. Sédillot, etc., for certain processes of their invention, and to M. Toirac for what concerns the teeth.

I have obtained like communications from many foreign practitioners. In Italy, M. Fabrizi has communicated to me the operations that he practises on the ear. I have received from Germany, from MM. Sprengler and Adelmann, suggestions and observations of great value in relation to the exsections practised at Wursbourg. M. Rorhbye has given me all that there is important in Denmark. I am indebted for some information of the same kind to M. Baroni, and M. Peyrogoff for Russia, and to MM. Hysern and S. de Toca for Spain. M. Kerst of Utrecht has furnished me valuable facts relative to Holland. An extended note has been communicated to me from M. Warren, on what this surgeon has done at Boston. MM. Rodgers, Gibson, Paul Eve, and Norris, have also communicated to me some facts. But the most detailed illustrations that I have obtained relating to America, are due to Mons. V. Mott.

Communications and notes without number have, moreover, been furnished to me by M. Champion of Bar-le-duc. This surgeon, as remarkable for the qualities of his heart as for his prodigious learning, has, by his own efforts, procured for me an infinity of facts relative to anaplasty, tumors, exsections, and deformities. The reader will then recollect, in reading this work, that many facts and opinions of which I cite the author, without pointing out any work from which I have taken them, have come to me by direct communication. I have been enabled in this way to embody a crowd of materials unpublished or little known, that they may speak for their country, and for surgeons of high ability, or worthy of being placed in a high rank in the dominion of science. It has also resulted from this, that in place of laws and precepts dogmatically prescribed, I have willingly confined myself to an accumulation of facts on a given point, when those facts themselves have appeared to speak with clearness.

Works on operative surgery have, moreover, been published in different places, and by different authors, since the publication of mine. Without speaking of numerous articles inserted by M. Bérard in his dictionary of twenty-five volumes, of

the treatises of M. Liston, of M. Syme, of M. Gibson, and of some German works, I will make mention of the excellent Manual of Operative Surgery, by M. Malgaigne, the Essays of M. Dieffenbach, of M. Korneziewski, of M. Mayor, and of M. Pl. Portal. An extended work, which treats however more of surgical pathology than of operative surgery, has been published by M. Bégin. At Paris, also, we have seen the commencement of a treatise of the same kind, a treatise which, conceived upon a larger plan, seems to promise better to place us in possession of the actual treasures of surgery, than that of the professor of Strasbourg. It is a work whose completion we look forward to with impatience ; I speak of the work of M. A. Vidal, (*Traité de Pathologie Externe et de Médecine Opératoire*, Paris, 1839, t. i. et ii., in 8°.) If the conclusion corresponds with what I have already seen, the new manual of which M. Sédillot has just given us the first part, will constitute in that respect a work of real utility. The operative processes borrowed by the author from military surgery, will make an excellent practical surgical compendium. I sincerely regret that the seventh edition of the Dictionary of Surgery of M. S. Cooper did not reach me till the month of February, 1839. This work, which posts up the actual state of surgery in Europe, and which the author has considerably augmented, would have furnished me some important materials.

Nevertheless, having analyzed with care whatever of note has been said among ourselves, and having interrogated on all sides for correct information, I believe I have made a recapitulation sufficiently exact of what exists to-day in the science of the operative surgeon. Perhaps, in consideration of so much effort, and of my own proper experience, I shall be pardoned for having indulged the hope of imparting an aspect less mechanical, and an impulse more medical, to operative surgery than my predecessors had done, while I have endeavored to enlarge and to systematize the field, and the basis of the processes which have from time immemorial formed its legitimate domain.

APPENDIX.

HAVING commenced the publication of this work two years since, I am now obliged to insert some facts which it was impossible for me to mention at the time in their proper place. These facts are of two orders, or form two series. Some have been communicated to me directly; the others already constitute a part of the domain of science.

ARTICLE I.—FACTS COMMUNICATED.

§ I.

In the note of M. V. MOTT, which gives a summary of what I have communicated from him in the text, I see that this skilful professor has practised the ligature of the arteria innominata once, of the common iliac once, of the external iliac six times, of the internal iliac once, of the femoral artery forty-nine times, of the right subclavian within the scaleni muscles, once, of the right and left subclavian without the scaleni muscles, three [now four] times, of the primitive carotid, nineteen times, [now twenty,] and of the external carotid, twice. He has amputated [for osteo-sarcoma] the lower jaw nine times, two of which operations were at the temporo-maxillary articulation, and the upper jaw fourteen [sixteen] times. He has twice practised tracheotomy in the case of croup, [and a number of times for the removal of foreign bodies,] four [nine] times the section of the sterno-mastoid muscle to relieve torticollis, once the extirpation of a thyroid gland which weighed five pounds two ounces, once [several times] the ligature of the thyroid arteries, with the view of causing atrophy of a goitre, once the exsection of the clavicle, several times the operation for empyema, once gastrotomy, one hundred and six times the operation for hydrocele with injection of sulphate of zinc, twice the exsection of the rectum, twice [several times] the extraction of loose bodies in the articulation of the knee-joint, many times the excision of false articulations, and once amputation at the hip-joint, and at the shoulder and the wrist, [four times operated successfully for false articulations of the thigh by the seton, several times successfully on the tibia and other bones by the same mode, once successfully the restoration of an imperforate vagina to all its functions, in thirteen cases effected the perfect restoration of the functions of the lower jaw after years of

permanent immobility, and once performed exsection of a portion of the nose and upper jaw for a large fibrous tumor.] M. Mott adds: "Our amputations at New York are rarely followed by death; I cannot recall to mind, at present, but four cases of amputation which have thus terminated. I have amputated two legs and a thigh for gangrena senilis, without waiting for the disease to be arrested. The amputation of the thigh, and one of the two amputations of the legs, were followed with success. Union by the first intention more frequently occurs at New York than in France. I have remarked that in America, the inflammation which follows operations is altogether of a healthy character, whilst at Paris there is more irritability than true inflammation. We must ascribe this difference to our climate, and to the constitution of our countrymen. If our operations are followed by more considerable inflammation, and by a more intense fever, our inflammatory diseases are also more acute than those that are observed in France." It is well to remark, that in their communications, MM. Warren, Gibson, Paul Eve, and some physicians of Philadelphia, hold precisely the same language as M. Mott on this head.

§ II.

M. Gibson, author of a Treatise on Surgery, which has reached its fifth edition, and Professor in the University of Pennsylvania, at Philadelphia, thus expresses himself: "During a period of thirty years practice in the United States, I have performed the operation for strangulated hernia fifty or sixty times, without losing more than seven patients. I have more than fifty times practised the *lateral operation* for lithotomy, and have lost but six cases.

"The greater number of the amputations that I have performed for diseases of the articulations, wounds from firearms, and complicated fractures, have been followed by complete success. I have especially succeeded when the operation has been done in season. In some cases I have succeeded in prolonging the life of the patient from ten to fifteen years, and in one case to twenty-five years. The operations for cancerous breasts have not prevented the reappearance of the disease at the end of some months, in the greater number of the cases. I have always failed in cases of cancer, when it was at the same time accompanied with affection of the glands of the groin and arm-pit, and of those of the neck when the malady had its seat in the lower jaw.

"The ligature of the subclavian and iliac arteries has rarely succeeded with me, whilst that of the carotid, the brachial, and of the femoral in cases of aneurism of the popliteal artery, has generally been followed with the cure of the patient. I ought to say, however, that aneurisms are not frequent in America; at New York, a city almost entirely inhabited by strangers, this affection is rarely observed but among individuals born in England. I have rarely had recourse to the trephine in the case of fractures of the cranium, with lesion of the brain and its membranes. I have in such

cases had reason to congratulate myself upon the success of the antiphlogistic treatment. At Philadelphia, with the exception of six weeks of intense heats during the summer, and six weeks of intense cold during winter, the temperature is constantly agreeable. This circumstance is sufficient to explain why the results of our practice are more satisfactory than in Europe, and in the great cities like Paris and London, and than in more remote latitudes, where the extremes of temperature are prolonged to a much greater length of time. I cannot believe, for example, that the two Cæsarean operations in which I saved the mother and infant, would have succeeded as well at Paris as at Philadelphia. All these operations have been performed after the usual modes."

[Professor Gibson appears to be under a misapprehension, both in respect to the character of the climate of the United States, and its influence upon curative surgical processes, and also in respect to the nature of our population at New York, as well as the non-frequency of aneurisms, and their limitation to persons from England.

1. *Of the Effects of our Climate on Surgical Operations.*—So far from the climate of the United States being in the least degree entitled to the appellation of a *mild*, or equable, or moderate temperature and character, with only six weeks of extreme summer heats, and as many of intense cold in winter, it is proverbially known, all over the world, that all the northern portion of the United States for many degrees of latitude, and especially its seaboard, is characterized by the most extraordinary and sudden vicissitudes of heat and cold, and of every other meteorological phenomenon. It was remarked by Volney, that an American never becomes acclimated to his own country; and this is not surprising, when we consider our protracted and most inclement winter of four to six months duration, of an almost polar severity, our long, wet, cold, and unwholesome spring of two to three months, and our violent heats often for months, during July, August, and September, in the middle portions of the day exceeding by many degrees what is ever known even in the tropics. [See my work on the *Topography, Weather, and Diseases of the Bahama Islands*, 1823–4–5; also, my work on the *Yellow Fever at Havana*, 1830.]

So far from our climate being, as Professor Gibson infers, a mild one, the range of Fahrenheit's thermometer during the year is frequently, on this northern part of our seaboard, from 110° to 120°; and even in the same day, in midsummer, the mercury has been known to descend rapidly over 40° in 24 hours! In this respect the climate of Europe has, on the contrary, a great superiority, as the thermometer there, as at Paris and London, seldom varies in any part of the year over 10 to 15 degrees in 24 hours, which I know from personal observations in those cities.

Again, the experience of Dr. Mott, whose observations, both in this country, and in Europe, Asia, and Africa, have been directed to this subject, and have given him great advantages, is directly to the point, that it is precisely during those extreme and arid sum-

mer heats, which Prof. Gibson makes an unfavorable exception, and when the thermometer is ranging in the neighborhood of 100° Fahr., that surgical operations always do better than at any other time. It is, we believe, proverbially known to all our practitioners, that it is then that such operations are most generally succeeded, says Dr. M., by that most desirable of all results after operations, a rapid and healthy adhesive inflammation, without violent constitutional reactions and protracted wasting suppurations. And it is to this to which Dr. M. has reference in his preceding note to Prof. Velpeau, in speaking of the healthy and entonic character of the fever which succeeds to surgical operations, as compared to that which is seen in European hospitals. But it must be understood, says Dr. M., that the contrary unfavorable results in European hospitals, and the atonic febrile excitement of irritation, and the prostration and exhaustion of vital power, are produced, not by any circumstances connected with the climate of Europe, but by the character and class of persons who are the subjects of hospital treatment in those countries. They are, with but few exceptions, such as belong to the poorer classes, who have long endured every privation as to food and other comforts, and whose constitutions are for the most part worn out and impoverished, and, therefore, incapable of sustaining the shock of severe surgical operations. Whereas, in our own country, where every individual of our population, it may be said, whether poor or rich, and in all our public establishments, and charities, and hospitals, even in our prisons, lives in comparative luxuriousness, such privations as are seen among the peasantry and mechanics of other and older countries are utterly unknown.

The favorable influence of our intense summer heats in promoting union by the first intention, was strikingly confirmed to Dr. Mott by what he observed also in Egypt, during his visit to that country. The somewhat similar climate of the valley of the Nile to our own during the summer, and its often long-continued and parching heats, have nevertheless, he observed, a most remarkable and salutary effect in accelerating the cure of all surgical operations by adhesive inflammation—a result favored, also, by the spare sinewy make and dry fibrous temperament of the Arab, resulting from the character of their climate, their food, and their active habits. The same beneficial results which an elevated and dry temperature produces upon the processes of adhesive inflammation, seem to be derived also, says Dr. M., from the tonic power of intense cold during our protracted winters.

Thus, therefore, our climate, and its action on surgical processes, are, *toto cælo*, at variance with the supposition of any advantages deducible from an erroneous conception of its *mild* temperature.

2. In regard to the subject of *aneurisms*, Professor Gibson erroneously asserts that they are not common in the United States, and that at New York our population is almost exclusively foreign, and that aneurisms are almost exclusively confined to them, and particularly to the English. The experience of Dr. Mott is directly

at variance with that of Professor Gibson. In the first place, says Dr. Mott, not less than six sevenths of the whole population of New York is of native-born citizens, and the whole amount of all our population so far exceeds that of Philadelphia, that a comparison cannot justly be made between those cities as to the class of diseases prevalent in either. In the next place, there is no greater frequency of aneurisms or other surgical cases at New York than are naturally derivable from the fact, that as the great emporium of commerce, our city presents a far greater proportion of hard-working laborious population, directly connected with commercial pursuits, than her excess of inhabitants over the population of any other city would seem to denote. Aneurisms, therefore, and especially every kind of casualty, or injury, or accident purely surgical, are natural casualties among a vast industrial people engaged in those arts and mechanical labors, whether on shipboard or on land, that pertain to a highly commercial and enterprising mart and emporium so considerable as our own. Few surgeons, perhaps, of the present day, or of the past century, have treated so many cases of aneurism as Dr. Mott, and his experience goes directly to establish the fact, that of all that number, and of all that he has seen in this city in a practice of near forty years, the great majority, if not all, were our *own countrymen.* He does not recall a solitary case of a foreigner, and nearly all belonged to that class who had been habituated, as might naturally be supposed, to severe mechanical labor. Nor could such cases, notwithstanding the fact that our city, out of 350,000 souls, (including the cities and towns immediately adjacent to it,) contains, besides some 15,000 negroes, a population of perhaps some 50,000 to 60,000 foreigners, be confined to natives of England, for at least 30,000 of our foreign population are Irish; and of the rest, the total of Scotch, Germans, French, Spanish, Italians, Swedes, &c., exceed by double the number those from England.—*T.*]

§ III.

Spain, that we think so poor in a surgical point of view, is less so, perhaps, in reality than in appearance. MM. Argumosa, S. de Toca, Hysern, all three professors in the school of Madrid, are distinguished there as anatomists and as surgeons. M. Hysern himself has communicated to me an infinite number of facts. In February, 1829, he performed, at the general hospital at Barcelona, the partial amputation of both feet at the tarso-metatarsal articulations, on a child of ten years, in a case of gangrene from cold, which had extended to near one half the metatarsus. This gangrene was already limited by a regular inflammation. The success was complete.

[It is not, perhaps, extraordinary, that M. Hysern, living in the semi-tropical atmosphere of Madrid, should advert to a disease like that of *gangrene from cold*, which must necessarily be a rare occurrence in so mild a climate as that part of Spain. Dr. Mott remarks

with great justness, that there is, perhaps, no seaport or other city in the world, where practitioners have such ample and frequent opportunities of studying this disease, as at New York. The long-continued severity of our winters, and the extremely tempestuous and dangerous character of our coast in that season, and our proximity, at the same time, to hot latitudes, and the immense extent of our commerce with such latitudes, whether with the West Indies, South America, Africa, or the Asiatic tropics and China, render this affection one of the commonest occurrence every winter among the crews of vessels arriving from such countries upon our coast, who being prevented, by violent storms and contrary winds, from entering our ports, are thus imminently exposed to every variety of frost-bitten limbs. It is particularly noted, that the crews of what are called wet ships, or such as during this perilous coast-navigation frequently ship seas, generally escape, as their feet are almost constantly immersed in water on deck, and therefore in a temperature above the freezing point. This casualty of inflammation of the extremities ending in gangrene, and resulting from exposure to cold, is, as we have said, of such frequent occurrence, that its treatment is exceedingly well understood in all our hospitals, those being the places where nearly all this class of patients are received. Dr. Mott coincides with the general observation of practitioners in saying, that not only the phalanges of the toes and fingers, but all the metacarpal and metatarsal bones, and the entire foot, and frequently both feet or both legs or arms, are, after the limitation of the gangrene is well defined, amputated under such circumstances, and almost invariably with perfect success. For it must be remembered, that this species of gangrenous inflammation is of the mildest and least malignant kind, generally occurring in young and healthy seafaring subjects; that it is disconnected, for the most part, with any constitutional taint; and is purely a local affection. In addition to the observations of Dr. Mott, I may remark, that I noticed it frequently while I was Physician to the Seamen's Retreat, Staten Island, (New York.) and that it occurs to me here, as not irrelevant, to refer specially to a case of a sailor in the prime of life, in whom, by the malpractice of the official person under whose care he had previously fallen, there was established, by the prolonged and unmedical application of *poultices*, a *permanent* or chronic gangrene of *some months*, in all the phalanges of the toes. These bones successively *rotted out* under the system of poulticing, and when he was brought to the Retreat, his feet presented the case of two stumps with red flabby granulations, and the anterior extremities of the metatarsal bones protruding out beyond the flesh to the distance of an inch or more, and having the appearance of black burnt brands, or ends of beams in the framework of a building half consumed by fire. These necrosed neglected projections were clipped off by a pair of common strong nippers, close to the sound flesh, and until the fresh bleeding surface of the healthy portion of the bones was reached. The effervescing cataplasm of bark, yeast, charcoal, and alcohol, was applied for a few

days, followed by adhesive straps, bringing the flesh well and firmly in every part over the ends of the bones, which, with tonic treatment internally, rapidly completed the cure. Emollient poulticing is undoubtedly proper in the onset of the disease, (which resembles that of a severe blister,) to allay the acute and often agonizing pain of the inflammation, and to promote the sloughing of the parts which follows; but nothing is more injudicious than to continue this practice beyond the time when the line of demarcation of the gangrene is clearly established.—*T.*]

A. "Towards the month of September, of the same year, says M. Hysern, I practised, for the first time, blepharoplasty on a girl of twenty years, to restore a loss of substance of the external half of the two eyelids of the left eye. I employed a method which is mine, and which I have called temporo-facial. The success was complete.

"In July, 1833, I practised anew the temporo-facial blepharoplasty, to restore the totality of the inferior eyelid which I previously extirpated at the same sitting, in consequence of a nævus maternus which had invaded that and the conjunctiva of the ball, up to the lower half of the base of the cornea. The result was sufficiently satisfactory; the new lid perfectly shut the eye with the upper, which had its movements free.

B. "In August, 1833, I performed rhinoplasty by the Indian method, on a man forty-eight years of age, from whom I had extirpated a cancerous tumor that affected the nose, the nasal notch of the left superior maxillary, and almost the entire pyramidal bone of that side, extending below to the upper third of the upper lip. The operation succeeded. The enormous wound of the face was reduced to a crucial cicatrix of an inch and a half in length in its transverse branch, less than an inch in its vertical, of two to three lines in breadth throughout almost its whole extent, and of four to six lines in the centre, that is to say, at the crossing of the branches.

"In September, 1837, I practised another rhinoplasty by the Italian method, that is to say, in place of taking the patch at hazard on the limb, I procured it from the place where there are more nerves and cutaneous vessels; that is, from the anterior and external part of the arm, near the bend of the elbow, and over the course of the branches of the radial nerve and the profunda. The patch was adherent in more than three quarters of its periphery. Fifteen days after, I cut off the base of it; but in spite of every possible precaution, gangrene commenced, except on one inch of its upper part, which kept in place and preserved its vitality.

"In the month of October following, I practised another rhinoplasty by the Indian method, and with success. To hold the new nose, I employed advantageously a framework of cork, divided vertically into three parts, in the manner of the forms that hatters use.

C. "In March, 1835, I performed, on a girl of five years, the extirpation of a lupus (*loupe*) of the size of a pullet's egg, having its seat in the middle of the upper part of the forehead, on the hairy scalp. This lupus had eroded the bones, and was adherent to the

membrane of the superior longitudinal sinus, so that M. S. de Toca, who assisted me, and myself, as well as some other persons, had a perfect view of the influence of the respiratory movements upon the circulation of the blood in this sinus, which was raised up every time that the infant cried or made an expiration, and sunk and receded, on the contrary, at each inspiration. Notwithstanding the close and extended adhesion of the tumor, I did not cut the sinus, and the success of the operation was complete.

D. "In May, 1835, I made a complete extirpation of the left parotid, in a cancerous state and adhering intimately to the sterno-cleido-mastoid muscle. It was necessary to tie the external carotid very near its origin. The immediate success of the operation was complete, but the cancer returned some time after.

E. "In August, 1835, I performed the exsection of the left superior maxillary bone on a girl of eleven years, by removing the anterior and external wall of the sinus, and all the alveolar border, for a sarcomatous polypus of this sinus. I extirpated the polypus by means of the handle of a scalpel; I scraped all the osseous parts which were visible, and finally applied to them the actual cautery. The operation was perfectly successful, and the polypus did not reappear. This tumor was as large as half of the fist, threw the nose very much to the opposite side, forcibly raised up the eye, and depressed the palatine arch.

"In February, 1835, I exsected the left half of the lower jaw at the articulation, with extirpation of the parotid and submaxillary glands. I was obliged to tie the external jugular vein, as well as the primitive carotid artery; the operation was successfully executed, but the patient died two hours after in a state of stupor. I was not permitted to open the body.

F. *Cheiloplasty.*

"In July, 1833, I performed, on a man aged fifty years, the extirpation of a cancerous ulcer which occupied two thirds of the right side of the lower lip, the sixth part of the upper lip, and extended itself to an inch beyond, into the lower portion of the cheek, embracing the greater part of the chin, and involving more than two inches of the external table of the lower jaw. After the extirpation of the soft parts, I removed with a gouge the affected part of the external table of the bone. I afterwards undertook the restoration of the soft parts, in adapting to them the skin of the superior and lateral region of the neck, with the subjacent portion of the platysma myoides, according to my autoplastic method.* The

* This method differs from the others in four principal points:

First. The patches describe always an arc of a circle, but never the semicircle, as in the Indian autoplasty;

Second. I preserve carefully in the patches the subjacent cutaneous muscles;

Third. I cut and I apply those patches in such a manner that the new muscles may take a direction analogous to those that I cut away;

Fourth. In fine, I apply sutures to a great number of points, for example, from line to line; I remove half of them twenty-four hours afterwards, the rest at the end of forty-eight hours; and then substitute for the suture adhesive plasters.

patient got well without a relapse, and the restoration produced the effect that we anticipated from it, leaving scarcely any deformity.

"In September, 1837, I extirpated another cancer from the left side of the lower lip, cheek, and submaxillary gland. I practised for this case, also, cheilo-genoplasty by the same method; this autoplasty succeeded, but two months after, the cancer, which had already reappeared once, returned again, and I therefore declined another operation.

G. "In June, 1834, I operated on D. J. Bonavida, aged fifty-four years, attacked eleven years before with a severe neuralgia on the right side of the face, and for which other surgeons had in vain performed the section of the inferior dental nerve, the extirpation of some lines of this nerve, its cauterization in the foramen mentale, and the section of the facial nerve; I effected the extirpation of the nerve in the whole length of the dental groove of the lower jaw. To effect this, I raised almost the whole external table of the bone, in isolating it by four cuts of the saw, aided by the gouge and mallet. I afterwards took hold of the nerve with the dissecting forceps, and extirpated it completely, after which I cauterized the superior extremity of it with red-hot iron. Having remarked that the pains affected not only the dental trunk, but also the most superficial parts of the lower half of the cheek, and the corresponding half of the lower lip, and of the chin down to the base of the jaw, where were distributed the filaments of the nerve formerly extirpated by Professor Argumosa, I took away also all these soft parts, and I finished the operation by autoplasty, according to my method, by means of the skin of the neck and of the platysma myoides.

"There was at first considerable relief, and the patient felt no other than slight pains produced by atmospheric changes. This state lasted for nearly six months; the pains returned then with the same intensity as before, but in the direction of the infra-orbital plexus, the buccal nerves, the lingual, and, as it seemed to me, of the portion of the inferior dental trunk which remained behind the jaw.

"The patient immediately demanded another operation. I resisted for some time, seeing the return of the disease; but at length, perceiving no other means of relief, I yielded. I undertook and effected the extirpation of the infra-orbital plexus and the buccal nerve, from the internal face of the masseter muscle to an inch and a half in front, then that of the inferior dental and lingual nerves, at three to four lines below the foramen ovale of the sphenoid bone; so that I took away more than an inch of the dental nerve, and twenty lines of the lingual.

"Having commenced by incising freely, and almost horizontally, the cheek, from the commissure of the lips to a little beyond the anterior border of the masseter muscle, and without interfering with that, I dissected out the buccal and the inferior dental and lingual nerves, between the pterygoid muscle and the ramus of the

jaw; then I took hold of them with the blunt hooks, (*érignes mousses.*) I assured myself, and more than twenty persons present, most of them distinguished surgeons, also satisfied themselves, that it was truly the nerves described that I held in the érignes. I then passed a blunt-pointed very narrow bistoury to their upper part, and turned the edge of it against the nerves. In drawing, at the same time, the érignes with the other hand, I was enabled to make their upper section, avoiding thus the internal maxillary artery and every other vessel; I avoided, also, the internal lateral ligament of the lower jaw, and I finished by cutting the nerves at the lower part with the scissors.

"M. Obrador, then professor in the Royal School of Medicine at Madrid; M. S. de Toca, one of our most distinguished operators; M. Arnero, and M. Quintanar, skilful physicians and surgeons, aided me in this operation. The nervous pains ceased immediately. When they reappeared, after some months, they were extremely slight: never did they become as strong and insupportable as before.

H. "I have made eight artificial pupils: 1st. Two in September, 1833, one of them with success; 2d. Two others in August, 1835, without any success; 3d. Two in July, 1836, with success; 4th. One in August, 1837, with success for complete obliteration of the pupil; 5th. One in September, 1837, for leucoma complicated with cataract. In this case I performed the operation for the cataract by extraction, and the artificial pupil, at the same time, by a process of my own, and which is a modification of that of Wenzel for *iridectomy*. The operation was fully successful.

I. "In July, 1835, I effected, at the Surgical Clinique of the school of Madrid, the complete extirpation of a degenerate goitre, of the size of the head of an adult, and with two lobes distinctly separated. I commenced by tying the four thyroid arteries as well as the corresponding veins, which were enormously developed, and finished by the extirpation of the diseased gland. The extirpation succeeded; but the patient died a month and a half after from a hectic fever, owing to a deposite of matter upon the chest.

J. "In May, 1834, I extirpated an erectile tumor from the scrotum, of the size of two fists, with perfect success.

K. "I was the first at Madrid, in November, 1833, to perform lithontrity for a stone of extreme hardness, of the size of a large hen's egg. I used the method of M. Civiale. The success was complete, and there has been no relapse.

L. "In April, 1838, I performed the exsection of an abnormal articulation at the lower third of the left arm of a soldier, aged twenty-eight years, who had been wounded by a musket-ball a year and a half before. In December, 1837, I made the exsection of the inferior half of the fifth metacarpal bone of the right hand, for an osteo-sarcoma. I saved the muscles and the tendons. The success was complete, and by means of a double ring the finger preserved its movements.

M. "In September, 1832, I extirpated a degenerate lipoma on

the right thigh of a soldier aged thirty-four. This lipoma, which weighed fifteen pounds, extended from the popliteal space along the internal and posterior part of the thigh, separating and flattening the semi-tendinosus and semi-membranosus muscles, the gracilis, sartorius, adductor, and pectineus, upon the crural artery in its whole extent, and had penetrated, by two productions in form of cones, into the interior of the abdomen under the crural canal. The operation was laborious; the immediate result appeared satisfactory; but absorption of pus supervened, and the patient died the eighth day."

§ IV.

Besides what I have had it in my power to say on the subject in the detail of special operations, I see in the note of M. Jacquier, the case, 1st. Of a nævus on the eyebrow, in an infant of six months, cured by a caustic composed of sulphate of zinc, sulphate of copper, and honey; 2d. Of a fatty tumor of the sclerotica, cured by excision and cauterization; 3d. Of a soft brownish vegetation upon the oculo-palpebral groove, extirpated with success on a man of sixty years; 4th. Of an extraction of an invaginated necrosis of the clavicle, in a young girl; 5th. Of an amputation of the arm near the axilla, by the spontaneous separation of the injured parts.

Article II.—Facts Omitted.

§ I.

In addition to what I have said of the introduction of air into the veins, I have here to subjoin a few words. M. Mayor, (*Acad. Royale de Médecine*, 28 May, 1839,) who professes to have noticed this accident, has given two new examples of it, which appear far from conclusive. In fine, we see in an extended labor of M. Busse, (*Gaz. Médicale*, 1839, p. 261,) that the subject has been examined in Prussia under the point of view in which I treat it in the present work.

§ II.

Numerous cases of *section of the tendons*, or of the *muscles*, ought to be added to those which I have mentioned. In the case of a patient in whom the semi-tendinosus muscle was contracted like a cord for seven months, the cure was effected by M. Lutens, jeune, (*Gaz. Méd.*, 1838, p. 149,) by means of tenotomy. Since then, I myself have four times performed the section of the tendo-Achillis for club-foot backward, (*pes-equinus*,) and in all the four cases with prompt success; once the section of the tibialis posticus; twice the section of the tibialis anticus; once the section of the extensor longus pollicis pedis; once the section of the extensor of

the little toe; once the section of the plantar aponeurosis; twice the section of the biceps flexor cruris; once the section of the semi-membranosus; and twice the section of the semi-tendinosus, gracilis, and sartorius. These examples have demonstrated to me more and more the safety of tenotomy.

The history of this operation as applied to the treatment of club-foot, (*pied-bot*,) comprises, moreover, two periods. In the first, they confined themselves to the experiment of dividing the tendo-Achillis; in the second, the operation was extended to all the tendons of the muscles of the leg and foot. It is to M. J. Guerin that we owe this generalization. Having established that the club-foot, and the different forms that it may assume, are but the result of the primitive muscular retraction, differently distributed in the muscles of the leg and of the foot, this physician, whose researches were not well known to me when the first volume of this work was printed, has been naturally conducted to lay down as a principle, the successive or simultaneous division of the tendons of those muscles which hold each variety of the club-foot under their subjection. Here is the way in which he has embodied this precept in a memoir recently published, (*Gaz. Méd.*, 1839, pp. 205, 321, and 337,) but the conclusions in which had been addressed to the Academy in the month of July, 1838, and the first applications of which go back to the epoch of the concours of the Academy of Sciences, 1836.

"The surgical treatment of club-foot," says he, "ought to comprehend the section of the tendons of muscles whose retraction determines the special forms of each variety of this deformity: for the elevation of the heel, the section of the tendo-Achillis; for the inversion of the foot [i. e., when turned] upon its outer edge, the tibialis anticus; for the eversion of the foot [i. e., when turned] upon its inner edge, the peroneus tertius, and all or part of the extensors of the toes; for the flexion of the foot on the leg, the tibialis anticus and the peroneus tertius, and sometimes the extensors of the toes; for the forced adduction of the foot, the tibialis posticus; for its abduction, the peroneus longus et brevis; for the curvature of the foot following its internal border, the adductor of the great toe; for the permanent extension or flexion of the toes, the section of the corresponding muscles; and finally, the simultaneous section of the tendons of those muscles, according to the concurrence of their contraction in the different combinations of form that the club-foot presents." This doctrine, which the author had explained to me verbally about a year past, has been applied by him in the treatment of more than a *hundred* cases of club-foot, since the month of January, 1836, the epoch at which he made the section of the tendo-Achillis, of the flexor proprius pollicis pedis, and of a portion of the plantar aponeurosis, for a case of club-foot backward, in a young girl of the Hospital of Orphans, submitted to the examination of the judges of the concours of the Academy of Sciences.

§ III.

The *suture* of the extensor tendons of the index-finger has completely succeeded with M. Valentin, (*Journal des Conn. Méd.-Chir.*, 1839, p. 107.) A section of the tendons of the extensor carpi radialis longior et brevior muscles, treated with the suture by the same surgeon, terminated well, (*Ibid.*, p. 108.) A girl aged eleven years, who had the forearm flexed by a band, the consequence of a burn, has been cured by means of excision, and permanent well-conducted means of extension, by M. A. Thierry, (Jodin, *L'Expérience*, t. iii., p. 268.) In consequence of a wound by firearms, which caused a complicated fracture, a patient was left with an angular leg. M. A. Key (*Gaz. Méd.*, 1839, p. 366) sawed out the callosity, adjusted the limb, and cured the wounded man.

§ IV.—*Anaplasty.*

Employing the Indian mode of rhinoplasty, M. Serre, (*Compte-rendu de la Clin. de Montp.*, 1838, p. 16,) in 1838, obtained complete success from it. By incising in the direction of the lateral commissures, after having cut out a cancer by a V-shaped incision so as to have two triangles to unite on the median line, M. Bonnet (*Bullet. de Thérap.*, t. xvi., p. 217) is of opinion that he has employed a new process, though it is nearly the same that I have myself many times used, and which I have spoken of further on. Cheiloplasty seems to have equally succeeded with M. Payan, (*Revue Méd.*, 1839, t. i.) An enormous fungus hæmatodes, growing from the septum, and which occupied the upper lip, was extirpated with success by M. Serre, (*Compte-rendu*, 1838, p. 18,) who, by means of cheiloplasty, reduced to nothing the deformity caused by the first operation. I have twice performed, in 1839, blepharoplasty with partial success, by insertion of a V-shaped portion of integument.

§ V.—*Arteries.*

A remarkable case of a dissecting aneurism of the thoracic aorta has been published by M. Pennock, (*Gaz. Méd.*, 1839, p. 39,) and M. Goddard (*Ibid.*, p. 40) has related another which is scarcely less so. Besides those which I have related, M. S. Cooper (*Surg. Dict.*, 1838, p. 160) ascribes cases of ligature of the internal iliac artery to a Russian surgeon, and to M. Thomas and M. Hudson, and states that two of the patients were cured; but are these facts authentic? That of M. Hudson, for example, is it not the same as the fact published by M. Pomeroy White, of Hudson? The ligature of the hypogastric artery practised with success, according to the same author, (S. Cooper, *oper. cit.*, p. ix.,) by M. White, relates probably to the same fact. I find, also, in M. Cooper, that M. Busche tied the common iliac artery in an infant aged two months, which died at the end of some weeks.

The point of a scythe wounding the right nates, produces a hemorrhage, followed by a pulsating tumor that M. Riberi (*Gaz. Méd.*, 1838, p. 796) considers to have been a varicose aneurism; but every thing shows that this case was one of aneurism proper. The particulars of the case of the ligature of the right carotid and subclavian arteries, by M. Morisson, (*L'Expérience*, t. iii., p. 302,) are now published. The subclavian artery has been once tied with success by M. Gibson, (*Journal des Conn. Méd.-Chir.*, t. xii., p. 237.)

A fact, having some analogy to the case I have mentioned, of ligature of the external iliac, from a recent wound, presented itself in the practice of M. Mouret, (*Gaz. Méd.*, 1839, p. 298.) A man receives, under the groin, a cut from a knife which opens the femoral artery. A ligature, after the method of Scarpa, is applied between the profunda femoris artery and the wound. Imprudent movements cause a hemorrhage on the twenty-seventh day. M. Mouret passes then a single ligature around the external iliac, and effects the cure of the patient.

The patient in whom M. Pl. Portal (*Ibid.*, p. 297) tied the external iliac artery, in consequence of the excision of a bubo wounding the vessels, died at the end of some days. A ligature upon the external iliac, by M. Petrunti, for an inguinal aneurism, was, on the other hand, followed by success.

Cases of ligature upon the subclavian artery have been published by M. Syme, (*Edinb. Med. and Surg. Journ.*, vol. cxxxvii., p. 338,) who was obliged afterwards, in one case, to amputate at the shoulder-joint. M. Woodroffe informs me that he has met with entire success in this operation. In a case related by M. Neret, (*Archiv. de Méd.*, Juin, 1838; *L'Expérience*, t. iii., p. 106,) an aneurism of the left subclavian artery extended into the chest and penetrated the lung. A ligature upon the subclavian, for a wound in the axilla, caused gangrene of the limb, rendered necessary amputation at the shoulder, and was followed by death, in a patient of M. Haspel, (*Gaz. des Hôpit.*, 1839, p. 186.)

Embarrassed by the swelling of the limb, in a case of gangrene succeeding to a wound of the brachial artery, M. Petrunti (*Gaz. Méd.*, 1839, p. 186) tied the vessel by passing a riband through the arm, with a seton-needle, and secured it by a knot on the skin and a graduated compress. The success was complete, and the author says that his preceptor succeeded in the same manner with a soldier. A military surgeon, M. Haspel, (*Gaz. des Hôpit.*, 1839, pp. 190, 191,) has seen, also, wounds of the palmar arch, of the dorsalis pedis, &c., cured without the necessity of ligature.

A patient in whom M. Lallemand (*Archiv. Gén. de Méd.*, 1838, t. iii., p. 370) had tied the femoral artery, for a varicose aneurism, was attacked on the sixth day by a hemorrhage, which rendered necessary a ligature upon the external iliac, but did not prevent the death of the patient from the renewal of the hemorrhage. Having tied the external iliac, and perceiving gangrene established in the leg, M. Syme (*Edinb. Med. and Surg. Journ.*, vol. cxxxvii., p. 372) had recourse to a ligature upon the common iliac, and after-

wards amputated the thigh at the hip-joint, but the patient died soon after. Having passed a ligature around the external iliac for an enormous varicose aneurism in the fold of the groin, M. Morisson (*Gaz. Méd. de Paris*, 1838, p. 682) found violent pains produced in the leg on that side, which resulted in death at the end of two days. A case of diffused traumatic aneurism of the femoral artery was cured by M. Castara, by means of compression in the fold of the groin.

A popliteal aneurism opened and suppurated, in a case in which M. Pl. Portal (*Gaz. Méd.*, 1839, p. 298) had tied the femoral artery by the method of Anel, and in which case there was a gangrene to considerable extent at the heel. I have myself tied the femoral artery with success, for an erectile tumor upon the condyles of the femur.

§ VI.

Adopting my process for the treatment of varices, M. Liston says he has succeeded in removing the pins at the end of forty-eight hours. I am the more astonished with this result, because experience has taught me that ten to fifteen or eighteen days were really necessary effectually to obliterate the vein thus strangulated. Varices have been treated successfully by M. Melvin, (*Encyclogr. des Sc. Méd.*, 1839, p. 275,) by means of the pins and the twisted suture. Apprehending that the strangulation, whether by my mode or that of M. Davat, might not be sufficient to obliterate the veins, M. Bonnet (*Thèse*, No. 5, Paris, 1830) combines cauterization by potash to the treatment of varices by pins. The process of M. Gagnebé, (*Archiv. Gén. de Méd.*, Mai, 1839, p. 30,) which I explained in 1832, and which consists in passing a thread around the vein under the teguments, by a simple puncture of the skin, has, it is said, succeeded in the hands of M. Ricord, (*Gaz. des Hôpit.*, 12 Juin, 1839.)

§ VII.

A curious case of lithontrity has been published by M. Taron, (*Ibid.*, 1839, p. 266.) A man aged thirty years, introduced a shoetie into the bladder; lithic concretions gathered upon this foreign body, which three or four applications of lithontrity sufficed to break up and extract. By further information we learn that this patient died, in consequence of the operation, (*Journal de Scalpel*, No. 1, Juin, 1839.) I myself, in June, 1839, cured a young man of eighteen years, in a single sitting, at lithontrity, of a calculus of eight lines.

§ VIII.

Examples of *amputation* in cases of *spreading gangrene*, have been published to a certain extent since the printing of the article which I have assigned to this subject. M. Segond (*Gaz. Méd.*,

1837, p. 523) having thus amputated the arm, lost his patient on the twenty-second day, owing, says the author, to his having abstained from taking any sort of aliment after the operation. Three patients, on the contrary, in whom amputation was performed on both legs at the same time by M. Luke, (*Ibid.*, 1839, p. 104,) for gangrene of the feet, the consequence of typhus fever, recovered.

In a fracture near the knee, one of the fragments compressing the popliteal vessels caused sphacelus of the leg. M. Smith, (*Gaz. Méd.*, 1839, p. 43,) who amputated the thigh before the arrest of the gangrene, cured his patient. In the case of M. P. Eve, (*Lanc. Franç.*, t. xii., p. 540,) the gangrene had reached the thigh, and amputation was performed in a line with the trochanters. The cure was effected in six weeks. M. Morisson, (*Ibid.; Méd. Chir. Rev.*, Oct., 1838,) in amputating the thigh to arrest a gangrene of the leg, caused by a wound from firearms, was not less successful.

§ IX.

Desiring to *amputate the arm* in the manner of M. Onsenort, and to exsect the acromion, M. Voisin (*Gaz. Méd.*, 1839, p. 92) thinks, erroneously, that he is projecting a new method. A patient in whom M. Liston (*Encyclogr.*, 1839, p. 233) had exsected the head of the right humerus for a caries, appears to have been well cured. It is stated that an amputation practised upon the humero-cubital articulation, by M. Blandin, (*Gaz. des Hôpit.*, 1839, p. 173,) has succeeded well. Out of eight amputations, one of the thigh, two of the legs, one of the arm, two of the forearm, one of the middle finger, and one of the first metatarsal bone, in the practice of M. Moulinié, (Bermond, *Compte-rendu, etc.*, p. 45–55, 1838,) three have been followed by death. Pains, with convulsive movements, which existed for eight years in the stump of an amputated thigh, were removed without any return by acupuncture, under the direction of M. Longhi, (*Gaz. Méd.*, 1839, p. 123.) M. Blandin, (*Ibid.*, p. 79) has a second time extirpated, with success, the first bone of the metacarpus. Of two new cases of amputation at the hip-joint, by M. Syme, (communicated by M. Hardie, pupil of the schools of Edinburgh,) one has perfectly succeeded. Having amputated the thigh by circular incision near the trochanters, for osteo-sarcoma in a boy aged fifteen years, M. Brainard (*Encyclogr. des Sc. Méd.*, 1839, t. iii., p. 35) afterwards extirpated the head of the femur, in consequence of the diseased state of the bone. The young man died on the forty-eighth day, two days after passing a ligature on the femoral artery for repeated hemorrhages. A vast tumor occupied the iliac fossa.

§ X.

Numerous cases of *exsection of the jaw*, have still to be added to the table that I have given. The exsection of the upper jaw has been performed with success by M. Syme. I have myself taken

away the whole of this bone for an encephaloid tumor, in a patient who left the hospital cured, and whose case has been given by M. Jeanselme, (*Gaz. des Méd. Prat.*, 1839.) M. Capelleti, (*Annales Univ. de Méd. d'Omodei*, vol. lxxxvi., p. 39,) who has published a long memoir on this subject, relates that the exsection of two thirds of the lower jaw was completely successful in the case of a woman who was pregnant. Not less successful were the cases of the two patients operated upon by M. Syme, (*Edinb. Med. and Surg. Journ.*, vol. cxxxvii., p. 382.) I also twice removed, at the Hôpital de la Charité, in 1839, the right half of the lower jaw in two women, who both recovered. Operated upon after my method by M. Sanson, for a cancer which occupied the left side of the lower jaw, the patient of whom M. Tigné (*Bulletin de la Soc. Anatom.*, 1838–39, p. 302) speaks, appears to have done exceedingly well. I have exsected, in one case, the posterior extremity of the two last metacarpal bones, with the unciform bone; in another, the cuneiform bone alone; and in a young man, the phalangeal extremity of the third metacarpal. One of the patients died; the others remained a long time in the hospital.

§ XI.—*Lithotomy.*

M. H. Thomas, (*L'Expérience*, t. iii., p. 301,) an English surgeon, following M. Philippe, of Reims, has performed the operation of lithotomy with success, upon a pregnant woman. Having, in a case of my own, a stone of three ounces weight to remove from the bladder of a woman, I concluded to adopt the vesico-vaginal method. This appears to have been the first time this operation was performed at Paris. Operating upon an adult by the high operation, the 18th of June, 1815, I succeeded, says M. Champion, in extracting two stones, one of the form of the little finger, and somewhat larger in size, and which had entered by one of its extremities into the left ureter; the other weighing thirteen and a half ounces. The volume of this stone obliged me to detach the peritoneum above the superior portion of the bladder, in order to carry my incision in the latter to more than three inches in extent. The stone was so strongly embraced that it was impossible to introduce the forceps, even when they were unjointed, in order to seize and to hold it, which compelled me, says the author, to employ a curved lever, with which I had provided myself, and which I cautiously insinuated beneath in order to raise it gently, that I might disengage it from its bed, while I supported it with the hand that was free. The internal coat of the bladder was lined throughout with a false membrane, strewed with coarse sand, resembling a thick wet spider's web covered with gravel. At the end of some days, this false membrane, which I had intended to attack by solvents, detached itself by fragments, which made their way to the wound in the hypogastrium, and thus enabled me to extract them. The patient recovered perfectly.

The difficulties that I encountered in this case, says M. Cham-

pion, were necessarily numerous, for they were the consequence of the long-protracted retention of the calculus, and the size this body had acquired. I know that in one case, *Deguise*, the father, could not seize the stone after the incision by the high operation, and that he was obliged to force it upward by aid of a forceps, or a curette introduced by the cut through the perinæum. More recently, one of the distinguished surgeons of the capital, assisted by one of his brethren not less skilful, was much embarrassed in a similar case, by reason of the narrowness of the vesical cavity, a circumstance which determined them to perform the recto-vesical incision, by which the stone, in fact, was extracted. The case of M. Léonardon much resembles the preceding. The stone extracted by M. Champion has been deposited in the cabinet of the Faculty, and the curved lever invented by Levret, (*Encyclopédie Méthodique*, partie chir., t. ii., p. 236, col. 1, du texte, p. 106, col. 2 de l'expl. des planches, par Allan, pl. xxxix., figs. 8, 9, 10,) to raise large-sized polypi in the vagina, and to serve as a guide to the ligature-carrier, (*porte-anse*,) is the instrument that he made use of.

§ XII.

An instance of success obtained by the suture, in a case of *vesico-vaginal fistula* of the fundus (*bas fond*) of the bladder, and where the fistula was large, transverse, and of four months standing, has been published by M. Coley, (*Ibid.*)

§ XIII.

Desiring also to simplify *staphyloraphy*, M. Sotteau (*Annales de la Soc. de Méd. de Gand.*, t. iv., p. 333) has invented a forceps which carries and brings back the needle through each side of the division, and which is really very ingeniously constructed. Since I made mention of them, this sort of suture forceps, which are applicable alike to vesico-vaginal fistulas, recto-vesical, &c., have been still more improved by MM. Bourgougnon, Foraytier, and Despiéris.

§ XIV.

A simple puncture, made in the direction of a vagina, which had been rendered completely imperforate by inflammations and eschars, was followed by peritonitis and death in a woman operated upon by M. Liston, (*Gazette des Hôpitaux*, 1839, p. 183.)

§ XV.—*Tumors.*

A tumor of the weight of two pounds, situated under the jaw, and extirpated with success by M. Rufz, (*Archives Gén. de Méd.*, Avril, 1839, p. 479,) was, according to all appearance, a lymphatic glandular tumor. The tumor of the breast extirpated by M. Eti-

enne, (*Gaz. Méd.*, 1839, p. 123,) of the character of elephantiasis, was probably only an hypertrophy of the mamma, as in the cases that I have described. Believing that he had removed a tumor of the character of elephantiasis, of the size of a child's head, and which occupied the labium majus of the right side, in a woman aged thirty-two years, M. Michon (*Bulletin de la Soc. Anatom.*, Mai, 1839, p. 69) found in reality that it was nothing more than a fibro-lobulated tumor. Was not the tumor of two pounds weight, taken from the fore part of the knee by M. Pl. Portal, (*Clin. Chir.*, p. 277,) under the title of lipoma, an hematoma? A woman, aged sixty-six years, had on her knee a true lipoma of eight pounds weight, and which the same surgeon (*Ibid.*, p. 274) took away with success. M. Lawrence, (*Gaz. des Hôpit.*, 1839, p. 125, 126,) who appears to have noticed a great number of synovial cysts about the knee, has seen death ensue in two patients operated upon by him. M. Reybard (*Anus Artificiels*, p. 193) was not, until after fourteen or fifteen sittings, enabled to remove an enormous exostosis of the cranium in a woman, whom, however, he succeeded in curing. M. Philips (*Lettre Chir. à M. Dieffenbach, etc.*, 1839) says he has obtained satisfactory results from anaplasty, after the removal of cancerous tumors.

§ XVI.

An enormous swelling of the tongue, caused by the bite of a viper, induced M. Weger (*Encyclogr. des Sc. Méd.*, 1839, p. 261) to practise tracheotomy, which perfectly succeeded. A tumor of the tongue, strangulated by the method of MM. Cloquet or Mirault, was completely destroyed by M. Arnold, (*Ibid.*, t. iii., p. 16.)

§ XVII.

A large *erectile tumor* on the temple of an infant, treated by needles by M. Maclachlan, (*Gaz. Méd.*, 1839, p. 362,) appears to have entirely disappeared. An erectile tumor, which occupied the labium majus of the left side of a woman aged twenty-nine years, was extirpated with success by M. Pl. Portal, (*Clin. Chir., etc.*, p. 142.) After having extirpated one of these tumors on the fore part of the thigh, the same practitioner (*Ibid.*, p. 141) was obliged to cauterize the wound many times, with the butter of antimony, the nitrate of mercury, and the nitrate of silver. An erectile tumor which surrounded the anus, was cured by means of numerous ligatures, by M. B. Philips, (*Lond. Med. Gaz.*, Fev., 1839; *Arch. Gén. de Méd.*, Juin, 1839, p. 239.) In order to cure a *pulsating* tumor, of the size of a nut, situated on the external part of the dorsum of the tarsus, and caused by a punctured wound from a nail, M. Fleury (*Archiv. Gén. de Méd.*, Mai, 1839, p. 87) was obliged to cauterize the base of it with red-hot iron some time after he had freely incised it.

§ XVIII.

A new case of *hydrocephalus cured by compression*, in a female infant aged twenty-seven months, has been communicated to me by M. Lowenhardt, (*Journal des Conn. Méd.-Chir.*, t. xii., p. 257; *Encyclogr. des Sciences Méd.*, 1839, p. 177.) A hydrocephalic child, treated by puncture, in the practice of M. Tetlow, (*Gaz. des Hôpit.*, 1839, p. 185,) was much relieved, but died on the tenth day of an acute bronchitis.

§ XIX.

M. Heyfelder, (*Archiv. Gén. de Méd.*, Mai, 1839, p. 59,) following my method of operating for *empyema;* first, in a child aged seven years, at the end of two and a half months of the disease; second, in an infant aged six years, at the end of three months and a half; third, on a soldier aged twenty-one years, at the end of some weeks; fourth, on a boy aged six years; fifth, on a child aged seven years, obtained success in each, except that the wound in his third patient remained fistulous. A like result was obtained by M. Brugnon (*Ibid.*, p. 80) in May, 1837. F. Wetzel, (*Heidelb.*, ann. 1838, t. iv., cap. 4; *Arch. Gén. de Méd.*, Juin, 1839, p. 229,) aged nineteen years, operated upon for empyema the 21st of June, 1834, and several times afterwards, was still living in 1838, with a fistula in the thorax.

§ XX.

A case of intestinal *hernia*, strangulated through the ruptured mesentery, has been published by M. Ranking, (*Encyclogr. des Sc. Méd.*, 1839, t. iii., p. 15; *Gaz. Méd.*, 1839, p. 103.) The *kelotome* and the *sonde-bistoure*, as proposed by M. Peraire (*Bulletin de l'Acad. Royale de Méd.*, t. iii., p. 606) for the operation of strangulated hernia, are evidently useless. If the son of a distinguished practitioner of Rouen, M. Flaubert, (*De la Hernie Etranglée, etc.*, Paris, 1839,) thinks that he can maintain that the operation for strangulated hernia succeeds better when the peritoneum is inflamed, than when it is sound; it is because he has not given attention to the state of this membrane at the moment of the operation in the hospitals of Paris.

§ XXI.—*Urethra.*

Adopting the *cauterization* from before backward, after the plan of Wiseman, M. Barré (*Cauterisation Antéro-poster., etc., de l'Uretre*, Rouen, 1839) makes use of a very convenient instrument, which I have thought it right to delineate in the atlas.

§ XXII.

The *incision* of strictures *in the rectum* has been followed by great advantages in the hands of M. Stafford, (*Gaz. Méd.*, 1839, p. 363.)

§ XXIII.

An *ascites* of three weeks, treated at first by squills, calomel, &c., was cured in a short time by acupuncture, (Campbell, *Gaz. Méd.*, 1839, p. 105.) I have observed two favorable cases from this treatment: MM. Bricheteau and Barthélemy have also cited similar cases.

§ XXIV.

Supporting his declaration by a number of observations, M. M. Smith (*Gaz. Méd.*, 1839, p. 41) pretends that the *trephine* should be employed to prevent necrosis and caries in ostitis, as also for curing those diseases when they are once established.

§ XXV.—*Emphysèma.*

A man blowing his nose too violently after an operation for fistula lachrymalis by the canula, that M. Blandin (*Gaz. des Hôp.*, 1839, p. 174) had performed upon him, was suddenly seized with a strongly-marked emphysema of the eyelids.

NEW ELEMENTS

OF

OPERATIVE SURGERY.

DEFINITION AND DIVISION.

In medical science the word *operation* may be defined a *mechanical action*, directed by the hand, and designed as a remedy upon one who is infirm or sick. It embraces thus the same idea as that of *surgery;* but usage has resulted in giving to it a value, if not different, at least very much restricted. To-day, *surgery* means in fact *surgical pathology*, and all diseases are included in its domain in which a *topical* application forms the leading feature of the treatment, whilst *operative surgery* (*la médecine opératoire*) is confined to the study of the therapeutic means which require the intervention of the hand, whether by itself or armed with instruments. One is a true science, which is scarcely distinguished from *medical pathology*, properly so called; the other approximates more to the arts. The first cannot be cultivated with advantage but by those who are endowed with a great aptitude for labors of the mind; the hand, on the contrary, is the instrument, and the indispensable and characteristic agent of the second. As for the rest, it is impossible to establish between them an exactly defined limit. Thus also do we see them constantly trenching upon one another in the works that have been devoted to each.

If it is permitted to operative surgery to include within its province the rules relative to the employment of cataplasms, plasters, ointments, leeches, cupping, acupuncture, blisters, moxas, cauterization, the seton, and bleeding, we cannot see by what title the reduction of fractures and of luxations, and the study of bandages and dressing, should be excluded from it.

Catheterism in general, the extraction of a foreign body, whether in the ear or between the eyelids, and the section of the frænum of the tongue, require neither more address nor knowledge than venesection or the opening of an abscess. The manner then of circumscribing the field of operative surgery is an affair purely conventional, which every one has a right to interpret according to his own mind or particular views. For myself, I shall treat of operative surgery under four principal heads: the first section will be

devoted to operations in general; the second will include every thing relating to minor surgery; in the third I shall occupy myself with the ordinary operations; and special operations will be detailed in the fourth.

ORDER FIRST.

OPERATIONS IN GENERAL.

There are an infinity of rules which are not peculiar to any operation in particular, from the fact that they are applicable to all. The examination of the classifications, methods, indications, and counter-indications, and of what it is necessary to do before, during, and after an operation, all justify this assertion.

CHAPTER I.

CLASSIFICATION.

There has always been felt an urgent necessity of distributing operations into a certain number of divisions. The ancient division, mentioned by Celsus, which would refer them all to *dieresis* or *synthesis*, to *exeresis* or *prothesis*, and which reigned for so many ages in all the schools of Europe, cannot now be retained. In the *eight* classes substituted for them by Ferrein, he is still more unfortunate. The union, the separation of tissues accidentally united, the dilatations and the re-establishment of natural passages, the closure or obliteration of channels that have become useless, the extraction of certain liquids, the removal and the extraction of foreign bodies, the reductions, of which he makes so many different kinds, form, in fact, the most unnatural distribution that could be imagined. Diarthrosis, or the process of remedying deformities, added, at the time of Dionis, to the four primitive orders; *dilatation* and *compression*, to which M. Roux accords a separate place; while *prothesis*, rejected also by Ferrein, does not appear to be worthy of any, would answer but very imperfectly to complete the arrangement. The exploration of the bladder, of the Eustachian tube, and the lachrymal passages, the injection of those different parts, and the pure and simple torsion, for example, of the vessels, would have no rank, though in themselves they may frequently constitute important operations.

The efforts of Lassus and of Rossi, to avoid the difficulties pointed out by the preceding authors, have had no success; and the plan at last adopted by Sabatier has so many disadvantages, and is

so inconvenient, that hereafter no one will ever think of reviving it. In fact, with what incongruity it strikes us, when, for the *eye*, for example, we see *fistula of the cornea*, *hypopeon*, *hydrophthalmy*, *staphyloma*, *scinhus*, *procidentia iridis*, *foreign bodies*, *cataract*, and *artificial pupil*, scattered about in the midst of three volumes, and into so many distinct classes. It results from this, that it is next to impossible to know in what part of the work to search for the article we wish, unless we run over beforehand an interminable index. For example, to open the anterior chamber of the eye, we should be obliged to consult in turn the second, third, and fourth volumes, according as it may relate to the extraction of pus, a foreign body, or the crystalline lens. In this point of view the essay of Delpech is still more unfortunate. Nor, in fine, is the method developed by M. Richerand, though one of the most advantageous for study, and conceived in an intellectual spirit, totally free from the objections which may so justly be made against that of Sabatier. From whence it results, that the topographic arrangement that had already been proposed by J. Fabricius, and from which Boyer did not think proper to deviate, notwithstanding the criticisms, more or less just, that were made upon it at different epochs, is still the best, and the only one, perhaps, which can, up to the present time, be of any help to the reader in a treatise on operative surgery.

It is the only system which embraces the general ideas in use by all the world. By its aid there is no one who may not know immediately where to find *trephining*, *cataract*, *empyema*, *lithotomy*, &c.; whilst in imitating Sabatier or Delpech, we should have to ask whether such operations belong rather to *wounds* and *foreign bodies*, or to *fractures* and *effusions*, &c., and afterwards to find in what order of those different chapters they are to be classed in regard to one another. The *nature* and the *causes* of disease are too little known, or too changeable, to serve as the foundation for the classification of operations. In proceeding exclusively by the arrangements of functions, or by the organic system, we take our departure, it is true, from fixed points, but we are obliged to associate together subjects the most dissimilar, (salivary fistulas, abdominal hernias, polypi of the rectum, &c.,) or to separate others, (foreign bodies in the trachea and the œsophagus, tracheotomy, œsophagotomy, &c.,) which have the greatest analogy to each other.

We may here glance at the operations under two general points of view: first, as independent subjects, and class them according to their greater or less analogy or difference; secondly, as therapeutic resources, and submit them to the same divisions as the affections they belong to. In practice, the first of these methods is not applicable but to the very smallest number of operations; for example, to trephining, amputation, ligature of arteries, and suture. The incisions, extractions, and special operations cannot in truth be adjusted with it. The second would be yet more difficult to generalize; for if cataract, fistula lachrymalis, hare-lip, &c., may serve as heads of chapters in a work of operative surgery, it is not so with complicated fractures, caries of the joints, gangrene, and wounds

from fire-arms. Perceiving, by the difficulties against which all others have vainly struggled up to the present time, that it would be impossible for me to create a classification well systematized and regulated, I have believed it to be my duty to decide in favor of the plan the least fatiguing for the pupil. This plan approaches more an anatomical arrangement than any other. It is the only one, with some few modifications, that is allowed to be followed in the amphitheatres, and is the one of which M. Dubois (*Traité des Etudes Méd.*, Paris, 1837, p. 600) has endeavored to point out the advantages. Founded upon the same principle as that of my treatise on surgical anatomy, it permits me to place in the first class all the general operations, and to reserve for the second all the special operations. It has afterwards appeared to me, that for the special operations, the best plan was to run over the whole trunk, from the head to the pelvis, taking sometimes the operation itself, sometimes the diseases, and sometimes the organ, or the parts which belong to it, for my guide and chapter. Having had no other intention in adopting this method than to render a knowledge of the subjects more easy, and to aid as much as possible the memory of the reader, I attach no further importance to it, and consign it without a murmur to the criticism of those who are capable of judging of it.

CHAPTER II.

NATURE OF OPERATIONS.

ARTICLE I.—*Systematized Operations, and such as are without any rules*—(*Opérations Reglées et non Reglées.*)

AMONG operations, there are those of which all the steps are known in advance, and others in which no rule can enable us to foresee the difficulties.

The first, generally designated under the title of *Operations Reglées*, are fortunately numerous and important. It is to these that we assign amputations, the operation of aneurism by the method of Anel, cataract, hare-lip, lithotomy, &c. The second comprehend tumors, whether cancerous or of other descriptions, which develop themselves upon the cranium, face, neck, axilla, and in the abdomen, and which we are obliged to extirpate. There exists a third class of operations which hold in some sort the middle place between the two preceding; such are those which have reference to cancers of the breast, sarcocele, fistula in ano, hernias, and even exsections and the operation for aneurism by the ancient method. We know effectively what are the coverings to divide in an operation of strangulated bubonocele, but we are more frequently ignorant of what is the true pathological condition of the parts to be

reduced. Thus operations are arranged naturally into three series: 1. In the one, the instrument acts on parts altogether sound, or scarcely disturbed by the disease; 2. In the second it bears upon points whose principal anatomical relations have been changed, or its object is the eradication of a tumor, whose limits, if not its very nature and seat also, it is at first almost impossible to determine; 3. In the third, in fine, we apply it to diseases whose limits it is easy to establish, and which are surrounded by organs well known, but which are too numerous in variety to permit the rules for operating in one case to be exactly proper for the others

Article II.—*Operations on the Dead Body.*

The convenience of the division, essentially practical, of which I have just spoken, is especially confirmed by the processes that are performed on the dead body. There it is possible, in fact, to imitate the removal of limbs, the ligatures of arteries, in a word, all the operations which apply to the organs in their normal state, that is, all the systematized operations. Nothing like this can be had for sarcomas of the face, and of the maxillary sinus, for amputation of the upper jaw, of the parotid, of the thyroid, for a cyst of the ovary or the interior of the abdomen, and, in fact, for all the extemporaneous operations.

There is no pupil who does not know that the ideas that we get in the amphitheatre of ligatures upon polypi, of excision of the neck of the uterus, and of the operation for fistulas in perineo or in ano, and especially for hernias, are extremely imperfect, and but feeble aids when we come to operate upon the living patient. We should therefore be grossly deceived if we believed ourselves perfectly instructed in all operations, because we had repeated them a great number of times on subjects for dissection. No one, however, can be a skilful surgeon without having been for a long time thoroughly versed in those exercises. They give precision, confidence, address, and a manual adroitness that the most minute anatomical knowledge can never supply. But this is not all, even for the operations of the first kind. While the eye is more flabby, more soft, and less transparent on the dead body, nothing there gives us that idea of mobility, that tendency of the vitreous humor to escape, and of the eyelids to contract, and of the tears incessantly to flow, which are seen in life. When we amputate a limb, the tissues, being more firm and better extended, are, it is true, more easy to cut than after death; but in this last case we have no muscular retraction, no blood which incommodes or disquiets us, and no explorations to make, to know if certain hemorrhages proceed rather from veins than arteries. However superficial an artery may be, we cannot lay it bare without dividing some vascular branches, whose contents sufficiently mask the parts to render the power of distinguishing them more or less embarrassing; while in the dead body nothing analogous to this is met with. The pulsation of the vessels, which, at the first glance, would seem to be a com-

pensation, is, however, so little manifest, and so indistinct at the bottom of wounds, that we cannot in reality derive but a very feeble advantage from it. In tracheotomy and œsophagotomy, is it possible to represent even the smallest number of the embarrassments which arise from the venous plexuses, anastomoses, and the numerous arteries of the neck? In passing to the other two classes, we must note also the difficulties that are inherent in them from these general differences. We do not operate for fistula lachrymalis, unless the angle of the eye is glued together, ulcerated, or more or less altered. It is the same, most usually, with the nasal fossæ when we wish to extract polypi from them. The movements of the throat, the desire to vomit, the mucus or the blood, and the state of agony into which the patient falls at every moment while we are operating for a hypertrophy of the tonsils, or a bifurcation of the velum of the palate, are not found on the dead body. The states of caries and necrosis which render the exsection of a joint indispensable, constantly and profoundly alter the surrounding soft parts. From whence it follows, that there is no possible comparison between what we are then forced to do, and the trials that we make on the dead body. In those different cases we know, nevertheless, what is the number and the situation of the coverings and of the organs that we are to divide, or where the part is that we wish to take away or perforate; but let me suppose that a morbid mass, of a certain volume, develops itself in the perineum, of what use to the surgeon will be his exercises on the cadaver? But what I say of the perineum, is applicable to the groin, to the axilla, the neck, the abdomen, and all other points of the body. Though this kind of exercise, therefore, is not to be neglected, we must guard ourselves from according to it too much importance.

The experiments on *living animals*, which, under this point of view, are of infinitely greater value, have not, nevertheless, all its advantages. First, the forms being rarely similar, we obtain, in general, but fallacious results, if we would make rigorous deductions from one to the other. Moreover, it is necessary to study an operation with the mind at rest, and with all necessary care, and to practise it on the dead body, and not on a being endued with life; so that there are two kinds of means that come to the aid of each other, without our having it in our power to substitute the one for the other.

Operative Surgery, then, is definitively founded—1. On anatomy; 2. On operations on the dead body; 3. On living dissections; 4. On pathological anatomy; 5. On the constant practice of operating on the living subject.

Article III.—*Methods.*

As there are but few operations that cannot be performed in different ways, we must seek out in season for a proper word to express the *ensemble* of the steps of which each one of them is composed. The terms *methods*, *processes*, and *modes*, have been applied

to this use. These three words, which are nearly synonymous, have for a long time been employed almost indiscriminately, and they are so still on a great many occasions. It has, however, been attempted, following the example of M. Roux, to give to each of them a distinct value, and a special signification. The term *method*, for example, has a much more extensive signification than the two others. It is thus that we say method, and not process, or mode, when we speak of extraction or depression of cataract; whilst in the operation for stone, with the concealed lithotome, (*lithotome caché*,) we make use of the word process, and not that of method, to point out the modification of the operation by Boyer. The ligature upon polypi is a method. The ligature, after the ideas of such or such an author, is only a process. In short, we generally understand by method something fundamental, sufficiently broad to be divided and modified in many ways; while the word process is more restricted, and is scarcely used but in designating a diminutive of some method. The operations of aneurism, amputation, hydrocele, and lithotomy, are all excellent examples to point out the justness of these distinctions. To place a ligature on the artery without touching the tumor, is called a method; to place it higher or lower, takes the name of a process. To open the sac is a method; the manner of opening or that of placing the ligature is a process. To sum up the whole, method embraces the entire thing, while process is applied to each one of its modes of application. It is far from happening, however, that, in ordinary language, we do not constantly deviate from these conventions purely arbitrary, or that we do not often use, even in works that are the most carefully written, the words *process* and *mode of operation*, in place of the word *method*, and vice versa. Fistula lachrymalis, among other things, proves this sufficiently. In fact, we almost indifferently say the method and process of Dupuytren, Desault, and Boyer. Hydrocele, hernia, and lithotomy, are subject to the same remark. The process and the method of cauterization and of injection; the method and the process of dilatation, and dividing strictures; and the process and the method of Frère Come, are in daily use. This, at best, is a question entirely of a secondary character, and of no moment. It is permitted to every one, in such a discussion, to adhere to such usages if he pleases, or to reject them, and place no value upon them.

CHAPTER III.

THE CARE REQUIRED IN OPERATIONS.

ARTICLE I.—*Indications.*

THE first object which should engage the solicitude of the surgeon, before performing an operation, is to ascertain the indications.

It is on such occasions that the most extended and precise medical knowledge becomes a matter of indispensable necessity. After having established that the cure is more difficult or even impossible in any other manner, it is then necessary that he should recognise the utility of it; that he should acquire the conviction that the patient incurs less of danger in submitting to it than in remaining under the action of the disease that has rendered the operation necessary. It is not that we are permitted to perform operations only, as Dupuytren (Sabâtier, *Méd. Opér.*, Paris, 1824, t. i., p. 13–16) lays it down—1. When these are the *only means indicated;* 2. When we have vainly essayed all other means; 3. When they form the last resource; 4. When we are sure of being enabled to complete them; and, 5. When there is to result from it an entire and permanent cure; but, likewise, when compared with other therapeutic resources, and with the inconveniences of the disease, they present both more advantages and fewer dangers. 1. We operate, and with propriety, upon a great number of tumors which it would not be possible for us to cure, but with difficulty, by the aid of caustics or certain ointments; 2. It is useless to try all the other remedies before operating for fistula lachrymalis, hydrocele, cancers, &c.; 3. In phymosis, cataract, hare-lip, and abscesses, the operation ought to be the first rather than the last resort; 4. We proceed to the examination of a strangulated hernia, of a foreign body, and of a wounded artery, without being sure of succeeding or of completing the operation; 5. The puncture of the abdomen, of the bladder, and the thorax, and the extraction of polypi from the nose, are practised every day, without being followed in general by any other result than a temporary relief.

A diagnosis, therefore, elucidated by a thorough knowledge of pathological anatomy, a prognosis founded upon what the most sound judgment can ascertain of the progress or probable issue of the derangements of the organism, and as exact an appreciation as possible of the power or of the value of the ordinary therapeutic agents, will alone enable the surgeon to resolve this first problem, which, in one of its aspects, does not seem to me to have hitherto been considered in a proper point of view.

I shall now speak in relation to the choice that is to be made between the operation properly so called, and the other medicaments that might be substituted for it. Thus, because the lachrymal tumor, hitherto considered of a nature which confined it within the limits of operative surgery, yields sometimes to regimen and the antiphlogistic method, and because certain tumors of the breast are discussed by means of compression, we should be altogether wrong, in my opinion, to conclude from this, as some have lately done, that the application of this treatment ought always to precede and be made trial of, with the view of dispensing with the aid of the cutting instrument. In fact, the question is not to know if cancer or any tumor whatever may be made to disappear under the action of such or such a medicament, or by the intervention of a serious operation; but to know which of the two offers in the last

resort the most advantages to the animal economy. I agree that the application of leeches, frequently repeated, and that emollient cataplasms and abstinence cure a certain number of tumors, and even lachrymal fistulas; but should we therefore infer that this treatment, the success of which is far from being constant, and which may be prolonged many months, deserves to be substituted in the place of a metallic tube in the nasal canal, if it is true that this application, which is made in a second of time, would cure in two days a disease of ten years' standing, and succeed in a great majority of cases? Allow that leeches and diet may sometimes prevail over masses that have the *appearance* of sunhus or cancer, I do not deny it; but if these tumors were moveable and favorably placed, who would venture to maintain that the bistoury would not remove them still more effectually, certainly with more rapidity, at the same time producing a less severe shock upon the system, and causing in reality a much less amount of suffering? But what I say of lachrymal fistula and of cancer is applicable to a crowd of other maladies, and is the basis of an observation that the surgeon should never lose sight of. If it is cruel to subject to the operation of the actual cautery those whom we might treat by more gentle means, it would be still less conformable to the interests of humanity to compromise the future health of the patient, under the vain pretext of exempting him from a little suffering. The slightest puncture, it is true, *opens a gate to death;* but this axiom, which is applicable to the bite of leeches, to bleeding, cupping, blisters, cauteries, setons, moxas, and the capital operations, does not and ought not to prevent us from resorting to abstraction of blood, to revulsives, or to drains; and there is no internal medication, if it possess some activity, to which we may not apply the same remark.

Article II.—Various Precautions.

§ I.—*Hygienic Precautions.*

The choice of the season is certainly not a matter of indifference for the performance of operations. Other things being equal, if the spring and autumn suit better than the winter or midsummer, it is not only because their temperature is more mild, but also because the system is then in a better condition to resist general morbid reactions. So also we should not perform, except in temperate seasons, lithotomy, the removal of large tumors, or any other operations which produce a severe shock upon the system.

But we must not accord too much importance to this precaution, since we know that there is no season capable of rendering impossible the success of an operation, whatever it may be, and that the question of time cannot be any other than a mere matter of greater or less convenience. At the hospital where I operate for cataract, stone in the bladder, fistula lachrymalis, tumors of the breast, both in winter and summer, I have not observed that success or failure depended upon one season more than another. No doubt the ap-

pearance of an epidemic is a substantial reason for greater caution, and that we must at the same time look to the morbific constitutions that exist at the moment. We cannot, however, apply this rule but to operations where urgency may be questionable. A strangulated hernia, a wound of an artery or of the intestines, croup, or foreign bodies in the œsophagus, would not admit of delay.

Pelletan and Dupuytren were in the habit of keeping patients in the hospital some time before operating upon them, in order, they said, to acclimate them. MM. Viricel and Champion do not conform to this rule, unless it has been impossible for them to operate immediately. On this subject I find it difficult to lay down rules. We cannot deny that the atmosphere, regimen, exercise, and the concomitant circumstances, constitute an entirely new life to most persons who, for the first time, enter a hospital, and that to most people from the country especially, this sudden transition may be a formidable cause of disease.

A man having an artificial anus comes from a remote province, and wishes to be operated upon immediately. I object. The third day he is seized with a gangrenous erysipelas, and on the fifth day dies. The operation for a fistula lachrymalis, which I was asked to perform on a mason from the country, was deferred for some days. A peritonitis supervened, and proved fatal in forty-eight hours. Another countryman wished me immediately to extirpate a cancerous eye, in order that he might quickly return to his labors. He was seized with an erysipelas, which proved fatal to him in a few days. The day was fixed for taking away a polypus from the uterus in a peasant girl, who was in other respects in good health. All the symptoms of a violent peritonitis showed themselves the same morning, and death took place on the third day. An operation would not have prevented these patients from dying: and who does not see that if, yielding to their entreaties, I had performed it, it would have been made to assume the responsibility of all these fatal results!

What I have said of hospitals I might also apply to private houses, when speaking of patients who are strangers to the city, and who visit it for the sole purpose of being operated upon.

It is certain, on the other hand, that in operating immediately, we relieve the patient of one cause of ennui, of anguish, and of moral suffering, which also are sources of danger. On this subject there is nothing absolute. For trifling operations, or for those of a moderate degree of severity, for cataract, fistula lachrymalis, hare-lip, staphyloraphy, and excision of the tonsils, for example, and for those operations intended to relieve acute pains in some severe maladies, delay, as it appears to me, would be improper. For the great operations, the extirpation of tumors of considerable size, lithotomy, and operations for aneurism, if life is not actually compromised, it is on the contrary prudent, as I conceive, to wait some days, and not to be in a hurry.

The age also is a condition which must be taken into account.

With infants we need not be in haste to operate for lachrymal tumors, small erectile tumors, hydrocele, the removal of enlarged tonsils, &c., because the growth of the individual often causes these diseases to disappear. We desist often from the operation for hydrocele, cataract, artificial pupil, and a great number of other operations in old people, because at that period they offer less chances of success, and that in the decline of life, even under the most favorable circumstances, they lose a great many of their advantages. I shall, however, be obliged to recur to many of these questions when speaking of particular operations.

In selecting the morning rather than the afternoon, the operator has the advantage of finding his patient less fatigued, and himself better enabled to watch with care the wants of the patient immediately after the operation. In other respects, there is nothing imperative in this matter; and the most plausible argument for this preference is, that in general the forenoon is most convenient for every body. As to urgent operations, we perform them as soon as we can, without taking into consideration the season or hour of the day; on which account authors have been induced to establish two periods, a time of election and a time of necessity.

§ II.—*Moral Precautions.*

Moral precautions, so far as operations are concerned, vary, and must vary, according to the individuals. The first rule is to inspire an unlimited confidence in the patient; and we all know that confidence is acquired in a thousand different ways. The second is, to convince the patient that the operation is the best possible means of arresting the progress of his sufferings, and we should take care to undeceive him if he exaggerates the dangers of it. In short, we must do every thing, without exceeding the limits of truth, to induce the person to be operated upon, not only to desire, but to demand the operation, and to look forward to the moment of its performance, if not with pleasure, at least with resignation. In this respect we have two sorts of people to deal with. Some, of extreme pusillanimity, are so alarmed at the idea of the slightest cut of the bistoury, that we are compelled to deceive them upon the duration and the acuteness of the pains they must undergo, as well as the dangers they are about to be exposed to. Others, and who are rarely met with except in public establishments, imagining that they must be operated upon whether or no, and even without any notice being given to them, never speak to the surgeon but with an air of inquietude, and remain in a continual state of apprehension until we disabuse them of their error. Upon this subject it has been asked, if it was well to announce to the patient the day and hour of the operation. To this we may reply yes and no. As a general rule, *operations with the day and hour fixed*, as was formerly the practice in public establishments, and which Pouteau compares to a species of auto-da-fé, are bad. I have also taken care completely to eradicate this practice from La Charité, where there were still some

traces of it when I first entered upon my duties in this hospital. But we are not to infer from this that we ought to conceal from every patient what we are going to do to him up to the last moment. If there are some that we ought to prepare without their knowledge, and take them, so to speak, unawares, there are a great number of others who should be gradually familiarized with the idea of the operation, and be not only made to understand and reason upon the details of it, but informed beforehand of the time fixed upon.

Practice shows us, moreover, two other kinds of persons whom it is necessary to look to in a moral point of view. Among these we may arrange such as, having no fear of the dangers that they run, and making a boast of their courage, submit themselves with perfect indifference to the knife of the operator, and take pride in receiving the cuts of the knife without making any complaint.

The second class of whom I would speak, comprises persons that are naturally timid or very susceptible, but who, after having hesitated a long time, become convinced that an operation is absolutely necessary, and then concentrate all their courage with such force that they refrain from uttering a single cry, suppress even a reasonable manifestation of suffering, and stifle the slightest murmur of complaint.

The fear of Pope Innocent was so great, says St. Augustine, (*Cité de Dieu*,) when they announced to him that it was necessary for him to be operated upon a second time for fistula in ano, that the physicians, the day after, found only a firm and solid cicatrix in the place of the sinuses and of the small openings which were seen the evening before. A hemorrhage which yielded to nothing, was suddenly arrested when F. Collot had told the patient that he was in danger, and that it was necessary for him to put his affairs in order. (*Opérat. de la Taille*, p. 141.) M. A. Petit, on the contrary, has often caused hemorrhages to be arrested by dispelling fears with which the patients were overwhelmed. (*Méd. du Cœur.*) An artificial stoicism is no more favorable to the success of operations than an extreme pusillanimity, as is familiarly known to all well-informed surgeons.

It is consequently sometimes as useful to calm and repress the extravagant courage of some patients, as it is to quiet the fear and timidity of others. To the former it is necessary to point out the grave nature of what they are disposed to treat so lightly, and to show them the necessity of not making up their minds with so little reflection. To the others we must explain that assumed bravery can never take the place of true courage; that it is as dangerous to suppress their sufferings as it is improper to exaggerate them, or to utter them when there is no reason for doing so; that in acting thus they do violence to nature, whose intention is, that the distress of each suffering organ should be expressed freely and without constraint. Nothing, moreover, is a more unfavorable augury than these forced exhibitions of courage, and these affected displays of calmness or of resignation. It seems that the vital power is ex-

hausted in thus retracting upon itself, and that it is afterwards incapable of resisting the onset which has been made upon it. The fact is, that operations performed under such circumstances have generally a less favorable issue than others, and are of a nature not to be relied upon.

Ought we to operate upon a patient against his will? is a question that I have often heard asked. For myself, I answer, no, if the person is an adult and of sound mind; but, yes, on the contrary, if we have to deal with a child or an idiot. Though all the family should desire it, the surgeon would, in my opinion, be culpable in operating by force upon a patient who enjoyed his civil rights. Our duty is to explain to patients what is most suitable for their complaints, and to enlighten them upon the dangers to which they are exposed in not submitting to the proper remedies; but they, and they alone, have the right to do or not to do what we advise. Children and idiots are exceptions, because, not having their will free, and dreading only the pain, they do not know how to protect themselves from the dangers of the future; but we must not in such cases attempt any thing without the consent of relatives.

We are, however, sometimes permitted to operate upon certain patients, not absolutely in spite of themselves, but without their knowledge, and by surprise. Prompt and easy operations of little importance are of this kind, especially with pusillanimous and very timid persons; such are simple incisions, the opening of abscesses, the excision of small pedunculated warts, the removal of a nail which is partly detached, some operations for hydrocele, &c.

If an operation can be performed in many different ways, I would advise the surgeon to apprize the patient or his family of it. We operate thus for cataract by extraction or depression; we remove a stone from the bladder by lithotomy or lithontrity; we amputate the leg near the ankle or near the knee. It is possible that the patient may have a preference for one of these methods to the exclusion of the rest. If his choice is not the best, his physician will endeavor to convince him of his error; but if, after having used every means of persuasion, he finds him resolute, he may, if there is no serious objection, accede to his wishes.

§ III.—*The State of the System.*

Not to operate unless we are sure of removing all the disease, and that there does not exist in the system an affection more serious than that for which the operation is performed, is a law which has a great number of exceptions.

I have proved by a great number of examples, that even in cases where it is impossible to take them entirely away, the extirpation of lymphatic tumors should nevertheless be attempted. The amputation of a limb is sometimes indicated, though there may be other parts of the osseous system or other articulations affected, as, for example, in scrofulous patients. A consumptive patient, a paralytic, a patient affected with aneurism of the heart, or a can-

cerous lesion, ought, notwithstanding, to undergo amputation immediately in the event of a serious injury to the limb. These diseases also should not prevent us from performing the operation for strangulated hernia, aneurism, or tracheotomy. It is nevertheless true, that we ought then to apprize the family or the friends of the patient of the object we have in view in undertaking the operation, and that in such patients we ought not to take the bistoury in hand except in cases of urgent necessity. In fine, *it is better to wait for death than to run before him.*

The operation often is the only remedy we have; but the patient is in so serious a state, and the malady so far advanced, that there is scarcely any thing to be hoped for from it. Then what must be done? If we do not operate, death is certain; but after how long a time? If we operate, one patient in ten, twenty, or thirty, will be saved; but the rest will sink under it a month or a year later. If it is just to say with Celsus, *Melius anceps remedium quam nullum*, it is also just to say, *better to let the patient die than to kill him.* In supposing then that the operation may be very dangerous in itself, and that, in the circumstances in which we are placed, it offers only one chance of success in ten, it would in my opinion be compromising surgery to subject the patient to it. The extirpation of the womb, when not out of its place, of the thyroid body, degenerated throughout its substance, and of the entire lower jaw, &c., are cases of this kind. If the chances for success, on the contrary, are more numerous, and if, in spite of the dangers, the operation is one of easy execution, we ought not to hesitate, and it becomes a case of conscientious duty from which the surgeon ought not to shrink. Such are certain cases of strangulated hernia, where, whether from extensive peritonitis or from the probabilities of gangrene, the success of the operation, so to speak, is rendered impossible.

One circumstance, important to be considered, though the classic authors who have preceded me have scarcely paid any attention to it, is that which concerns the serious consequences which are actually complicated with the disease which we wish to remove. I will suppose, for example, that a tumor, or a bone to be excised, or a finger to be amputated, may be surrounded by an acute diffused inflammation, whether erysipelatous or phlegmonous, the limits of which are not yet in any manner definable, and which has not ceased to keep up an evident general reaction. Following that old axiom, *sublatâ causâ, tollitur effectus*, it would seem that in such a case we ought to operate as soon as possible. This, however, would be an error; observation proves that in such cases operations succeed badly, that they aggravate the inflammation, and do not save the patients from death. With the exception of some particulars, the inflammation is here like that of gangrene, and before operating we must wait until it is positively located and definitively circumscribed. I would not, however, wish that, from excess of timidity, we should be deterred from performing any operation upon persons who are troubled with certain general complaints: diarrhœa, for example, a febrile movement, whether

permanent or intermittent, loss of appetite, loss of sleep, night sweats, &c., are not a sufficient reason to postpone lithotomy or the amputation of limbs.

In short, I postpone the operation, if the general disturbance is connected with an acute inflammation, developed in the neighborhood of the part to be removed, rather than in the primitive disease itself; I hasten, on the contrary, if the general symptoms are under the influence of the evil we wish to remove. If, in destroying the diseased part, we may hope to eradicate the germ, we must then operate; but if, when the operation is terminated, the germ should remain in the system, it is better to temporize. Such is the law which I would venture to lay down.

The examination of the precautions relative to the lesions which may be complicated with the principal malady, would be superfluous. We do not undertake the performance of a serious operation which may be postponed in a pregnant woman, or a nurse, or while the patient is under the influence of a formidable disease, unless it may be the best means of putting an end to the functional disturbances of the whole economy. Moreover, these disturbances should have been resisted by the surgeon in proportion as they presented themselves, before, as well as after having made up his mind to operate. The manner of recognising and of treating them being necessarily detailed in works of pathology, it would be abusing the patience of the reader to repeat them in a work on operative surgery.

The preparations, then, of which we are permitted to speak, are those which the state of a patient, otherwise in good health, may require. On this point authors are far from being agreed. There are some who scarcely prescribe a single day of diet, while a greater number only operate after using *tisans*, purgatives, revulsives, bleedings, or a regimen of great severity, and precautions the most minute, in fact, during one or more weeks. So that it is difficult to lay down a general rule as to which is right or which wrong.

Almost all the preparations, whether hygienic or medicinal, to which patients were formerly subjected before being operated upon, have been abandoned by the moderns. These preparatory steps are nothing, in fact, says Pouteau, but a *protracted meditation upon the malady*. (*Œuvr. Posth.*, t. iii., p. 113.) And M. Champion, (*Correspond. Privée*, 1837,) on the strength of the success which attends operations of immediate urgency in the army, submits none of his patients to these preparatives. Nevertheless, there are some of them that deserve to be retained, when the nature of the lesions allows of delay.

It is in treating upon each operation in particular, that it will be proper to touch upon this question. I will confine myself for the moment to remarking, that every operation, sufficiently important to exact, immediately after it, a rigid diet during a certain number of days, in order to diminish the general reaction, and to effect a temporary change in the habits of the patient, requires that we should precede it by a gradual diminution of the aliments, and that

nothing more should be given the day before than some soup or light broth. The use of some light and refreshing diluent, one or more bleedings, whether by phlebotomy or by leeches, if the patient is robust, or but little enfeebled, a purgative, or at least enemata, or laxative drinks, in order that the transition may not be too sudden, and that there may not remain any germ of morbid derangements in the system other than those which may be produced by the consequences of the operation itself, are also necessary to be attended to.

All the preceding considerations ought equally to be understood of *local preparations*. The only one which it is necessary to recall here, is that the part which is about to sustain the action of the instruments, or of bandages or other portions of the dressings, must be carefully shaved and washed.

CHAPTER IV.

THE CONDITIONS THAT ARE ACCESSORY TO OPERATIONS.

Operations, once decided upon, exact three orders of auxiliary means, according as these become necessary before, during, or after the operation.

Article I.—*Before the Operation.*

Before taking the instrument in hand, we must look well to the locale, the assistants, and the dressings.

§ I.—*The Locale.*

In hospitals it is generally to the amphitheatre that the patient is taken, in order that his companions in misfortune may not hear his cries, or see the mutilation he is about to undergo. This locality, expressly intended for this purpose, has no other inconvenience, though it be otherwise commodiously arranged, than that it is more difficult to warm than an ordinary chamber. It is the only place which can give those present an opportunity of appreciating all that the operator is doing. Strictly speaking, it is fitted only for a small number of operations. That of hydrocele, lithontrity, hernia, cataract, fistula lachrymalis, and trephining, may and should be frequently performed in the ward where the patient is. It is scarcely for any other than lithotomy, amputations, and the dissection of certain tumors, that the amphitheatre is really indispensable. In private practice, we choose the room which is the largest and the best ventilated, and gives the most light, in place of the sick-room itself, when that does not appear suitable. Here the number of persons present ought to be as small as possible; seeing that those who are of no service almost always do harm, either by their

indiscreet or inconsiderate remarks, or by the impressions that are depicted in their countenances; the vitiation which they cause in the air of the apartment, or the inconvenience they give to the patient or the operator. The interests of the pupils, and of science, are in hospitals paramount to these considerations; but here every thing being public, the patients know beforehand what they are to expect, and resign themselves to it without complaint.

§ II.—*Assistants.*

The subject of *Assistants* merits also the greatest attention. Their number cannot be fixed, some being absolutely *necessary*, others merely *useful*. Private practice admits only of the first; while in public establishments we employ all whose services can afford the least advantage. In the country we are often from necessity for the most part deprived of them. Some of them may not have yet passed through any medical studies; to such we confide duties that exact only physical strength, coolness, and a little address or intelligence. It is important, also, that all have their duties well defined, and that each one know beforehand what he has to do. The surgeon takes care to arrange the parts according to the skill, sagacity, stature, or strength of the persons who are to be employed, and to select his aids, as far as possible, among pupils who have been in the habit of assisting him in practice, who can divine his thoughts by the slightest sign, and who have at heart the success of all his operations and labors.

§ III.—*The Instruments and Dressing*—(*i. e. l'Appareil.*)

The instruments and dressing form another department whose importance is not to be forgotten. The objects which compose it are naturally divided into three orders. Some of them, like the garrot, tourniquet, pelote, compressing bandages, &c., have for their object the prevention of certain accidents during the operation; the second comprise every thing necessary to the manipulations of the operator himself; the last belong to the dressings. Thus we must be provided: 1. With one or more flexible tapers, commonly called *rats-de-cave*, rather than lighted candles, in case the natural light is not sufficient; 2. A chafing-dish full of live coals and cauteries; 3. A little wine, vinegar, Cologne water, and brandy, in so many separate glasses; 4. Hot and cold water, basins and sponges; 5. The means of temporarily arresting the current of blood in the part which is about to be operated upon; 6. Compresses, lint, bandages, and folds of linen (*alèzes*) to dress the patient or protect certain organs.

The second series comprehends the different instruments that we may require, such as bistouries, knives, needles, scissors, saws, ligatures, tenaculums, forceps, &c., which are arranged on a platform or on a table, in the order in which they are to be successively employed. The strips of adhesive plaster, the pledgets of lint,

(*plumasseaux*,) compresses, bandages, and other portions of the dressings, are then arranged on another table, so as to be presented in their turn without confusion. As these details will be again referred to in a great number of operations, amputations and aneurisms among others, where their utility will be best appreciated, I do not think it necessary to dilate upon the subject here.

The position of the patient, of the surgeon, and the assistants, being necessarily governed by the nature of the operation, the part affected, and the preferences of the operator, cannot be advantageously pointed out except under each particular head. The same may be said of the means of arresting the flow of blood, whether provisional or definitive, and also of those which are proposed for moderating the pain.

These remarks apply also to the attention that we must give to syncope, convulsions, spasms, and all other matters that relate to the immediate consequences of the operation. As we shall be obliged to pass in review these last chapters, as well as dressing, the question of union by the first intention or not, and the principal accidents to which the great operations are exposed, when we come to treat of minor surgery and elementary operations, of amputation of limbs and of aneurism, it would, in truth, be a useless repetition to occupy the reader with those matters at present.

Neither will I stop to discuss the sense or propriety of the old adage, *Citò, tutò, et jucundè*, which was formerly proclaimed in the schools. This saying is of Asclepiades and not of Celsus, as some are pleased to repeat it. Hippocrates and Galen said: *Celeritèr, jucundè, promptè, et elegantèr*, which no longer has any value. To say that an operation ought to be performed with promptitude, steadiness, and some address, is a triviality which has no need of being repeated in our days. The important part of it is, not to sacrifice one of these advantages to the others; to keep constantly in view, for example, that promptitude is not precipitation, nor always quickness; and that in surgery it is safety which ought to be paramount to all. I shall not therefore treat of these different subjects but in a very general way.

Art. II.—During the Operation.

§ I.—*Position of the Patient, Assistants, and Surgeon.*

As a general rule, it is better to operate upon patients lying down than sitting up; the former of these positions is the only one which suits for almost all operations that are performed on the neck, chest, abdomen, genito-urinary organs, and the inferior extremities; the second, perhaps, is more convenient for the operator, in operations to be performed on the face, the cranium, and certain parts of the neck, the chest, and superior extremities; but it is not really more advantageous to the patient, except the operation is of short duration and of little severity. In truth, there are

scarcely any other than the operations in the interior of the mouth or of the nose, which render the sitting posture absolutely preferable, and that because of the blood, which otherwise would have a tendency to be carried towards the pharynx rather than to the exterior. In a sitting posture, the patient grows feeble much sooner, is more difficult to hold, and is more exposed to swooning, (*lypothymies*,) and to syncope; while lying down he has no need of any muscular effort, and seems better able to support the pain; nothing then prevents us from allowing him to repose from time to time; no embarrassment is experienced in giving him such a degree of inclination rather than another, and of being prepared on the spot for whatever accidents may happen.

As for the rest, when we desire to operate upon a patient in the sitting posture, it is sometimes a matter of indifference whether he be placed on the edge of a bed, table, or any other object; for example, for puncturing a hydrocele, the introduction of the bougie, or of a porte-caustique into the urethra, &c.; in some cases a stool is better, from the liberty it permits to move the patient round; it is, however, a chair or an easy chair that is most commonly used; an arm chair for persons very feeble or intractable, and an ordinary chair for those whose position we may wish to vary.

I need not add, that the assistants must incline the head of the patient sometimes to one side, sometimes to another; that they must retain it in the most perfect immobility, by supporting it with napkins and with pillows; that it will be proper for them to turn the back, face, or side of the patient towards the back of the chair, according as the disease has its seat in the right or left, in front or behind.

If the patient is to be placed in a recumbent posture, we may often dispense with changing him from his bed. The operation for cataract, tracheotomy, catheterism, hydrocele, fistula in ano, and lithontrity, are of this description. Patients that are very weak, operations in which the least shock might aggravate the consequences, such as strangulated hernia, the trephine, and aneurisms, often demand the same precaution. On the contrary, for all operations accompanied with a considerable discharge of blood, and whose success cannot be endangered by slight starts or movements of the patient, it is better to operate on a separate bed. There is in hospitals, for this purpose, a table, whose two ends may be raised or depressed at pleasure, and which is supported on a pivot, which permits the whole to be turned in any direction. This table, which is about thirty inches high, and which would be still more perfect if it were possible to vary its entire elevation or depression, according to circumstances, is to be furnished with a mattress, also with a sheet and with folds of linen. Out of the public establishments, they use a solid cot, furnished with mattress, cushions, pillows, sheets, and napkins; in the absence of a solid cot, the mattress is placed on a table, or drawers, or on some planks fixed firmly on chairs or arm-chairs; the important part of it is, that the bed shall be firm, solid, straight, without bed-posts, or raised edges; that it shall

be of a convenient height, and so arranged as to allow of passing all around it.

Upon the bed we give to the patient a variable position, necessarily in relation with the exigencies of the operation about to be performed upon him. Lying on his back, belly, or on one of his sides, sometimes lengthened out almost horizontally, now bent up almost double, sometimes seated with either the head or lower limbs elevated, he ought to be held and supported by a sufficient number of assistants.

In former times, surgeons made use of cords, straps, and machines to control the movements of the patient during operations; now we have recourse to nothing analogous, except in some cases of operations for stone. Such contrivances have been renounced; first, because they are useless, and that intelligent assistants may almost always be substituted for them; secondly, because they had become an object of terror for many patients. It does not, however, result from this, as Dupuytren seems to wish us to infer, that assistants are never obliged to use force or violence during operations. In saying, "It is almost unheard of that any patient ever manifested a desire to have an operation suspended, or made serious attempts to interfere with its completion," this practitioner evidently deceives himself. For we every day see individuals praying in mercy that we would stop, that we would finish, thus imploring and menacing us, and who would not fail to escape if they were not firmly secured. The assistants ought not, however, to forget that their strength is uncalled for, while the patient makes only slight movements; and that they ought not to restrict, stop, or prevent any but those which might interfere with the manipulations of the surgeon.

The *position of the operator*, and of the assistants about the bed, during the operation, can have no general rule: provided it is the most commodious for all concerned, and the least fatiguing to the surgeon, we have all that can be said; it is in treating of operations in particular, that we may be allowed to speak definitively on this point.

§ II.—*To arrest the course of the Blood in the Diseased Part.*

It is scarcely ever required at the present day to recur to a precautionary ligature upon the arteries to suspend the circulation in the part upon which we are to operate; direct pressure is almost always sufficient, but this is not equally practicable on all the vessels. While it is difficult on the subclavian arteries, fatiguing on the abdominal aorta and the iliac arteries, it is impossible on all the arteries of the splanchnic cavities: it is only upon the limbs, neck, and head, that it is generally easy and certain; it is effected by means of the fingers of an assistant, by a pelote, the garrot, the tourniquet, or some other compressor.

A. *Circular Compression.*—To obtain compression, the circular mode was for a long time in use. It was the means adopted by

Avicenna, and by the Greeks, and which Paré also continued to practise. Some, however, among the ancients, employed temporary hæmostatic expedients of a more efficacious kind; it appears, in fact, that Archigenes encircled the whole thickness of the limb with a ligature, which he thus applied directly upon the artery.

B. *Garrot.*—The circular bandage was gradually perfected in the hands of the French surgeons. They commenced by separating it from the course of the vessels, by the aid of a square compress of linen of greater or less thickness. In 1674 Morel changed it into a true garrot. This garrot, successively modified by Nuck, Verduc, and La Vauguyon, is still in use at present. To prevent the skin from being pinched, to diminish as much as possible compression on the points of the limb that do not correspond to the artery, there is previously placed on this last a compress of many thicknesses. A piece of pasteboard, horn, or leather, slightly concave, is moreover applied on the point opposite, in order to support the small stick (*batonnet*) of the garrot.

C. *The Tourniquet*, invented by J. L. Petit, towards the beginning of the last century, and of which different modifications have been proposed in England and Germany, has rendered the employment of the garrot much more rare than formerly. The instrument of Petit, in fact, is so arranged, that it acts with a certain force only on the course of the vessels that we wish to compress. Once applied, it may afterwards be left to itself; while the garrot has need of being watched or supported by an assistant to the end of the operation. When we have at our disposal only a small number of assistants, or when these are not sufficiently instructed, as in the country and in the army, for example, or when unlooked-for circumstances render indispensable some great operation, the garrot, being an instrument that we can make on the spot and anywhere, forms a valuable resource. The tourniquet of Petit would be still more advantageous if we could procure it; but in every other case, it is on the hand of the assistant that we must rely.

D. *Bridle*, (*bride.*)—An easy and sufficiently safe mode of compressing an artery, when we have at our disposal intelligent assistants, consists in placing on a rolled band (*globe de bandes*) or any other solid pelote previously adjusted upon the track of the vessels, the middle portion of a bandage, whose two extremities are brought together on the opposite side, in the same way as with the garrot. The two middle fingers, passed under the knot of the bandage thus arranged, while the thumb and other fingers rest on the two halves of the bandage, as on the sides of a bridle, give the assistant the power of augmenting, diminishing, or varying the compression of the artery, without the least fatigue, and without incommoding the neighboring parts.

E. The *naked hand*, however, is most frequently quite sufficient; in this case we apply the pulp of the four fingers on the artery, while the thumb takes a point of support on the other side. We may also effect the compression with the thumb itself. In that case it is well to place the last phalanx of the thumb crosswise on

the course of the vessel; fixing then the thumb or fingers of the other hand perpendicularly upon this, we may, in acting sometimes with the first thumb, sometimes with the second, compress for a very long time without being fatigued. The same rule is applicable to the fingers.

F. When the artery lies very deep, we make use of a sort of bureau seal, padded, in form of a pelote. With this instrument we cause less pain, and do not interfere with the retraction of the muscles, or the movements of the operator.

G. In certain cases a still more secure method may become indispensable. We lay bare the artery at a certain distance from the place where the operation is to be performed, and apply a ligature to it.

Whatever may be the method that we prefer, it is nevertheless indispensable to confide this part of the operation to an assistant that can be relied upon, and one of acknowledged coolness. It is evident, also, that this assistant must be possessed of certain physical strength, be of tall stature, and have great composure; that he ought to be thoroughly acquainted with the anatomical relations of the artery to be compressed, and should understand all the steps of the operation.

The great operations thus require the compression of the artery between the heart and the seat of the disease. Also, it is laid down as a rule, that they are not to be undertaken until we are assured beforehand of the course of the blood above the part. This rule, however, has many exceptions. Every time, for example, that the operation does not of itself require the opening of large arteries, as in the operation of aneurism by the modern methods, and the extirpation of most tumors, we may dispense with this precaution. We disregard it, also, when the section of the principal vessel is not to take place until towards the end of the operation, as may be the case, we will suppose, in amputation at the shoulder-joint; so that the law of which I have just spoken has full application only to amputations in the body of the limb, and in the operation of aneurism by opening the sac.

§ III. *To Prevent Pain.*

It has long been a subject of research to discover a method of performing operations without causing suffering to the patient. Theodore, and many after him, recommended placing under the nose a sponge impregnated with opium, with water of night-shade, henbane, and lettuce, in order to induce the patient to sleep, to be awakened afterwards by applying in the same manner a sponge wet with vinegar, or introducing into his nostrils or ears the juice of the fennel or of rue.

[If any efficacy could be derived from such applications, or if the plan still sometimes advocated of blunting the sensibilities of the nervous system by morphine were not of doubtful utility, from its impeding afterwards a full and healthy reaction, then the

anodyne effects of opium might be introduced into the system in the manner which is now believed to be the most gentle and innocuous,—we mean that practised by the Chinese of inhaling the fumes of opium into the lungs, which, according to the recent experience of some British surgeons at Hong-kong, during the expedition just closed, appeared to them to be eminently the best mode of administering this medicament. Some more recent marvellous accounts of putting the patient in a profound state of sleep, or trance, by what is called Mesmerization or animal magnetism, and then amputating or performing other severe operations without the subject indicating the slightest twinge of a muscular fibre, or the faintest expression of complaint, need confirmation. And were there truth in Mesmerism, it could even, by the confession of those who produce it, be but of very partial application. And we have still to recur to the objection of narcotics of every kind that diminish nervous excitability, and thus throw the system, as it were, off its guard, and therefore render it less capable of rallying after the operation, when all its energies are demanded. Thus it is that *small-pox*, before vaccination was introduced, was observed to be always more fatal when taken in the natural way, where, as Sir Gilbert Blane has remarked, the virus was unconsciously imbibed into the system, than where communicated artificially by inoculation, when the will and consciousness, being prepared for the shock, resist, as it were, its full effect on the constitution. The remark of M. Velpeau (*supra*) on the bad effect of foolhardiness in patients on the operating table, is in unison with these views.—T.]

Others limited themselves, from the time of Guy de Chauliac, as Sassard (*Journal de Physique*, 1781) and others have done since, to the prescription of opium. For a long time it was thought we could succeed better by applying a strap tied tight above the place where the parts were to be divided. M. Liegard has shown (*Melanges de Méd. et de Chir.*, p. 350, Caen, 1837, in 8vo) that this practice, so much extolled by Juvet, is not to be despised in some cases. It is preferable, in my opinion, to the compression of the nervous trunks towards the root of the limb, as advised by J. Moore, (*Ancien Journal de Méd.*, t. lxv., p. 306) and B. Bell, (*Cours de Chir.*, t. vi., p. 61.) Recurring back to the usage of the ancients, M. Hirckman has recently maintained that we may perform the most extensive operations without causing pain, if we make the patient respire a certain quantity of stupifying gas. [See our preceding note.—T.]

Nor has magnetism been forgotten. All the journals have rung with the account of an extirpation of the breast without the patient being conscious of it. It is also known that a woman who was in a magnetic sleep underwent, without awaking, the extraction of a molar tooth. But every thing leads to the belief that in such cases the operators must have been deceived by the insensibility or the chicanery of the patients, or by some confederate.

The Earl of Mansfield caused an arm to be amputated under a blast of trumpets. La Peyronie, whose leg was to be amputated,

himself arranged on his bed the apparatus and instruments that were necessary. A peasant even amputated his own limb with a coarse saw, according to Scharschmidt. M. Champion speaks of two women and of some men, who exhibited the same calm and the same resignation. I have amputated the thigh of three patients, who did not utter the slightest cry during the operation. A robust man, otherwise very susceptible, chatted tranquilly with the assistants while I was removing from him a large-sized sarcocele, without his manifesting the least sign of pain.

To avoid pain in operations, is a chimera that we can no longer pursue in our time. A cutting instrument and pain in operative surgery, are two words which are never presented separately to the mind of the patient, but in an association which he must of necessity admit. The efforts of the surgeon ought then to be confined to the point of rendering the pain of operations as little acute as possible, without diminishing the certainty of the principal result. The pretension of some writers, who believe they attain this end in not using the bistoury until they have dipped it in oil, does not appear to me to have any foundation. The oil, in attaching itself to the porosities of the wound, would, in fact, have the inconvenience of obstructing the circulation of the fluids, the exudation of the plastic matters, and the agglutination of the bleeding surfaces. Cerate, succeeding to washing, would be much better if any fatty substance whatever could be of utility. We cannot deny, that the instrument dipped into hot water, as M. Richerand advises, or brought in some other way to the temperature of the body, or even above it, as M. Guillot wishes, gives less pain to the patient. But in the result the difference is not sufficiently important; the precaution would be too troublesome to introduce into general practice. It is not to such accessories, but to the hand of the operator and the qualities of the bistoury, that we must look to obtain the desired result. Let the hand be light and steady, and the bistoury smooth and well sharpened, and give with the first stroke the whole length and depth that the incision should have, if you can do so without danger; then act with promptitude and without hesitation, and give to the wound rather a little more than less extent, without uselessly prolonging it, and you will have no other pains to encounter than those which are inherent in the operation, and which nothing can separate from it. Longer details on this subject would be entirely superfluous.

§ IV.—*Accidents.*

The principal accidents which may take place during an operation are hemorrhage, convulsions, syncopes, and the entrance of air into the veins.

A. *Hemorrhage.*

The issue of blood from the divided vessels during operations becomes an accident only when it has not been foreseen, or when it is more abundant and more difficult to check than we expected. In feeble subjects it is of a nature to give immediate cause for real danger. Sometimes it is owing to the tourniquet, the garrot, or the fingers of the assistant having been displaced. Sometimes, also, it arises from our wounding vessels that we had hoped to avoid, from its having been impossible to retain the patient in the position that we had given him. The blood in such cases comes either from the veins or the arteries, and oozes out or forms a jet.

I. *Venous hemorrhage* in these cases presents two aspects, according as the vessel is cut through, or only upon the side. In this last, we stop the blood by the application of the finger, a ball of lint, or small masses of sponge or agaric upon the wound, or by surrounding with a thread the circumference of the wound, whose lips have been previously seized by the forceps.

If the blood runs from the gaping extremity of a vein, it is almost always owing to the central circulation being more or less impeded. The accident is owing then sometimes to the circular strangulation of the part, sometimes solely to the mere compression of the large vascular trunks above the wound, which last compression, acting on the veins, hinders the blood from proceeding on its course to the heart, and forces it to flow backwards and out of the vein. At other times the obstruction is owing to the patient violently contracting the muscles of the chest, and to his impeding as much as is in his power his natural respiration. The remedy for this kind of hemorrhage, which is more frequent after than during an operation, is to remove all pressure on the course of the veins, and to induce the patient to respire freely, and not to restrict, but even to multiply his inspirations.

II. Though the hemorrhage may in reality be *arterial*, even when the blood oozes out, it is unnecessary to occupy ourselves with it, unless the patient is very much weakened. In this case we arrest the bloody exudation by means of pieces of agaric or sponge, and then hasten on to finish the operation. If the blood escapes in jets, we effect compression by the fingers, by torsion, or by the ligature.

Before considering direct compression or the ligature, it is necessary to see that the hæmostatic means have not been disturbed. If the tourniquet, the garrot, the pelote, or the hand of the assistant have been previously applied on the principal trunk of the artery, the hemorrhage is evidently caused by these having been displaced, and the first thing to do is to replace them in a proper manner. In the event that this precaution is not sufficient, or cannot be adopted, from the operation being of a nature that does not admit of these means, we must then recur to one of the modes already pointed out.

a. *Application of the fingers.*--In having recourse immediately to

the ligature or to torsion, the surgeon is obliged to suspend the operation at every cut he makes with the bistoury. If, on the contrary, he can avail himself of intelligent assistants, he may continue on without hinderance to the end, in directing them to place the pulp of the finger on each artery he opens. Unfortunately, the fingers employed in this way sometimes interfere considerably with the manipulations of the operator ; and there are so many of these required in certain operations, that we cannot have recourse to this expedient. In proceeding thus, we arrest, it is true, the hemorrhage on the spot ; but we crowd the blood more or less into the vascular branches in the tissues, and render their separation afterwards very difficult. Nevertheless, it is a kind of resource which I prefer, when there is but a small number of arteries to close, and when the whole operation is not to be of long continuance. In the other cases, I prefer torsion or the ligature.

b. *Torsion.*—To twist the arteries in proportion as we cut them in operations, is neither difficult nor an affair that requires much time ; but in treating of torsion, we must take into consideration all the good or evil that has been attributed to it, and of that we shall speak further on.

c. *The Ligature*, at last, is that which offers the most security and advantages, unless it be in respect to wounds, of which it is our intention to undertake the complete and immediate union. Those surgeons who, like J. L. Petit and some moderns, wish that the small arteries should be closed by the fingers of an assistant in proportion as they are opened, have principally in view the completion of the operation as quickly as possible, and of thus effectually putting an end to the hemorrhage. Those who prefer tying the arteries in proportion as they present themselves, know well that they render the operation longer, because at each moment it is necessary to stop for each new ligature, and that sometimes we are obliged to use a great number of them ; but they add, that we are thus sure of letting no important artery escape ; that we are better protected from consecutive hemorrhages ; and that we have no difficulty in finding the wounded vessel : in fact, that the amount of the pain is not thereby increased, and that the whole operation is thus made more regular and complete. It is, in fact, what in reality exists ; and if we apprehend that we shall not afterwards find the vessels whose hemorrhage we dread, or that we shall be obliged to open a great number of them, or if we have no particular motive for proceeding with great rapidity in our manipulating movements, this method is without contradiction the most advantageous to the patient, and that which offers the greatest security to the surgeon.

B. *Nervous Accidents.*

I. Certain patients, during operations, experience swoonings or syncopes, which alarm all the assistants, and may also disquiet the surgeon. These accidents happen sometimes from exaggerated

fears. We prevent them in this case by the aid of reasoning and of moral means, in order to inspire the patient with courage, by demonstrating to him, as well as we can, that he is deceived, and that he is exposed to no danger. If the pain is the cause of it, as happens with persons who are nervous or very susceptible, especially with inhabitants of the south, we have no other means of remedying it, but by operating as rapidly as possible, and with instruments that are perfectly keen. It is on such patients that the employment of narcotics, the benumbing the parts by means of compression, the immersion of the bistoury in hot water, and even magnetic influences, may offer some benefit. (*Vide* a note above on magnetism, &c.—T.)

Faintings and swoonings, from hemorrhage, are to be apprehended in patients already enfeebled, and in those in whom every loss of blood, however inconsiderable, produces this result. In these cases the preventive means are found in the previous and perfect compression of the arteries, and in the employment of the fingers or of the ligature, as has already just been said.

Though the accidents of which we speak are such as rarely disturb us seriously, they nevertheless require to be remedied as soon as possible. The first thing to do in such a case is to give free and easy access to the air about the patient, to open the windows, and remove from about the bed all the assistants that are not indispensable. If the operation is far advanced, we terminate it rapidly; and then give to the patient a position perfectly horizontal, and even more or less lowering the head. This position of itself alone is capable of preventing the syncopes, and causing them quickly to disappear, by returning the blood upon the brain. Moreover, we shake him, and push him about the chest, and slap him on the face, the temples, or the neck, but, better still, throw cold water upon his face. Cologne water, brandy, ammonia, and vinegar, placed under the nose, or applied by friction on the temples, forehead, and region of the heart, ought to be combined with the foregoing means, whether as preventive or curative remedies. As to the rest, every person is too familiar with the remedies for fainting and swooning to make it necessary for me to say any thing more on the subject. If, nevertheless, the syncope should resist and continue for too long a time, and that the operation should also be necessarily protracted, it would be advisable to lay the bistoury aside and return to it afterwards, rather than to persist, especially if the operation should of itself be one of a dangerous nature.

II. *Convulsions.*—The convulsions which happen in the course of some operations, are generally ascribable to the same causes as the syncope; so also do we employ the same means to prevent and overcome them. Convulsions, however, being, more than syncope under the influence of pain and of fear, demand also more frequently the suspension of the operation. If, then, it concerns an operation that must be long, and which is at the same time of a grave character, and that the convulsions have interfered with our progress from the very beginning, it is far better not to continue,

but to replace the patient on the bed, and wait until his feelings and his courage are in a better condition.

III. *Operations at two times*, (*Opérations en deux temps.*)—Those operations that we desist from to resume at another time, have received the name of *Opérations en deux temps;* and should be divided, in this point of view, into those of necessity and those of choice.

The first are not performed at two different times by the surgeon but from necessity, and in consequence of particular accidents; others are completed on two different occasions, because particular reasons, known beforehand to the operator, give the preference to this method. It is thus that some surgeons still act with respect to the double hare-lip; as others formerly did in lithotomy by the perineum, and as a certain number of moderns now propose for the hypogastric incision for that operation. As for myself, I never determine upon operating at two different times, unless it is impossible for me to do otherwise without real danger to the patient. As a method of choice, this kind of operation appears to me to be essentially pernicious.

[Dr. Mott remarks, that he totally disapproves of, and does not recognise, any rule in surgery, by which an operation, which is a unit, or an entire, and a whole in itself, should be directed to be performed at two different times; or in other words by *halves*. He himself, in his very extensive and varied practice, has never done it, in any one instance. If reference be had in the above expression, *en deux temps*, to certain complex operations, or complications in which parts are involved that require distinct operations in themselves, then there are certainly cases, and even these are rare, in which an intermission of a day or more may intervene between the execution of one portion of the duty of the surgeon, or one of the preliminary steps he is obliged to take, and the final processes which are to complete the work before him. Thus, in the case of a child of three months old, with complicated hare-lip, where there is a bony hook, or proboscis, of an inch or more in length, that grows from, or rather is a prolongation of, the septum narium, (as it often happens, also, from one side of the fissure of the jaw,) such may be the extent of the hemorrhage after the preliminary removal of that excrescence, which may, in most cases, be most effectually and conveniently accomplished by a blunt-pointed scissors, of strong and short thick branches, that the hot iron or other means become necessary to arrest it, and a delay of a day or two is demanded, to give the infant time to recover itself for the completion of the operation upon the hare-lip itself, whether that be single or double. Though it is to be remarked, *en passant*, that there is no operation in surgery, apparently, so formidable, (and which may so frequently be made so, in reality, by want of delicate and adroit manipulation in the operator, as this of hare-lip in infants, in all its forms,) that cures with such rapidity, and so perfectly, by first intention, or that evinces such irresistible recuperative energies in the system. In two cases only of the numerous hare-lips

operated upon by Dr. Mott, and one of them was of the nature of the one just described, was it found necessary to wait the interval of several days after the removal of the proboscis, before the operation for the hare-lip proper, which was of a most complicated character and of the double variety, was undertaken. Another case in which such double duty was required, was one in which, for the first time, Dr. Mott tied the carotid artery, many years since, for the removal of a large osteo-sarcoma of the lower jaw. As it was the first occasion upon which he was to operate in that *class* of important jaw operations, as projected and established by him, and the first time, also, in which he had ever had occasion to tie the carotid in an operation of that kind, he naturally felt disposed to adopt every possible precaution. He, therefore, reflected with himself whether in such cases it would not be sometimes advisable, both for the purpose of cutting off hemorrhage and consecutive inflammation, to tie the *primitive* carotid before proceeding to the removal of the tumor. And we believe the credit of first making this suggestion is due to Dr. M. Accordingly, the patient being a young lady, who, but for this most unpleasant deformity, was extremely comely, (as the restoration of the natural form and contour of her face after the cure fully testified,) the carotid was on the first day tied with facility without the slightest untoward symptom following. On the succeeding day, finding her in a state so exceedingly comfortable and favorable, and in such good spirits and strength, he determined at once upon the removal of the osteo-sarcoma, and was astonished to find, that throughout the extensive incision and the section of the side of the jaw containing the tumor, and which was made in two places, to wit, near the symphisis of the chin, and then at the bifurcation of the processes of the lower jaw near the angle, there was, so to speak, scarcely a table-spoonful of blood from the vessels, and the cure afterwards was directly and speedily effected by the first intention. The advantage of removing the jaw so soon after tying the carotid lay in this: that hemorrhage was, in a measure, totally cut off, and the consecutive constitutional inflammatory reaction, both for the operation on the carotid and that for the osteo-sarcoma, were both anticipated, as it were, by the direct adhesive inflammation in the parts themselves, all those important results being imputable to the fact that there had not been time in the interval of the twenty-four hours for anastomosing arterial connections to be established. Dr. Mott was only induced to defer the operation for the osteo-sarcoma, because of the anxious state of the mind of the patient, after he had tied the carotid, she knowing, as Dr. M. told her, that the removal of the jaw was a *new and untried operation*. These are the only two instances in which Dr. Mott has ever performed upon a patient operations which, by any latitude of construction, could be deemed to accord with the phrase *en deux temps*, or two stages; and as a general rule, except in the event of *double operations* being required, as in the cases above mentioned, he totally disapproves of and proscribes the practice in all cases to which it may be supposed to be

applicable, that is, the practice of commencing with an operation, and then, from apprehensions (generally not well grounded) of dangerous consequences, leaving off in the very inception or middle of them, and afterwards, recommencing and completing them at the expiration of an interval of some days. Yet there may be, as he thinks, some rare exceptions, as in great exhaustion from hemorrhage, to these remarks; as, for example, in some large and extremely vascular tumors of the scalp.—T.]

C. *Entrance of Air into the Veins.*

The introduction or development of air in the vessels of man or animals during life, recognised during the last two centuries by a certain number of pathologists, whose observations are referred to by Morgagni, had, almost for the last twenty years, been entirely forgotten. It was even necessary for an unfortunate event to occur in the practice of a celebrated surgeon, to draw attention to this grave subject, and to persuade persons to believe that air entering into the veins could cause death during an operation.

We knew by the experience of Bichat, as well as by the physiologists of the seventeenth and the eighteenth centuries, that animals could be killed by introducing atmospheric air into the heart. After having multiplied and varied his experiments almost to infinity, Nysten, in 1809, concluded that air injected into the veins, *in a certain quantity*, caused death, but he maintained, also, as Langrish had already done, in 1746, that this is caused by its arresting the movements of the heart, and not by destroying the functions of the brain, as Bichat had believed.

More recently, the experiments of Barry, which I myself witnessed, and especially those of M. Poiseuille, which I also attended, showed, as did those of M. Magendie, not only that the air, when forced artificially into the heart, speedily caused death, but also that this gas may spontaneously introduce itself into veins that have been previously opened. We must, however, add, that the observations of M. Poiseuille scarcely admit the *possibility* of this phenomenon but in veins subject to the *venous pulsation*, or in which is observed an actual reflux of blood during life, that is, in those large veins which extend for some inches beyond the apex of the chest. Beyond that, in fact, the expansion either of the heart or the thorax appears to have no influence on the column of blood. Atmospheric pressure, by immediately flattening the calibre of the vessel between the opening of the vein and the apex of the chest, seems to present an insurmountable obstacle to the admission of air in the direction of the heart.

It remained to ascertain why the blood may thus flow back to a certain distance, and not to some inches beyond. M. Bérard the elder undertook this inquiry. Anatomical examination and an attentive dissection of the parts demonstrated to him, as I also have often been enabled myself to confirm, that the internal jugular, subclavian, and axillary veins are naturally united to the bones

or to the muscles of the neighborhood, by fibrous plates or bridles, so solid, that when those veins are opened they remain gaping after the manner of inert canals: from whence it follows, that up to two or three inches above the sternum, that is to say, to near the larynx, the internal jugular vein is not flattened under atmospheric pressure when the blood ceases to fill it, and that it is the same with the subclavian vein throughout its whole length, and also with the upper half of the axillary.

By recent experiments, we have seen that dogs of different sizes, horses, and mules, that have received air into the veins, either by injection or inflation, almost always die at the end of from five to forty or fifty minutes, when there had been introduced a considerable quantity of this gas into the heart. To effect this, however, it was necessary for the opening in the vessel to be from two to six lines in diameter, to be kept gaping open, and also to be made in the regions indicated by MM. Poiseuille and Bérard. We have also seen that the introduction of air was announced by a dull sound, generally perceptible, sometimes nearly inappreciable, being in the horse a sort of gurgle, (*glougou*,) and not a hissing (*sifflement*) or whizzing, (*reniflement*,) as some persons have said. Agitation, convulsive movements, and epileptic-like attacks, soon announced the danger and formed the common preludes of death. The autopsy of the dead body disclosed the distension of the right auricle and ventricle of the heart, the presence in the cavities of this organ of a red blood mingled with a great quantity of air, and perfectly frothy, that is, "a sanguineous froth," (*mousse sanguine*,) as already observed by Magendie. In some cases the same state of things was seen in the left cavities of the heart, and also air was detected even in the vessels of the brain. As to the rest, the opening of the jugular veins on the side of the face, or of the axillary vein in its lower portion, and, *a fortiori*, the brachial veins, were not followed by any accident.

In fine, these experiments, demanded by the Academy of Medicine, in 1837, and made in presence of a commission, of which I formed one, by M. Amussat on one side, and M. Barthelemy on the other, show, as the ancients did, that air *can*, by the opening of a vein, be introduced spontaneously into the heart, and destroy the animal; provided this aperture shall have at least two lines of diameter, that it shall exist near the apex of the chest, and that it shall allow to enter from ten to forty cubic *centimetres* of air into the circulatory system of the wounded individual. Let us now see to what point the observations made upon the human species are analogous to the facts derived from animals.

Surgical practice had long since afforded instances of almost immediate death in the course of certain operations; but these accidents had been attributed sometimes to hemorrhage, sometimes to the exhaustion of the patient by excess of pain, sometimes to fright, and sometimes to syncope. For my own part, I know that many patients have succumbed in a few minutes, while removing from them a degenerate thyroid gland, a tumor at the bottom of the ax-

illa, or in the simple operation of tracheotomy; and that no other explanation has been sought after than those I have just given. Not satisfied with these reasons, and availing themselves of the experiments of physiologists on animals, modern surgeons have called to their aid the entrance of air into the veins to account for cases of unexpected death happening in the course of an operation. The facts of this kind that have come to my knowledge are about forty in number. I have given the analysis of them in a special paper. (*Lettre sur l'Introduction de l'Air*, etc., Paris, 1838; et *Gaz. Méd. de Paris*, Mars, 1838.)

We may divide them into four groups; one for facts of trivial importance, the second for those where death has not ensued, a third for cases followed by death but without an autopsy, and the fourth for those with autopsy.

1. *Rejected Cases.* I arrange among trivial facts such as rest only on hearsay evidence. They are five in number. Such are those of MM. Graefe, Cooper, Lodge, Stevens, (Cornack, *Inaug. Dissert.*, etc., Edinb., 1837,) and Duportail. Every thing indicates, in truth, that these cases had no existence, or that they have arisen only from some erroneous statement.

2. *Cases not followed by death.* Sixteen of the observations that have come to my knowledge, showing that the patients have been at first restored, seem at least to prove that they did not die from the effects of the first accidents. These cases are those of Simmonds, 1; MM. Mott, 1; Clemot, 2; Barlow, 1; Warren, 1; Roux, 1; Mirault, 1; Rigaud, 1; Delaporte, 1; Dubourg, 1; Malgaigne, 1; Begin, 1; Toulmouche, 1; Amussat, 1; and one of my own; total, 16.

These observations differ much in importance. Those of M. Rigaud, of M. Malgaigne, and of M. Mott, show only a wound of the external jugular vein. Those of MM. Amussat and Toulmouche relate only to the mammary veins. In the case of M. Barlow, and in some of those of M. Clemot, it seems that the wound had nothing to do with the veins, neither with the axillary nor the internal jugular.

There remain, then, only those of Simmonds, (*Med. Facts and Obs.*, vol. viii., p. 23,) MM. Roux, Warren, Begin, Delaporte, Dubourg, Mirault, and my own, with one of those of M. Clemot, which permit us to allow the fact to be *possible*, according to the region and the part of the veins wounded.

3. *Cases followed by death, without autopsy.* The cases followed by death, but which have not been accompanied by a post-mortem examination, are six in number, and are authenticated by the names of MM. Warren, 1; Clemot, 1; Barlow, 1; Goulard, 1; Klein, 1; and Maugeis, 1; total, 6.

In these six cases, we perceive that the wound was on a vein not well ascertained in the case of M. Clemot, probably on the internal jugular in that of M. Barlow, the thyroid plexus in that of Klein, and a sub-scapulary branch in that of M. Warren. M. Duplat says positively that it was the axillary in the case which he

attributes to M. Goulard. The median vein in the fold of the arm was the only one opened in the case of M. Maugeis. This simple enumeration shows the uncertainty which must remain in the mind with such facts before us.

4. *Cases followed by death, and in which there was an autopsy.* In this last group I find seven observations. They are those of M. Piedagnel, 1 ; of Dupuytren, 1 ; of Delpech, 1 ; of MM. Castara, 1 ; Ulrich, 1 ; Roux, 1 ; and Putegnat, 1 ; total, 7. That of M. Putegnat, being given without any detail and on the authority of a third person, ought, I think, to be laid aside. M. Piedagnel says that it was the external jugular vein which was wounded in a patient of Beauchêne. This practitioner has also told me that in the case of Dupuytren, the tumor occupied the posterior and right lateral region of the neck. It is not possible, therefore, that it was either the internal jugular or subclavian which was wounded. In the case of M. Roux and that of Delpech, the operation was the amputation at the shoulder-joint, and veins other than the axillary vein, had alone been wounded when the accidents took place. M. Saucerotte says, that in the patient of M. Castara it was, like that of M. Warren, a subscapulary vein which had been opened, and that to the extent of at least a line. The case of M. Ulrich is then the only one which accords with the region where, after our experiments upon animals, the introduction of air into the veins may occur and prove dangerous.

If now we take a survey of the whole question, we are in some measure forced to admit the following conclusion: Either the experiments which have hitherto been made on living animals are incomplete and delusive, or the cases of introduction of air into the veins of man are not conclusive. In viewing it with the greatest impartiality, I see, in fact, 1. That from direct experiments, a large quantity of air is necessary to destroy a dog : that this gas is not introduced spontaneously into the heart, but by means of sufficiently large openings into the jugular, subclavian, or axillary vein ; that the right cavities of the heart are then always distended, by a matter of a red color, and frothy, and evidently made up of the intimate mixture of the air with the blood. 2. On the other hand, the facts collected in reference to man, show that many of them relate to the veins of the breast or shoulder, the external jugular, or the veins of the face. In the others, the opening of the vein was small, and there could not enter but a small quantity of air. In fine, autopsy does not disclose in any of them, what direct experiment has permitted us to establish.

It is not my province to refute, in this place, the language of those who, without doubt, through inadvertence, have always either in the course of our experiments, or during the debate in the academy, which resulted from them, travelled out of the limits of the subject under discussion, and who have always reasoned, as if myself and many others had ever denied the possibility and the dangers of the entrance of air into the veins. Without seeking for the motives which could have induced some of our brethren

constantly to fall into this pernicious habit, it is sufficient for me to refer to the account of the discussions in the academy, to show the falsity of such reasoning. (*Bulletin de l'Académie Royale de Médecine*, Paris, 1837 et 1838, tom. i. et ii.)

May it not be said, then, that all the observations collected upon the human species, have in them something strange and altogether unusual? If it is true that patients may die of syncope, of hemorrhage, of fright, and of exhaustion during the performance of certain severe operations, then is it also true, that life may be extinguished with another order of symptoms than those that have been related. If we take away from the catalogue which I have given, the cases of Klein, of MM. Duportail, Lodge, Cooper, Dubourg, and Maugeis, which are utterly of no importance, or which are satisfactorily explained without the intervention of air into the veins, it will prove difficult to withhold the same explanation for the others. In supposing, that in the cases related by MM. Rigaud, Clemot, Begin, Malgaigne, and in that of mine, the jet of a small artery against some of the organic tissues, or the introduction of air into some of the sinuous *culs de sac*, may have assumed a resemblance to the hissing, gurgling, or bubbling (*bouillonnement*) mentioned by the narrators, it is almost impossible not to concede something more in the facts of MM. Piedagnel, Dupuytren, Castara, Delpech, Ulrich, Barlow, Warren, and Goulard.

In this state of uncertainty, may it not be asked, if, at the moment of operating upon a man, the veins, being kept pervious (*canalisées*) by the nature even of the tumor, or by the tractions exerted upon it, might not have been temporarily put in the state in which we find that those of the apex of the chest naturally are in living animals? By means of this interpretation, however, we could not include in the group of facts that are *very probable*, any but those of MM. Goulard, Piedagnel, Dupuytren, Castara, Delpech, Warren, and Mirault. It appears evident to me that nothing had effected this change in the cases of MM. Rigaud, Amussat, Toulmouche, Mott, and Malgaigne.

Could we not also call to our aid the previous *debility* of *the patients?* Every thing shows, although our direct experiments still present some doubts on this point, that the loss of a great quantity of blood must render the admission of air into the veins more dangerous. But in analyzing the facts, we see that, apart from those of M. de Piedagnel, of M. Roux and of Klein, all the patients were still strong; that most of them, moreover, enjoyed perfect health, and that they had scarcely lost over a few ounces of blood at the moment when the accidents happened.

If we do not wish to abandon this comparison, there remains only one other resource: it is to admit, that whether under a physical, or a physiological, or pathological point of view, the conditions upon which air enters the veins present marked differences in the human species and in animals. We may look upon these differences as possible, when we consider that air in the veins destroys

the horse more quickly than the dog; that under the influence of this gas, death is more rapid when we hold the animal in one position rather than in another; that by means of the air blown in by the mouth we kill sometimes with the velocity of lightning, whilst, with a syringe, a long interval of time is required to produce the same result.

I will, nevertheless, admit, that none of these reasonings are conclusive, and that there is nothing in them which places the accuracy of what has been said in favor of the introduction of air into the veins of man, beyond dispute.

To express frankly my opinion, I consider the introduction of air into the veins of men to have been *probable* in the patients of Simmonds, MM. Begin, Malgaigne, Mirault, Warren, Barlow, Delaporte, one of those of M. Clemot, the first case that M. Roux speaks of, and my own. *Nothing proves* that the accident took place in the cases of MM. Toulmouche, Mott, the second and third of M. Clemot, and those of MM. Rigaud, Dubourg, Maugeis, and Amussat. It was, in my opinion, *extremely probable* in the case of Delpech, and in that of M. Ulrich, and I think it *almost certain* in the cases of Dupuytren, and of MM. Castara and Goulard.

Thus, without denying the possibility of this phenomenon, when the veins form canals that open in the chest, I am of opinion that new experiments are indispensable to resolve this question definitively. If the fact is true of man, we must seek another physical explanation than that which has been given by MM. Poiseuille and Bérard; for there have certainly been seen elsewhere than in the neck and axilla, phenomena similar to those which seem to denote the introduction of air into the veins.

Treatment.—In all scientific discussions, there is a rock that we should do all in our power to avoid, viz.: that of adopting an opinion too hastily, and of coming to a conclusion too positively, in spite of the absence of proofs, either for or against; without protecting ourselves always, at any sacrifice, in doubtful questions, with the saving clause, *I know nothing of it*, which is so often the substance of our knowledge or of our answers. Because the facts hitherto adduced in favor of the introduction of air into the veins are incomplete, we should be wrong, for example, to conclude from thence that the accident itself has never existed. As for myself, I repeat, that this kind of accident appears to me to have been many times met with; only I feel that until there are proofs more conclusive, this opinion cannot be any thing but a personal belief, and that science possesses nothing at the present day which can change this belief into a fixed and general *conviction*.

With this idea, I have thought it due to consider, as so many others have done, the means that we may use to meet the dangers attributed to the introduction of air into the veins. Our intentions should be confined here to two kinds of remedies, viz., *preventive* and *curative*.

Preventive means.—An important difficulty will for a long time render doubtful the efficacy of the attempts that it might be possible to make to prevent the admission of air into the veins of a person

during operations. This difficulty is, that no one can tell beforehand, whether, on the supposition of opening such or such a vein, the phenomena will or will not take place. I have, myself, more than fifty times extirpated submaxillary, parotid, axillary, supra-clavicular, or supra-sternal tumors, which have placed me under the necessity of approaching very near the large veins of those regions, and often even of opening them. It is nevertheless true, when I say, that the case of which I have given an extract, and that of the young boy, are the only ones which have for a moment alarmed me under the impression that air was introduced into the veins. I will add, that, while serving as assistant to M. Roux, I have seen this surgeon open freely the upper part of the subclavian vein in one case, the superior portion of the axillary in another, and the inferior portion of the internal jugular in a third, without any thing resulting therefrom that could be referred to the introduction of air. When we reflect upon the number of amputations that have been made at the shoulder-joint, the frequency of operations that have been performed in the axilla for cancerous or lymphatic tumors, and the numerous cases of ligatures upon the arteries in the supra-clavicular and carotid regions, without being followed by any result similar to that which air produces when carried into the heart, we are forced to admit that the accident in question cannot, at least, take place but seldom. How then can we become certain, if it has not taken place in any given operation, that we are to impute this exemption to the precautions employed, rather than to the natural resistance of the organs.

We thus see clearly, that in order to solve this question of preventive means, as for all the others, it will be necessary to have further and repeated experiments. Let us, however, examine those which appear to have hitherto claimed attention.

The *compression of the thorax*, during the entire continuance of the operation, does not appear to me proper, neither theoretically nor from the experiments already made. If the compression were sufficiently powerful in the human species wholly to prevent the elevation of the ribs, the patient would obviously experience from it great inconvenience, if it did not in fact become insupportable. Besides, the chest would not the less enlarge itself in its vertical diameter by the depression of the diaphragm. Moreover, it is not yet demonstrated that the dilatation of the heart has any part in the inhalation of the air.

Reasoning upon the supposition that inspiration alone could draw the air into the heart, M. Poiseuille thought it would suffice, to prevent this accident, if we charged the patient carefully to avoid any thing like a full inspiration. But experience has long shown surgeons, that during serious operations, the chest of the patient is generally kept contracted in a spasmodic manner; that respiration is retarded and made by small movements, and that we are rather obliged to urge the patient to make full inspirations than to prohibit him from doing so, provided we guard against the venous circulation being thereby too much obstructed.

Compression of the veins between the heart and the wound.—When the idea of the introduction of air into the heart of man presented itself to practitioners, the first remedy which naturally offered was evidently the compression which I have named above, so natural and certain does this means seem to be. Thus M. Larrey had already remarked, in speaking of taking blood at the neck, that we must compress the vein below the puncture, and until the dressing is finished, if we would prevent the entrance of air into the heart. Dupuytren is careful to point out the same precaution while relating his case. We find a similar recommendation in the memoir of M. Barlow. M. Putegnat also gives it in his thesis. I perceive at p. 266 of the *Treatise upon Tumors*, by M. Warren, that the surgeon who operates in the neighborhood of the jugular, subclavian, axillary, or iliac veins, or even of the saphena when it is dilated, should reserve to the last the separation of the peduncle of the tumor upon that side, in order to be better enabled to compress the veins before opening them. This author adds, that, if the thing is possible, we should compress the veins between the incisions and the heart. I have believed it myself right to adopt this advice and to practise it in some cases of extirpation of parotid and submaxillary tumors. But it must be admitted that this remedy is but of little value. If, with the first observers, we could admit the possibility of the inhalation of the air at a very considerable distance from the heart, it would deserve to be taken into serious consideration. Nothing would be more easy than to put it into practice with the internal saphena, or the femoral, or iliac veins, the veins of the arm and face, and the external jugular; but if it is true that the introduction of air into any of these regions is impossible, compression, as a preventive means, becomes for that reason altogether useless. On the other hand, who does not see that for the supra-clavicular region, the upper part of the axilla, and the supra-hyoidean region, where its aid might be invoked, it is quite impracticable? Concealed by the clavicle or sternum, and separated from the ribs by the lower attachment of the scaleni muscles, the subclavian vein is so placed that nothing can obliterate the cavity of it by pressing through the skin. It is the same with the internal jugular vein below the larynx. We must also add, that the compression of this vein, in operations near the parotid region, favors the engorgement of the face, and increases the volume of all the veins that we are in danger of wounding.

After these various reasons, then, we are compelled to admit that the compression of the venous trunks between the wound and the heart is, in fact, a resource of but little importance, and rarely practicable.

It results from this examination that, in practice, we cannot count on the efficacy of any of the preventive means of which we have hitherto spoken; that we must make still further researches; and that, under this point of view, the only resources within the reach of the surgeon resolve themselves into these: First, To do every thing during an operation to avoid wounding the internal

jugular and subclavian veins: and, secondly, In the event of his being forced to penetrate to the neighborhood of these vessels, he must not separate the peduncle of the tumor without having first seized it, on the side of the heart, with two fingers, or included it in a strong ligature: third, To avoid, as much as possible, extending, pulling, or moving the parts, raising the arm, or throwing back the shoulder, or the neck, when the bistoury approaches the large vessels at the apex of the thorax.

Curative Means.—If therapeutics possesses no means which can absolutely prevent the air from entering into an open vein, it is no less humiliating to confess that it is still more powerless in the means of expelling this gas from the heart. I very much doubt if *placing the patient on the right side*, as M. Forget recommends, can be of any great efficacy.

The alternate raising and depressing of the thorax, (*compression saccadée*,) by the aid of which, Nysten thought to expel the air from the auricle through the wound of the vein, is evidently useless, at least in the human subject. Even in dogs, we cannot thus make the air contained in the right ventricle ascend; and the auricle will yield only a small portion of it. Who does not perceive that, in the human species, the thorax, infinitely less compressible than in dogs, will not admit of being sufficiently flattened to react efficaciously on the heart.

The means which first suggests itself, that is to say, the *closing of the venous wound*, a means practised in a great number of instances, presents, perhaps, as many dangers on one side, as advantages on the other. If it puts a stop to the introduction of air into the wounded vessel, it has the evil, also, of preventing the egress of that which the contractions of the heart tend to force out; so that it cannot succeed, unless, at the moment of its application, the gas is not in sufficient quantity to cause death. Inhalation by the mouth, through the opening of the vein, will scarcely ever be practicable; the plainest reflection, also, suffices to show that it could not succeed. *Artificial respiration*, whether effected by tracheotomy, or by introducing a tube through the natural air-passages, as attempted by M. Warren, could not, as it appears to me, have any object. The *introduction of a saline liquid* by some other vein, as is also recommended by that physician, could not but add to the danger that the patient is already exposed to.

There remains, then, suction with a tube or a syringe, conveyed even into the heart; but this resource, originating in experiments upon animals, ought to be, in my opinion, severely proscribed on the human subject. It is obviously clear, that the wounds of the internal jugular only would admit of its application. Who does not also see that, in order to introduce the tube, it would be necessary to put the vessel precisely in the conditions which would most favor the introduction of the air? In short, who has not felt that, during a serious operation, it is necessary first to ask if the accidents which take place, in reality depend upon this phenomenon; to seek, afterwards, for the opening of the vein; to demand of the assistants the

tube arranged for this purpose; to introduce this tube, and to apply to it the syringe or the mouth; and that all this would necessarily exact more time than is required for the patient to expire, if what has been said of the entrance of air into the heart during the course of certain operations on man is realy true?

We are then reduced, in this matter, to the means generally resorted to for syncope, unless *bleeding*, as formerly recommended, and still eulogized by MM. Boulay, Le Blanc, &c., may, in reality, have some efficacy; to place the finger upon the wound, and immediately suspend the operation, when the alleged characteristic sound has been heard; to keep the patient in a horizontal position; to stimulate him with the vapor of ammonia, alcohol, and vinegar; to use frictions on the body, and to throw water in the face; such are, at present, the only measures that reason and experience permit us to make use of, with safety. A pupil of the hospitals of Paris, M. Mercier, has made experiments which would tend to prove, that the compression of the abdominal aorta is a means of great efficacy; that in forcing the blood to mount towards the brain, it brings back to life animals that appear to be on the point of expiring; and that it is, in short, an infallible remedy; but I have not yet had an opportunity of testing the value of this method.

[*Entrance of Air into the Veins.*—In the case of Dr. Mott, above alluded to, he was then convinced, and ever has been since more and more confirmed in the belief, that the symptoms in that case were entirely ascribable to the admission or suction of air from without into the incised facial vein. And he also would embrace this occasion to add, that reflection upon the subject, and upon the facts that have been so clearly given by M. Amussat in his Report to the Paris Academy of Medicine, 1839, and by other practitioners who have witnessed this phenomenon, and also that the details of another remarkable case to which he has himself been an eye-witness, satisfies him fully in his own mind of the entire possibility of this alarming event during operations. The case of which Dr. Mott would now speak, was that of a French lady at New York, from the southern states, of middle age and tolerable health, in whom an enlargement of the *thyroid body* assumed, strange to say, the complete character of a malignant bleeding *fungus hæmatodes* of the worst description. Dr. M., not being able to bring himself to the propriety of attempting to remove so formidable a mass of disease of that nature in so unfavorable a subject, declined the operation, which, however, was undertaken by another surgeon.

The operator had proceeded but very little distance in his incisions, when it was discovered that the calibres of the venous and arterial plexuses, particularly those of the former, were, as so generally happens, enlarged to a prodigious extent, and that therefore the hemorrhage would, as it began to evince, be most profuse. At this critical moment of suspense, a *wheezing* or *whizzing* noise was suddenly heard by all present, (some twelve to twenty persons,) resembling in sound that of air quickly *rushing into a tube by suction*, and so unusual and unaccountable as to cause the late deceased

eminent professor *Dr. David Hosack*, who was present, to involuntarily exclaim, "What's the matter? Have you cut into the trachea?" This of course had not been reached or disturbed, and the remark had scarcely been uttered when the patient instantly expired. Take this one pathognomonic symptom alone of the accident, we mean the peculiar and readily recognisable and characteristic sound as of *suction of bubbling air* (as if, for example, from *frothy blood*) *suddenly rushing into the aperture of a tube*, or, as Dr. M. expresses it in the case he has published, into an *aperture in the exhausted receiver* of an air-pump; and it is quite sufficient, with the rapid fatal sinking and almost instantaneous loss of life which but too often succeeds, to show that there can be no analogy whatever found between the manifestations that take place in this phenomenon and those that are ordinarily observed during the faintings, swoonings, and prostration that are caused sometimes by profuse hemorrhage during operations, and that are thus as frequently also the immediate precursors of death. We might dwell also on another peculiar symptom which does not always exhibit itself, it is true, when air has been imbibed in the vessels, but which, when it does, is equally removed in its character from what occurs in death from exhaustion caused by hemorrhage. This symptom is, as Dr. M. has shown in the case of his own, described in his letter to M. Amussat, (see Report to the Paris Academy of Medicine, already cited, and M. Guerin's Gazette Médicale of Paris,) that of *convulsions of a most violent and peculiar nature*, where the patient threw himself on the floor, and twisted and contorted his body and limbs with spasms of the most frightful description, resembling rather the agonizing sufferings of one laboring under hydrophobia, and indicating certainly the most poignant distress, such as might arise from sudden strangulation or smothering, giving rise to the most energetic exhibitions of muscular power. A very different and opposite state, it must be confessed, from that of extreme exhaustion, prostration, syncope, and swooning from profuse hemorrhage or concussion upon the nervous system, but imbodying results which might rationally be explained by analogy, from the supposition that the introduced air had, as it is proved to do in the experiments on living animals, penetrated into the right auricle and ventricle of the heart, and thereby directly interrupted the vital functions of that organ.—T.]

§ V.—*Sang-froid of the Surgeon.*

When every thing is in order during operations, the surgeon rarely troubles himself, but many practitioners are disconcerted and lose their self-possession at the slightest untoward accident. M. Champion has instanced to me a very distinguished operator, whose sang-froid is admirable when nothing particular occurs in the course of the operations he performs, but who is embarrassed with surprising facility in presence of every unusual obstacle. He abandoned one day, for dead, a female patient from whom he removed

a tumor on the fore part of the neck, because she fell into a syncope, from which M. Champion soon revived her by placing her on the bed and throwing a glass of cool water in her face. I myself know of one who operates with a remarkable composure, but who quickly becomes discouraged when he sees any thing of a disquieting nature that he did not anticipate. I have seen this physician, who is one that bears a celebrated name, and is justly esteemed, faint at the sight of a simple operation for empyema performed by one of his colleagues, and at the extirpation of a tumor from the neck in which he himself assisted. These are moral peculiarities that are very unfortunate, seeing that if it is important that the surgeon should reflect a long time, and analyze and weigh every circumstance before commencing an operation, it is also necessary that, when he is once armed with the instrument, he should be disconcerted at nothing; entirely absorbed in the work that he has commenced, he should have calculated all its chances and all its difficulties, whether natural or contingent, and be ready to change them, avoid, or remedy them, and foresee their consequences. It is under these circumstances that the qualities of the mind denominated composure and cool self-possession are indispensable, and merit the title of *surgical intrepidity*.

When these qualities are wanting, it is of great importance, as it is, in fact, in almost all the cases where the operation involves some serious responsibility, that the surgeon should be surrounded by skilful colleagues and assistants. Young practitioners, especially, have need of assembling about them compeers of reputation when they decide upon performing some important operation. They thus procure for themselves more confidence and security, and place themselves under protection from every harm if any unforeseen event should happen. There is instanced on this subject an example which the great masters themselves should sometimes call to memory: Marechal wished to open an abscess of the liver in the minister Leblanc; but it was Morand, who was then only a pupil, who prevented him from plunging the bistoury on the side of the abscess. Some time after, the minister presented Marechal to his family as the one who had saved his life. The surgeon replied, as he pointed out Morand, "It is to this young man that you owe it, for but for him I should have *killed* you!" (Leblanc, *Précis de Chirurgie*, t. i., p. 535.)

In possession of self-composure, and of every kind of knowledge, anatomical, physiological, and surgical, with which an erudite man may adorn his mind, the surgeon has the right to undertake an infinity of operations, which another should never attempt; those, especially, which are performed in regions where the compression of the principal artery cannot be effected between the heart and the seat of the disease.

The operations required for diseases of the infra-hyoid and supra-clavicular regions, and for those of the chest, abdomen, and perineum, are, almost all of them, of this nature; as to the others, we may readily conceive that the agitation of the operator, and his

want of self-possession, would not prevent the assistants from arresting hemorrhage, and placing the patient out of the reach of all real danger.

Art. III.—After Operations.

Having finished with the use of the instruments, there remain, for the completion of the operation, many important things to be done.

§. I.—*To arrest Hemorrhage.*

The loss of blood being that which gives the most alarm, and which may, in fact, the most speedily compromise the life of the patient, deserves to be considered first; nevertheless, there are an infinity of operations, which may, in this respect, be neglected without real danger. Arteries of small calibre, those of the fingers, great toe, scrotum, margin of the anus, neck of the womb, face, superior part of the cranium, those of the skin, and of the subcutaneous tissue in general, would rarely give place to serious hemorrhage in patients not previously enfeebled, if we could summon sufficient boldness not to apply the ligature to them; in other respects, as there is no inconvenience in obliterating them when it is easy to seize them, it would be imprudent not to close them immediately; it is only when they have ceased to bleed, and in cases where all the surface of the wound may be covered, and more or less completely compressed by small balls of lint, that I would advise abstaining from the ordinary hæmostatic means.

A. *Various Topical Applications.*—We hear no more to-day of *cauterizing* the wound of an operation with hot iron, boiling oil, or melted lead, as was done in the time of Paul of Egina, and Abu-l'Kasem; nor of stuffing it with *tow*, and enveloping plasters saturated with *white of eggs*, *bole Armeniac*, or other astringents pointed out by Guy de Chauliac (*Grande Chirurgie*) and almost all the surgeons of the middle ages; nor of having recourse to *arsenic*, *vitriol*, and *alum*, (Borel, *dans Bonnet*, t. iv., p. 89,) still recommended by Lavauguyon and Le Dran; nor, in fine, of employing *sponge*, or the *agaric* from oaks, as Brossard and Morand proposed, long time after Encelius, (Bonnet, *Collect., etc.*, t. iv. p. 364,) towards the middle of the last century. Some, however, still extol the remedies that are included in this enumeration. M. Binelli says, that with a water of his invention it is easy to arrest every kind of hemorrhage; and some experiments on animals seem, in fact, to give support to his assertion. M. Bonafoux (*Revue Méd.*, 1831, t. i., p. 49, 324) composes with charcoal, gum, and colophane, a powder which, according to him, possesses the same properties. In fact, MM. Talrich and Grand (*Bulletin de Thérap.*, t. i., p. 137) have discovered a liquid whose efficacy has been placed beyond doubt by a great many experiments on dogs, sheep, horses, &c.; but the application of these new means, which, in my opinion, are little to be

relied upon, not having succeeded in man, it becomes unnecessary that I should say any thing further of them.

B. The *ligature* is properly preferred to them. Paré is the author who revived and rendered new this important modification. If Galen, Avicenna, Tagault, and some others had already mentioned it, it must be conceded that it was of no advantage to their successors. Fabricius of Hildanus, Wiseman, and Dionis, who soon adopted it, did not neglect to bring it into general use. For more than a century past, there are but some few exceptions in which we do not use it, or substitute other means for it. We begin with the principal artery, seeing that it is that which it is most easy to find, that it is the one more important to be tied, and that afterwards the other branches are more easy to be discovered, because they then carry a greater quantity of blood. We seize it with the *forceps*, called the artery or dissection forceps, embracing it throughout all its thickness, and taking care at the same time not to include the nerve or vein. Some persons, however, have advised to seize and tie at the same time the artery and the vein together. Their object was to avoid by that means the hemorrhages which the large veins may give rise to. The moderns have rejected this practice, first, because it is useless, and also because it is dangerous: useless, since the retrograde circulation of the veins does not allow the blood to escape by their mouths into the thick part of the stump, or because, if this accident happens, it is not necessary to recur to the ligature to remedy it; dangerous, because, as it is said, in tying a large vein, we run the risk of producing inflammation. Others add, that it is proper to separate the artery carefully from the surrounding tissues. Experience enables me to say that these are rules of but little importance. Whether we seize the artery alone, or deprived or not of its surrounding tissues, or embrace the whole of it, or insert one of the branches of the instrument in its tube, while the other occupies the interior of the neighboring vein, or that the ligature encloses the entire artery only, or the artery and the vein, the operation will nevertheless have nearly the same chances of success or failure. The difficulties and the dangers do not lie there; and what has been said on this matter is in no degree borne out by practice. As to a simultaneous ligature on the nerves, all recommend that it should be avoided.

In the place of the forceps, Bromfield and most of the English surgeons make use of a pointed instrument, in form of a prolonged arc, to which they give the name of *tenaculum;* but this tenaculum, though it renders the application of the ligature more certain and easy, is less convenient than the forceps for seizing the artery without tearing it; it is on this account, without doubt, that it is but rarely employed in France. The English themselves have recently made such modifications of it, that it resembles now our hook forceps, (*pinces à crochet.*) Be that as it may, having once seized the artery, the operator endeavors to bring it out to the surface of the wound; an assistant passes a ligature beneath, in order to unite its two extremities above, and to form a circle, which he pushes beyond the point of the forceps, which is then inclined horizontally. We

tighten this ligature by embracing its extremities with the last fingers of the two hands, and by drawing upwards, while with the thumbs, or the index fingers, we force the knot as deeply as possible into the bottom of the wound. Some persons prefer drawing on the ligature so as to carry the extremities of it backward beyond the plane of the artery that we wish to tie. If it is in the bottom of a cavity where the vessel is found, it suffices, in order to obtain the same result, that we support the ligature outside the knot with the index fingers, which thus represent a sort of pulley. But it is evident in this matter, that every one must adopt the course which appears to him the most convenient and the most safe. The principal artery being tied, we carefully search for the others, to secure them successively in the same manner; only that it is useless then to isolate them as carefully from the small veins and other tissues which surround them: that is to say, if the direct ligature is almost indispensable for the large arteries, it is not as important for the smaller ones. Here the tenaculum, grasping the vessel as a hook would do, brings it out more easily, and enables us with greater facility to surround it with the ligature. If the artery is deep or too difficult to separate, we have recourse to the intermediate ligature; that is, we include in the thread the entire organic mass from whence the blood seems to come. In those cases we are sometimes obliged to use a curved needle in order to pass the ligature around the vessels.

The *threads* that are used are *single* for vessels of the second or third order; a *double* or *triple* ligature is preferred for the large trunks. However, in England, where fine ligatures have been generally adopted in the treatment of aneurisms, they make no further use of double or triple threads even for other operations. Without being indispensable, the French method is, however, rather the most safe.

The principal artery is sometimes so hard, incrusted with phosphate of lime or diseased, that, in applying a ligature upon it, it breaks like glass; in this case we may introduce into its interior a small cone of linen, of cork, gum-elastic, or any other substance, or place between it and the ligature, and of sufficient breadth to surround it, a small cylinder analogous to that which is known under the name of the *rouleau of Scarpa.*

Sometimes the blood escapes from the interior of a bone, either by simple transudation or by the trunk of its nourishing artery. A small graduated compress applied on the spot where the blood escapes, while we are proceeding in the search for other vessels, generally suffices; or sometimes it will be necessary to have recourse to cauterization, or to insert in the medullary canal a piece of wax, plugs of lint, or of agaric.

There is a crowd of arterial branches noticed during an operation, that soon after cannot be found, but which sometimes give rise, a little while later, to a sufficiently abundant flow of blood. On this subject an explanation has been given, which to me appears any thing but satisfactory. I do not see that the momentary absence

of the hemorrhage ought to be imputed to the spasm of the divided arteries, nor to their retraction, nor perhaps to the instantaneous effect that the action of the atmosphere exercises upon them. If they seem to reopen themselves at the end of some hours, it is evidently because the concentration of the organic actions produced by the operation finishes by giving place to an eccentric movement more or less energetic, which brings back the fluid from the interior to the exterior. The mode followed at first by Parish in America, by Klein in Germany, by many surgeons in England, and in France by Dupuytren, a mode which consists in *not dressing the wound until after the expiration of some hours*, does not consequently appear to me to be justified by reason, and I think myself authorized to censure it as a general method. Except in some rare cases, it is always possible to guard effectually against hemorrhage immediately after the operation. The wound remaining open, undoubtedly gives a better opportunity for placing new ligatures if they become necessary; but who does not know at the present time that we render the ligature useless upon an infinity of small arteries, by uniting immediately the greater part of the solutions of continuity. Besides, the patient, seeing that he is not dressed, becomes restless, and dares not trust himself to sleep. In fact, it is a practice which, though good in some cases, ought not to become general.

Since immediate union after operations has been proposed and followed by a great number of operators, it has been suggested to leave in the wound as few foreign bodies as possible. They thus began by *cutting off one of the ends of each ligature* very near the artery. Veitch, who considers himself the inventor of this modification, strongly insisted, in 1806, on the advantages thereby procured. He was in the habit of employing very fine ligatures of silk, in order to be enabled to cut their two extremities, and to leave their knot around the artery. Doctors Wilson and Hennen followed this practice for a long time before M. Lawrence had given any account of it. MM. Collier, S. Cooper, and Delpech, who have also tried it successfully, declare that these ligatures often give rise to abscesses, and that it is better to leave their extremities out. It would appear further, that they were in the habit, in different countries of Europe, from the year 1780, of cutting the two portions of the ligature very near the knot. As silk and thread do not appear susceptible of absorption, and act always like foreign bodies, an attempt was made to use ligatures of another kind. Ruysch had already proposed for aneurisms *wide strips of leather*. Beclard revived the use of them in France. In America M. Physic tried ligatures of *deerskin*, and M. Jameson, (*Journal des Progrès des Sc. Médicales*, t. vi., p. 117; t. vii., p. 126; t. ix., p. 150,) who has employed them for a long time, speaks much in their favor. Others have had recourse to the gut of the silk-worm, to catgut, &c. But experience has not yet decided upon the real and precise value of these different substances. [Dr. Mott has tried forms of animal ligatures, catgut, buckskin, raw-hide, &c., in the treatment of aneurism, and, from his experience, it is preferable to leave one end out, as abscesses will

otherwise form in the wound.—T.] At Paris they generally use ligatures of thread, single or double, according to the size of the artery. When they are applied, and before proceeding to the dressing, we cut one of the ends off near the vessel, in order to diminish the bulk they would make in the midst of the tissues. The other extremity rests without, to serve to draw out the knot which it forms deep within, when that shall be detached from the artery. As a general method, it is the best in practice.

C. *Compression.*—Kock, (*Bulletin des Sc. Méd.*, t. xiii., p. 361,) surgeon of the hospital of Munich, affirms, that for more than twenty years he has not in any case had recourse to ligatures after amputations. He confines himself to pressure upon the principal artery of the limb, by means of graduated compresses, and a roller bandage extended from the trunk to near the wound, which he unites immediately. Numerous facts, he says, support this practice, and prove that the arteries have no need of being tied to prevent them from carrying blood to the surface of the stump. A serious question appears to me to lie at the bottom of these assertions. The annals of science contain facts without number which prove that the division of the largest arteries *may not* be followed by any flow of blood. Every one knows that lacerated wounds, amputations following gangrene, and wounds by fire-arms, have often, in this respect, astonished operators. S. Wood had his shoulder torn off by the wheel of a mill, and got well without any artery having been tied. De la Motte, Carmichael, Dorsey, and M. Mussey, each one, relate a similar fact. A child of nine years, mentioned by Benomont, had the leg torn off, and recovered in the same manner. The thigh violently separated from the hip, in another case, was in like manner not followed by any flow of blood. Amputations of the thigh, related by Tcheps, Scharchmidt, Theden, Thomson, MM. Taxil, S. Cooper, Beauchêne, Segond, and Labesse, were attended with the same phenomenon. MM. Arbé, Lizars, Mudie, Smith, and Flandin, have all stated the same of many amputations of legs, arms, forearms, &c., as I have elsewhere shown. (*Journal Hebdomadaire*, 1830, 1831.) Similar facts have also been mentioned by M. Briot, (*Soc. Méd. d'Emulat.*, t. viii., p. 273,) by Chabert, (Malgaigne, *Thès. No.* 55, Paris, 1831,) by M. Roux, (*Voyage à Lond.*, etc., 1815, p. 53,) &c. We thus explain the ideas of Theuillier, (*Thès. de Haller*, extr., t. iii.,) who, in place of ligatures, prefers that, after operations, we should confine our treatment to diet, bleeding, and relaxants, a practice since revived here (Roux, *Voyage à Londres*, etc.) by a surgeon of the provinces. Although the dangers of Kock's practice had been shown by the evidence of M. Graefe, at Berlin, and even by M. Kock, his son, (*Journal des Progrès*, t. xii., p. 248,) I have, nevertheless, thought it my duty to make some experiments myself, of which the following are the principal results.

D. *Bruising.*—The bruising mentioned by M. Briot (*Soc. Méd. d'Emulat.*, t. viii., p. 273) scarcely answers but for the small arteries; if people who make use of it, after having cut or torn off the cord

from new-born infants, if the animals who do the same succeed thus in preventing hemorrhage, it is because, as a general rule, the circulation naturally ceases of itself in the umbilical vessels after birth. Nevertheless, having employed it successfuly on the epigastric arteries, the tibials, and the arteries of the fore-arm, I can imagine that Le Dran may have found it to answer after the division of the testicular cord of man.

E. *Plugging the Artery*, (*Fermeture.*)—A cone of alum or sulphate of iron, four to six lines long, inserted into the crural artery, and even into the carotid of a dog or cat, becomes firmly fixed there, and suffices in general to stop the effusion of blood; except that from the kind of eschar which results from it, rendering the immediate union impossible, we run the risk of seeing the hemorrhage reappear when the foreign body falls out; it is proper to add, that its introduction is not always easy except in the larger arteries. Wax produces the same effects, except that, being more slippery, and without any chemical action on the vessels, it becomes necessary to insert it deeper. Nevertheless, if, when it is introduced, the operator endeavors to push it from above down with a forceps or with the fingers, across the walls of the vascular tube, which he holds firmly grasped, there results from this a sort of swollen knob which the blood cannot easily remove. The small probe (*stylet*) which Chastanet (Gouraud, *Principales Opérat.*, etc., Tours, 1815) appears to have used with the same intention a long time ago, though less safe, often effects a permanent obliteration of the artery. The point of a wax bougie is infinitely better, provided it is not allowed to penetrate over an inch in depth. Catgut, deerskin, or chamois leather, scarcely acting as foreign bodies, have yet greater advantages, inasmuch as they do not prevent our closing the wound immediately. These different means are at the best but a species of plugs, whose manner of acting is too simple to require long explanations.

M. Miquel d'Amboise (*Journal des Connaiss. Méd.*, t. iii., p. 3, 70, 75, 102, 131) had made, at the close of the year 1828, observations similar to those of mine. I have proved, he remarks, by thirteen experiments, that in introducing into the arteries of a dog a foreign body, especially the string of an instrument, there is soon permanently developed there a morbid condition, which renders them incapable of receiving the blood, though they may not be mechanically obliterated.

F. *Reversing*, (*Renversement.*)—When it is not too difficult to isolate the artery, so as to reverse it upon itself, as Theden (*Progrès de la Chir.*, etc., p. 78) says he did on the intercostal, and Le Dran (*Opérat.*, etc., p. 193) on the whole cord after castration, we almost have it in our power effectually to arrest the flow of blood. For that purpose it is sufficient, as I have often done, to fold back the end of the vessel, double it, and then force it a little into the tissues, or immediately shut the outer wound, in order to maintain it in the position that we have given it. But as it is possible that without this reversing all those arteries would have equally ceased

to bleed, prudence demands that we should wait before drawing any conclusion from it. In passing, afterwards, the inverted end across the trunk of the artery itself, as M. Stelling proposed and did at Paris, in 1835, (*Gaz. Méd.*, 1835, p. 367,) we should make of this operation of reversing one that was difficult, dangerous, and very unsafe.

G. *The Perpendicular Compression*, which J. L. Petit, (*Œuvres Posthumes*, t. iii., p. 152,) in the last century, wished to see prevail, has not been adopted. Inserting plugs of linen, agaric, sponge, or lint, and maintaining them, as this author directs, by the aid of a machine, on the arteries at the bottom of the wound, could only have the effect to aggravate the consequences of the operation, without the certainty of preventing hemorrhage; and in respect to the distinguished personage of whom he speaks, it would have been better to have searched for the principal arterial trunk of the limb above the solution of continuity, than to have done what he did.

H. *Torsion.*—A subject which naturally arises out of the foregoing experiments is that of torsion, as a substitute for the ligature after operations. I was led to this discovery in 1826,* in making experiments on dogs of the various known hæmostatic means. I had not, however, yet attempted it on the human subject, neither had I sufficiently varied my experiments on animals to permit me to speak of it to others than to the pupils who followed my lessons in operative surgery at the close of the year 1827. But on the 13th of November, 1828, after having amputated the fore-arm of a girl named Rohan, in presence of MM. Al. Dubois and Malteste, I twisted the radial and ulnar arteries, reversed the anterior interosseal, and immediately closed the wound; no hemorrhage supervened, and the cure was effected in twenty-three days. On the 4th of December following I did the same thing, and with the same success, after amputating the first metatarsal bone in a strong and vigorous adult. Nevertheless, it was not until the 21st September, 1829, that I performed the first amputation of the thigh without ligatures. I had only to twist the femoral artery and two small muscular branches. *There occurred no hemorrhage.* The young girl, who was nineteen years of age, did well till the fourth day, but died on the twelfth. The autopsy of the dead body showed numerous purulent and tuberculous abscesses (*foyers*) in her lungs. The ilio-femoral articulation was in a complete state of suppuration. Some days later, on the 26th of the same month, I did the same, after an amputation of the arm in a young man aged twenty-three years. The brachial artery, the anastomotica magna, and two branches of the external communicating artery, were twisted without difficulty; but many other branches caused me more trouble. Perceiving, at the end of a quarter of an hour, that in spite of the tourniquet the blood continued to flow, I took off the dressing. *None of the twisted arteries bled.* The hemorrhage was from the bruised (*froissées*) branches, and from three others that I had not at first perceived. I tied them all, and the bleeding did not return. The pa-

* Those who have since appropriated to themselves this discovery, did not speak of it till in 1829.

tient died on the sixth day, and the necropsy disclosed no other lesion than extensive disease of the scapulo-humeral articulation. Neither the arterial nor venous vessels showed any trace of inflammation, and the ends of the arteries were firmly closed, and alike lost in the midst of the other tissues, in both of these cases.

Be that as it may, I had from that time the conviction that torsion may succeed as well upon the arteries of men as on those of dogs, and that, in truth, we might sometimes use it in lieu of a ligature. It remained to show if it was better, or ought to be preferred to it. The experiments now known, without enabling us to decide this question definitively, are sufficiently numerous, however, to allow us to make an easy examination of it.

Operative Processes.—Like every thing that depends on the hand of man, the manner of twisting the arteries necessarily varies more or less, according to the ideas or notions of each.

I. M. Thierry, wishing to do it parallel with the axis of the vessel, is satisfied with seizing the divided tube by its extremity with a *valet à patin*, of which the branches are more or less flattened, according as the calibre of the artery itself to be twisted is more or less considerable, and he afterwards turns it from four to eight and ten times on itself, without grasping the base of it.

II. In Germany many other modifications have already been proposed. M. Kluge, for example, warmly extols an instrument of his invention, with which the torsion is effected by loosening a spring which causes the forceps to turn on itself.

III. As for myself, I most frequently employ a grooved forceps of any description, or even an ordinary ligature forceps. After having seized the vessel crosswise by its extremity, I separate it from the surrounding tissues, and immediately grasp it near its root at the bottom of the wound, with another forceps intended to hold it, or with the thumb and fore-finger of the left hand, whilst with the first I turn it on its axis from *three to eight times*, and not ONLY *three times* for the large arteries, as they have incorrectly made me say.

IV. M. Amussat recommends that after the artery has been grasped with a forceps with rounded branches, it should be pulled out several lines beyond the bleeding surface; that after having cautiously separated it from the veins, and from the nervous filaments and all the tissues that surround it, we should force back the blood that it contains, and grasp the vessel near its root with another forceps, whilst the first, by means of gentle movements, tears its internal and middle coats; that we should then, with the last-named forceps, twist the end of the vessel from six to ten times with a rapid motion, at the same time that the fixed forceps holds it firm, without pressing too much upon the sides of the wound; and that the separation of the internal coats having been effected, we are to push them back through the cellular coat in a direction towards the heart, as I have shown under the article *Aneurism*.

In place of pushing back the coats and leaving the twist of the

artery at the bottom of the wound, we may continue the torsion of it until it is completely detached, and leave only a simple shred in the middle of the division. Nevertheless, "we are obliged to admit," says M. Vilardebo, (*Thèse, No.* 158, Paris, 1831,) from whom I cite these details, "that such manipulations are more easy when the fingers limit the torsion than when we make use of two instruments. The second forceps is of use only to break up the artery and push back the coats. After this, we seize the end of the vessel with the thumb and fore-finger of the left hand, on a line with the tunics that have been pushed up, and we give the first series of turns with the forceps, which we then bring the fingers nearer to, in order to continue the torsion during another instant; the artery is then seized again still nearer to the instrument, twisting it all the time, and so on successively. The operation is terminated by twisting, after the manner of a corkscrew, the spiral thus formed, and by crowding it into the depths of the tissues."

Two things, as it seems to me, ought to be distinguished in this matter: first, the isolation; second, the torsion of the vessel. The first, which is applicable to the ligature as well as to torsion, is incomparably the most difficult and delicate. If the large arteries surrounded with healthy tissues, and themselves elastic and unaltered, and all those that repose in the muscular or cellular tissues, may easily be divested of their coverings, elongated, and drawn out to the distance of several lines, it is far from being always the case with those that run into the substance of certain tendons and large nerves, or that adhere by their circumference or their outer side to the fatty tissues that envelop them, that are fragile, scarcely distinguishable, or crushed upon the least pressure, or which we are in dread of having escape from us as soon as we have grasped them. If it were absolutely necessary, we might, nevertheless, in most of these cases, effect our object through force of time, address, and precautions; but to what purpose? It is an error a hundred times demonstrated, to believe that there is danger in including some lamellæ of cellular tissue, or some fleshy fibrils, in the ligature along with the artery. The nervous filaments, even the small veins strangulated in this manner, involve in reality no other inconveniences than that of causing momentarily a little more pain. One must be a stranger to the routine of practice in the large hospitals, to impute to the defective isolation of arteries, the accidents which too frequently follow operations. It is then for torsion only that these preliminary attentions are indispensable. From whence it follows, as we may at once admit, that, so far as regards its practicability, the ligature will always have the advantage.

As for the rest, when the favorable conditions above mentioned exist, and we have given all necessary attention to the operation, the twisted arteries are as solidly closed as if they had been tied. Inflammation, suppuration, external or internal, of the vascular and nervous tissues, do not appear to me more to be apprehended after torsion than from ligatures. That the first should cause them more

than the second, must have been owing to its having been performed with one forceps only, and without taking the precaution of limiting its extent inwards, as, for example, in the process of M. Thierry. Nothing at least proves, in the facts published at Berlin, Hamburg, and Paris, nor in all those that belong to myself, that these fears are well founded. The reproach which has been cast upon it of leaving the remnant of an artery that may act as a foreign body in the wound, does not appear to me to have any force. In the two patients amputated upon by me at the hospital of St. Antoine, in 1829, and who died, the vascular cone, still recognisable, was so mixed up with the surrounding tissues, that it could not have created any inquietude in reference to the future, and I have not learned that other practitioners have *positively* established any injurious effects from it. Thus the only indisputable objection in torsion is in not *always* offering as much security as the ligature, of not being applicable to all cases, of requiring much practice in order that it may be well done, and of rendering the operation longer and more fatiguing; on the other hand, in permitting nothing to be left of a foreign nature in the stump, it presents the advantage of producing less irritation to the wounded surface, and of favoring the cure without suppuration. In this respect, however, the anticipations of practitioners will be rarely realized. The patients operated upon by M. Amussat did not recover faster, with the exception of one only, an infant, who was well, I believe, at the end of from twelve to fifteen days, than if they had been treated by the ligature. Neither was complete union by the first intention obtained in certain cases of amputation by MM. Fricke, (*Rev. Méd.*, 1831, t. iv., p. 62,) at the hospital of Hamburg, Ansiaux at the hospital of Liège, Dieffenbach and Rust at the hospital of Berlin, (*Bull. des Sc. Méd.*, t. xxii., p. 445,) Guerin at Paris, Bedor (Schrader, *Thès.*, Berlin, 1830) and Fourcade (*Lancette Franç.*, t. v., p. 56) at the hospital of Troyes, Lallemand and Delpech at Montpellier, and M. Key at Guy's hospital, (*Journ. Hebd. Univ.*, t. vi., p. 400.) That being the case, torsion should not, in fact, be deemed of any importance except in certain operations which are performed solely on soft parts. In fact, ligatures properly applied may generally be removed from the sixth to the twelfth day; and a crowd of facts prove that, after their separation, eight to fifteen days, and sometimes less, suffice to complete the reunion; but we do not find that a wound which comprises muscles, bones, aponeuroses, &c., can be perfectly cicatrized and solidly agglutinated in less than from twelve to twenty days. To resume: I consider that after operations it is not advisable to twist arteries that are difficult to isolate; that it is better to tie those that torsion could not be practised upon, but with every desirable degree of security, and that we must not admit this hæmostatic means in such cases, but as a method liable to exceptions.

I. *Conclusion.*—The hæmostatic means ought, moreover, to be varied after operations according to circumstances. The ligature is preferable wherever the blood escapes by jet from a rather

large artery, which can be easily secured. In the breast, scrotum, and omentum, however, and in every part where the arteries are long, flexible, and surrounded with loose tissues, torsion offers real advantages. Bruising, and reversing, and pluggings (*les bouchons*) are of infinitely less value. If the blood oozes out from small arteries, as after extirpation of tumors of the neck, breast, and axilla, and we are not desirous of effecting immediate reunion, compression by small balls of lint (*boulettes de charpie*) is an excellent means which I cannot too much recommend. [On the same principle act the admirable styptic pressed sponge, punk, cobweb, fur of hats, &c.—T.] Compression on the course of the vessels through the teguments, as Kock applies it, would be practicable on the limbs or head, if it should not be possible to tie or twist the divided artery. At the bottom of certain moveable cavities, such as the pharynx, mouth, and anus, the hot iron frequently should have the preference. Liquids, medicaments, and styptics ought not to be used but upon wounds already inflamed, or for consecutive hemorrhages, and when it is not proper to act mechanically on the wound itself. We must add, in conclusion, that cool air, and cloths saturated with cold water, are after a great number of operations sufficient to arrest the hemorrhage in the space of an hour or two, if there have been no other than small arteries divided.

§. II. *The Dressings.*

After the hæmostatic means have been employed, we attend to the cleansing and dressing of the wound.

A. We *clean* two things in operations,—the wound and its neighborhood, or all the regions which have been soiled by the blood. The wound should be cleaned at first, and while we are engaged in securing the vessels. Here our manipulations should be more or less minute, according to two circumstances—according to the hæmostatic means employed, and the kind of dressing that we wish to use. If we use only small balls of lint, either naked or on fine linen, it is of little importance that all the anfractuosities of the wound are or are not perfectly freed of clots of blood. It is much the same where torsion has been used, or where the two ends of each ligature are to be cut off near the knot. When each ligature remains with one of its ends entire, thorough abstersion from the wound of all the blood that may have contracted adhesions with it is no longer a matter of absolute necessity, if we are going to dress the parts flat, (*à plat.*) In every case, on the contrary, where it is desirable to effect the approximation of the edges of the wound immediately, it is important to free it as completely as possible of every kind of foreign body. To clean it, we use sponge and tepid water rather than wet cloths. In pressing the sponge, we first wash it freely with water, then cleanse and detach all the portions of adherent fibrine, by brisk but gentle rubbing. That done, we wash all the other parts, and then wipe them and dry them with soft linen. We return then to the wound, to sponge up the exudation

from it by a last wipe of the sponge, and proceed then to the distribution of the ligatures.

B. *Disposition of the Ligatures.*

When the hemorrhage has rendered it necessary to employ ligatures, and the ends of these ligatures have been retained, it is convenient to fold them outside, and to fasten them on the skin, at some distance from the wound. Many modes of doing this have been proposed. Most surgeons are in the practice of gathering all the ligatures into one group, which they place near the most depending angle of the wound. But, by this method, some of the ligatures are obliged to occupy the whole extent of the wound before they reach the surface, and there remains at the bottom of the wound a species of roller or network, which necessarily increases the irritation and suppuration, and by that means, in fact, interferes with the agglutination. Others, and I for one, have for a long time followed this practice: conduct each thread separately in a straight line towards the point nearest to the surface. In this manner the ligatures represent rays as short as possible, which do not hinder the surfaces from placing themselves in contact, and becoming adherent to each other. This last method is incomparably the best when it is practicable to undertake immediate reunion, without leaving cavities under the borders of the wound. In the contrary case, as after amputations of the leg, for example, there is but little inconvenience in following the ancient practice, since then it is next to impossible to avoid the suppuration of the parts which are covered by the teguments, and brought together by the suture, or straps, or in any other way.

These threads, folded outside, were formerly covered there by a small compress known under the name of the *ligature compress*. It was then necessary for an assistant to hold his finger upon this compress, until the first portions of the dressing were applied around the wounded region, at least for amputations. Now we prefer, and I scarcely ever deviate from this course, a plaster of gum diachylon, from one to two inches long, or the end of an adhesive strap, (*bandelette*,) in fact, which is applied over the extremity of each thread, or each group of ligatures. If there should still remain any bloody exudation, or should it be renewed, it must be removed for the last time, and we then proceed to the dressing. The dressing after operations is a point of the greatest importance. Perhaps it has as much to do with the success of many important operations, as the mode by which the operation itself has been performed. Also, it has been conceded from all time, that the dressing should be treated of apart, and form a special subject, in works of surgery. I refer, then, for all that relates to its details, to that portion of this work which treats of minor surgery, not intending at present to speak of it but in its connection with the great operations.

§ III.—*Union of the Wound.*

There are two modes of treating wounds after operations. Sometimes we approach the lips as exactly as possible, and endeavor to keep them in the most perfect contact; sometimes, on the contrary, they are kept apart by placing between them foreign bodies and different kinds of dressing. In the first case, we endeavor to obtain what is called the *immediate union*, or that by *first intention;* in the second, we promote suppuration, and the cure or cicatrization is only obtained *indirectly*, (*médiatement*,) or by *second intention;* I will add to these, *immediate secondary union.*

A. *Indirect* (*médiate*) *Union, or that by Second Intention.*

As late as the termination of the last century, indirect union (*la réunion médiate*) is, to a certain extent, the only one of which surgeons have made mention; but this is far from saying that it has always been performed after the same rules.

The ancients had the practice of filling the wound with compresses, or sponges, dipped in vinegar, and of treating it, in fact, like all other solutions of continuity in which they wished to promote suppuration. Those who, like Archigenes, Heliodorus, and Paul of Egina, had recourse to cauterization to arrest the hemorrhage, made use at first of garlic and salt, with the view to make the eschar fall off, then cataplasms of honey, flour, or eggs, or simply emollient substances. The Arabs have particularly extolled astringents, styptics, and Armenian bole; they also frequently employed the balsam of sulphur. Fabricius of Hildanus thought he could simplify this dressing in amputations by contriving a woollen purse, with which he enveloped the stump after having padded it with different substances. Wiseman preferred a beef's bladder to the purse of Fabricius. He employed also the dry suture* to approximate a little the lips of the wound. Sharp wished nothing more than the hot iron; but to hinder the soft parts from retracting, he had recourse, like Pigray, to two ligatures applied crosswise. It is thus we come to the mode of dressing generally followed towards the close of the last century. At present it is done in the following manner. The ligatures being arranged as we have above said, we place a fine piece of linen, covered with cerate, and perforated by holes, over the whole extent of the wounded surface, whose edges are brought more or less forward, so as to form, by means of these, a large cavity. Coarse lint fills this space; some smooth pledgets are placed over it; long compresses, conveniently arranged, are then made to embrace the whole extent of this region; then, with a bandage of sufficient length and width, the dressing is completed.

In the place of applying fine linen immediately to the wound, some surgeons fill it with sponge, agaric, or lint, as was done in the

* *La Suture sèche*—a phrase of the schools for *adhesive plaster*—vide a few pages farther on—Art. *Suture.* The phrase took its origin from sewing the edges of the strips together.—T.

last century; except that they border the circumference of it with a liseret, or small bandage of linen, slashed (*découpée*) on its outer edge, and spread with cerate. The perforated compress appears to me to be preferable. As it is easy to turn it over upon the edges of the wound, we have no fear of seeing the lint or other material of the dressing contract adhesions with the cellular granulations, and the living parts that have been divided; by means of this, in fact, the second dressing can be performed without pain and with the greatest ease, as soon as we judge proper.

The Maltese cross, in such general use formerly, has given place to the long compresses, which are more convenient, and better applied to the form of the different parts. We must take care not to push back these compresses with too much force against the root of the limb in amputations, for in doing so we should be certain to crowd back the muscles and teguments whose retraction we are so desirous of moderating. It is for the purpose of avoiding this retraction, and to diminish as much as possible the protrusion of the bone which results from it, that Wiseman, and especially Louis, have recommended the application of the containing (*contentif*) bandage from above downwards, and not from below upwards. I cannot too strongly recommend on this subject the following method: We first pass the bandage once or twice around the trunk, then we bring it to the root or upper part of the limb, conducting it by turns moderately tight to a level with the extremity of the bone, and proceed afterwards to the rest of the dressing, as has been just described. Another bandage, or the remains of the first, serve to fasten the compresses by a second layer of turns, and to hold the whole firmly together. In this manner the muscles find difficulty in retracting. The skin is pushed forward, and we moreover prevent, in a great degree, the swelling of the stump, and the erysipelatous or phlegmonous inflammations of which it may become the seat, and even the phlebitis, which it is so important for us to arrest, the moment it begins to be manifested.

B. *Immediate Union, or that by the First Intention.*

The explicit direction to bring together the edges of the wound, and to close it immediately after amputations, does not appear to go back before the time of Alanson, or at farthest to Gersdorf. Adopted by Hey, and soon after by almost all the surgeons of Great Britain, it was not received among us but with a certain repugnance, except by *Percy*, who had frequent occasions of testing its advantages in the midst of camps. Pelletan, M. Larrey, &c., at first stoutly opposed it; but Dubois, Boyer, Dupuytren, Delpech, MM. Richerand and Roux, and almost all the distinguished operators of Paris and of other cities of France, nevertheless, adopted it in a majority of cases. It appears, however, that Dupuytren had not as much reason to approve of it as he had believed at first, and that M. Roux often thought it advisable to refrain from putting it in practice.

To unite by the first intention, it is important, much more than in the other method, that we should not leave in the wound any other foreign bodies except those that we are not permitted to remove from it. We begin, then, by removing carefully the clots of blood and the threads that are not indispensable, and by cleaning the surrounding parts with a sponge, and wiping the whole out with dry and soft linen. That being done, we approximate as exactly as possible the divided parts, endeavoring not to leave more space between them towards the bottom than near the edges. While an assistant retains them in this position, the operator puts on the adhesive straps, (*les bandelettes agglutinatives.*) By commencing with those of the middle, it is generally more easy afterwards to apply the others. Three or four almost always suffice. It is a rule to leave some space between them, and not to cover the entire cleft with them. The longer they are, all other things being equal, the better they hold on, the less inconvenience are they to the skin, and the better they attain the end we have in view. To support their action, it is often useful to have at the same time, on the sides of the wound, parallel with its largest diameter, graduated compresses of more or less thickness, or rolls of lint, (*faisceaux,*) either between the straps and the skin, or otherwise, between the remainder of the bandage and the straps; it is the only means in some cases of hindering the fluids from accumulating at the bottom of the cavity, and of obtaining a free and regular union.

If the ligatures have not been cut near the arteries, we fold them back separately and fasten them between the adhesive straps* by small strips of diachylon plaster. In the place of *bandelettes découpées* (*vide supra*) or the perforated compress that are placed on the entire anterior surface of the stump, some persons simply make use of a large thin layer (*gateau*) of lint, smoothly spread with cerate; in this matter each should act as he thinks proper: the important point is to prevent the too close attachment of the portions of the dressing with the neighborhood of the wound. Soft pledgets (*plumasseaux*) of dry lint are afterwards arranged so as to cover in a convenient manner the sides and fore part of the stump. For that purpose two or three pledgets suffice: a greater number, from the excess of heat which they might give rise to, might be more hurtful than useful.

The long compesses vary necessarily in their number or length, according to the size of the part or extent of the incision. Their middle part ought to rest precisely on the front of the wound, and their extremities to be carried gently towards the upper part of the limb. The one that some, after amputation, apply around or circularly to the limb, to fasten the others a little above their place of crossing, is, for the most part, useless.

A bandage freed of its hem and ravelling, (*faux fil,*) and which is soft and rather narrow than too wide, completes the dressing. After

* Strips of *adhesive plaster*, elsewhere called by the author *bandelettes agglutinatives*, are here, designated as *rubans emplastiques*. They mean the same thing.—T.

having passed it, by circular turns, from the stump towards the upper extremity of the limb, we bring it back in the same manner to the side of the wound, on the fore part of which we may cross it several times, so as to shape it into a kind of *capeline* bandage, so frequently employed formerly; and in order that we may thus obtain one that is more regular and neat, but which, however, augments the perpendicular pressure at the expense of the lateral. As we may thereby compromise the safety of the patient, this sort of affectation must be dispensed with, wherever we apprehend a deposite of matters at the bottom of the wound.

Suture.—In the place of plasters, or what is called in the schools the *dry suture*, (*la suture sèche*,) some operators employ the *bloody suture*, the suture properly so called, in other words, sew the wound up. This method, used by Pigray, Wiseman, Fabricius de Hildanus, Sharp, &c., with a view of holding the integuments firm together, has been especially lauded, in latter times, by Hey, M. Benedict of Breslaw, and by Delpech, who asserts that he has derived the greatest advantages from it; at Montpellier they scarcely ever dispense with it after amputations. The interrupted suture, i. e. with intervals between the stitches, is that which is preferred in such cases, though the suture of Pelletier may answer as well. For more safety, and to relieve the threads, we may also, after the manner of Delpech, place some adhesive straps* between them. If the employment of the suture of which we are speaking was not necessarily accompanied with much severe pain; if the union of the teguments was the most important part of the operation; and if the plasters did not effect the same object when they are properly applied, there is no doubt that it would have been long ago adopted: but the contrary being generally admitted, every thing induces us to believe, that for the future, except in a small number of cases, the adhesive plasters will continue to be substituted.

When we begin like Louis, Alanson, and M. Richerand, by fastening a long bandage around the body, that it may descend afterwards by turns to the base of the wound, it is upon this that the straps ought to take their *point d'appui*, and with this difference from the other parts of the dressing, that it ought to be changed as seldom as possible.

Open Dressing, (*Plaie à l'air.*)—Kern, Klein, Walther, and most of the German surgeons, approve neither of lint nor pledgets about the stump, which they slightly cover with a few compresses wet with cold water. This practice has found many imitators in England and America, even among hospital surgeons; and I learn from M. Castello, physician of Ferdinand VII., and professor in the university of Madrid, that it has been a long time practised throughout nearly all Spain. In France, up to the present, it has counted but a small number of partisans. This, as it appears to me, is to be regretted, for nothing can be more satisfactory than the results that

* The author, varying here from his two phrases above, denominates adhesive plasters or straps, *bandelettes emplastiques*.—T.

foreigners obtain from it. Divested of a mass of useless dressings, the stump is infinitely less heated. In preventing or moderating the inflammation which must invade it, we place the contiguous surfaces in the best possible condition to obtain immediate union, and the general reaction is reduced usually to a small affair. The trials I have made of it have proved to me that cold water, though often useful, is not always without its inconveniences. In hot sea-seasons, and when the patient is to remain in bed, I cheerfully follow this practice, especially if the inflammation threatens to be intense; otherwise, it exposes us to real dangers, and is not as good as the ordinary method.

C. *Relative Estimate (appréciation) of Dressings by the First and the Second Intention.*

The ancient method of treating wounds endangers, it is said, the exhaustion of the patient, by the abundance and continuance of the suppuration, and by the severe pains at each dressing: it requires three, four, five, six, and even seven or eight months to effect the cicatrization, ordinarily produces only a small cicatrix, which is torn upon the least exertion, and is almost always accompanied with a considerable deformity upon the apex of the stump, after an amputation. By the new method, say Alanson, MM. Guthrie, Klein, &c., the patients suffer infinitely less; the fever is always moderate; there is no debilitating suppuration; the stump remains rounded, firm, and well nourished; and at the end of eight, ten, fifteen, twenty, or thirty days, the cicatrix is solid, and the patient in a condition to use an artificial limb.

Of ninety-two soldiers treated in this manner on the field of battle by Percy, eighty-six were cured in twenty-six days: out of seventy, Lucas did not lose but five. But while in France the chief of military surgery defended immediate union with so much ardor, the chief of civil surgery endeavored to cause it to be proscribed. Out of six persons operated upon by Pelletan, he saved only one. In all there were effusions of blood and of pus between the lips of the wound, in the course of the vessels, and among the muscles, and the only one that was saved owed his life to an effusion of pus which forced off the adhesive straps: there is danger, then, says he, in closing a wound which may bleed, or has need of suppurating, either owing to the ligatures that irritate it, or because the bone, more or less altered by the action of the saw, must necessarily exfoliate.

The cure by the first intention is more prompt, says M. Gouraud, who adopts the objections of Pelletan, but it is more certain by indirect union; (*la réunion médiate:*) by being prolonged, the suppuration prepares the person operated upon for the changes which must supervene throughout his whole system; and every time we operate for an old disease, the secondary reunion is the only one which is suitable.

As for myself, I can aver, that if the accidents mentioned by Pelletan often occur, it is much more for want of sufficient precautions

than as an unavoidable consequence of the operation; allow that there may be some danger in drying up the source of a copious suppuration of long date, and shutting in eight days the wound that results from the removal of a limb which the constitution had for a long time transformed into a secretory organ; but are not these exceptions? and can reasons so feeble, and for the most part questionable, weigh down against all the perils that we risk by indirect union?

In shunning one extreme, we should guard ourselves from falling into the other. If the bleeding surfaces may be easily brought together, if there remain in the stump nothing but sound parts, the immediate union has immense advantages; and we ought to try it. In the opposite conditions, we may act otherwise, and confine ourselves to approximating little by little the lips of the wound, after having placed between them small balls or pledgets (*faisceaux*) of lint, naked, or by the intervention of the perforated compress. It would be imprudent and even dangerous to persist in maintaining these in contact with it, if, in the course of the first three or four days, blood or other fluids should be effused in sufficiently large quantities to prevent the reunion from being freely made from the bottom towards the edges. It is then that it is proper to give a large and free issue to the matters accumulated behind the straps or sutures, and between the teguments and divided muscles, to clean cautiously the whole extent of the opening, (*clapier*,) and to dress afterwards loosely, that we may look no longer but to union by the second intention. In acting thus we will obtain most frequently, if not always, in the space of fifteen, twenty, or thirty days, a complete cicatrization, even after the amputation of the thigh, as I have many times myself experienced.

D. *Conclusions on the Relative Value of the two Kinds of Reunion.*

To be understood on this point, we must consider the question as the moderns have laid it down. Mediate [i. e. indirect.—T] union is no longer to-day what it formerly was. By the present modes, we frequently obtain a perfect cicatrization in the space of three to six weeks. The roller bandage with which we surround the stump, hinders the skin around it from being drawn backward, and sufficiently favors the contraction of the wound to reduce it with great rapidity, as soon as the ligatures are separated, and it is covered with vascular granulations. When we can afford to wait for the formation of pus, the lint is detached without pain and without the least danger; the suppuration diminishes from day to day; the suffering, the inflammation, and the fever have nothing alarming, and have been most strangely exaggerated. In permitting the fluids to ooze out as they form, it renders their absorption more difficult, and exposes less to inflammations, abscesses in the stump, and to phlebitis and metastatic deposites in the viscera, or serous cavities, than immediate union does. Moreover, the primitive adhesion, such as it is daily practised, scarcely leaves the patient cured before three weeks or a month.

If it be true, that in spite of the contact of substances so different, as bones, aponeuroses, muscles, cellular tissue, nerves, vessels, and the skin, the separation of some, the contusion of others, the continual tendency of certain others to change, the almost absolute impossibility of leaving neither clots of blood, nor lamellæ, nor arteries, nor the least foreign matter, at the bottom of the wound in amputation, for example,—the union has sometimes been achieved without any suppuration, and that this, therefore, is possible, then is it also true that on that account we should concede to the dressing more care and time than is ordinarily given to it; that the section of the soft parts should be neat and regular; that the teguments should fall without effort on the front part of the stump, as if they were a head-dress; that the bones should not protrude beyond the deep muscles; that all the arteries liable to bleed should be immediately tied or twisted; that the sides of the wound, freed of foreign bodies, should touch throughout their whole surface, and be kept together in the direction that offers the least resistance; that the straps should do no more than preserve the coaptation, without pressing or exercising any drawing force, and be also wide enough and sufficiently approximated together to prevent any slackening among them; that the suture should be added to them, or even preferred, if the skin is thin or tends to roll up inwards; that the diseased part should be afterwards kept in the most perfect immobility, and that the inflammation should be moderated by every possible means. If blood or pus be deposited at the bottom of the wound, and if the adhesion of the skin prevent their escape, they soon cause a local reaction; from thence come swelling and redness, and then fever, finally a kind of abscess which develops itself in the centre of the stump, an abscess whose floor is represented by the section of the bone, flesh, and vessels, while the tegument constitutes its dome or plafond. Reposing on tissues newly divided, the pus penetrates them, separates them, insinuates itself into their interstices, extends more and more, and spreads the inflammation through the muscles, vessels, and periosteum, and even under the skin. Then the veins, the lymphatics, and the absorbent system, and every thing else becoming involved, it constitutes a powerful cause of phlebitis or purulent fever, and exists in sufficient force to determine those metastatic deposites which are so often followed by death.

As soon as these dangers threaten, we should at least endeavor to remedy them. If the ligatures do not answer sufficiently well as filters, we relax one or more of the adhesive straps, which, in fact, must all be removed if the skin is red or swollen. We then treat, afterwards, as for a subcutaneous phlegmon. We now envelop in a large poultice the stump, which latter must have been previously leeched or not, as may seem necessary. We also open one of the angles or points of the wound as soon as the presence of pus is no longer doubtful, taking care to make this opening sufficiently wide to prevent the matter from stagnating afterwards at the bottom of the cavity which produces or retains it. We do, in fact, all that can be done to empty, cleanse, and cicatrize the part, the same

as if it were a true abscess, and to keep the teguments in the position which we had given them.

It is, in fact, under such discouraging circumstances, and not under the brilliant forms that Bell represents, that we meet with immediate union in practice. This, however, does not infer that we ought to reject it, but that it is not always convenient, and also has its dangers, and that it is often advisable to substitute for it the simple and incomplete approximation of the lips of the wound. Thus understood, it appears to me to include the advantages of the secondary union. In this sense, M. Serre, following his preceptor Delpech, is entirely right. The error of their school is to attach too much importance to the circumstance that there is no opening for matter towards the most depending part of the wound. The suture, in truth, is rarely required, and there would evidently be danger in not making a passage for the pus, as soon as it is collected in the stump in sufficiently large quantity. It is easy to see from these observations that Dupuytren, who placed a layer of soft lint between the lips of the wound, previously slightly approximated with straps of diachylon, and that M. Larrey, who dresses even with pledgets spread with resin of styrax, differ very little in their dressing from that of union by the first intention, such as it is practised and adopted at the present day.

E. *Secondary Immediate Union.*

To reconcile the two preceding methods, it is easy to establish from them a third, by applying to wounds from operations in general what O'Halloran advises for the flap operation in amputation. After having employed open dressings to the wound until it has become thoroughly cleansed and uniformly covered with rose-colored cellular granulations, there is nothing to prevent our approximating its edges so as to effect secondarily immediate reunion. I have used this mode with success in a great number of instances. It is a practice which Paroisse has strongly recommended, and that may be qualified with the name of *Réunion Immédiate Secondaire.* Every thing being thoroughly cleansed, it is generally easy to bring the edges of the wound in contact, either immediately or by degrees, and thus, without incurring any inconvenience, obtain a union in the space of a few days. I am of opinion that it is advisable, with very few exceptions, to undertake either the simple approximation of the edges of the wound, or even immediate reunion, taking care not to forget the foregoing precautions; but that if accidents evidently caused by it begin to be manifested, we ought not to hesitate reopening the wound, and deferring the union to a later period. I would add, that the results of this mode of dressing are much more under the control of art than those of absolute secondary union; that consequently they will be favorable or unfavorable, according to the skill or mal-address of the surgeon, according as the operator shall attach more or less importance to certain precautions that cannot be learned in books, and of which those only who have

the opportunity of putting them into practice can estimate the value. It must not be forgotten, moreover, that the preceding remarks have much more reference to wounds from amputations than to any other operations.

CHAPTER V.

CONSEQUENCES OF OPERATIONS.

Article I.—Natural Consequences.

After the dressing we attend to the removal of the patient, and to the position which it is most proper that he should have. If the operation has been performed upon an ordinary bed, it is sufficient to remove the coverings and other objects that are wet or soiled by the blood, and to replace them by dry linen. In the contrary case, the patient operated upon is borne upon a litter or upon the arms with the least possible motion, taking care that he receives no chill. In cold seasons, it is desirable to place him in a bed that has been warmed; in other cases, this precaution is unnecessary. Once in bed, the patient should be placed in a position which will require the least muscular effort; that is, on the back, having the head moderately elevated, and the lower limbs slightly flexed. As to the part which has been operated upon, we place it in such a position that nothing can draw upon the lips of the wound or upon the ligatures. It consequently requires a position which must vary according to each kind of operation. If the wound is in a part of the body which must remain in bed, the coverings are raised from it by means of hoops. When the limbs are concerned, we are often also obliged to place some cushions under them. The patient, being thus arranged, should be left quiet.

Ordinarily he suffers sharp pains during the first hours, but these afterwards diminish by degrees, and soon become quite supportable. He also often appears pale and feels cold, or has even a slight chill for some time. These phenomena, which are accompanied with debility and with contracted pulse, soon disappear, or require no other remedy than one or two table-spoonfuls of wine, some warm drink, or an anti-spasmodic potion. If every thing goes on regularly, the inflammation in the wound is developed in a moderate degree only, and causes but a slight febrile reaction of some three or four days. It is this period which requires the most precautions in the regimen. If the operation is really severe, little as we may have to apprehend hemorrhage, it is advisable to leave a skilful assistant near the patient for the first twenty-four hours, sometimes even for some days. This precaution, which the presence of the pupil on duty renders almost entirely unnecessary in hospitals,

ought not to be neglected in private practice ; it inspires confidence in the family, and powerfully contributes to the composure of the patient.

§ I.—*Regimen for those operated upon.*

Some practitioners keep their patients who have undergone a severe operation upon a rigid diet from six to ten days. This method, very generally adopted in France, has for its object to prevent or moderate the febrile reaction, to hinder the formation of abscesses in the vicinity of the wound, and the supervention of a local inflammation in the digestive organs. Bleedings, more or less numerous, according to the strength of the individual, and emollient drinks and anodynes, are united to this treatment. Most foreign surgeons strongly eulogize a course directly the reverse. In England, in America, and even in Germany, many practitioners administer large doses of opium, wine, and brandy to their patients, even the same day of the operation. Kock allowed them coffee, strong liquors, and nourishment the day after. Benedict maintains that instead of preventing unpleasant symptoms, bleeding promotes their development; it is the most robust subjects who best resist morbific causes, and with them inflammations are most easy to cure. The severe diet and copious bleedings prescribed by some persons before or immediately after operations, are only of advantage, he says, where incidental diseases and local inflammations supervene in those who have been operated upon.

These two doctrines appear to me equally objectionable. The severity of the regimen is in reality carried too far in France by a great many surgeons; but it is evident that the course pursued by the English and German practitioners must be liable to many more inconveniences. For myself, I conform generally to the following rules ; if it is a slight operation, as that for fistula lachrymalis or amputation of a finger, I scarcely change the customary regimen of the patient. In the extirpation of tumors, and in all operations that do not necessarily disturb the circulatory functions, I diminish to one quarter or one half the quantity the patient takes when in health, and I willingly allow him water slightly tinged with wine, (*de l'eau rougie,*) or some pleasant tisan of his own choice for drink. If the operation is more serious, or necessarily of a nature that must seriously implicate the general system, I confine my treatment to bouillons or very light broths (*très légers potages*) for two or three days. At the end of this time, if there does not supervene an evident febrile reaction, I allow substantial broths, then some of the white meats, eggs, and fried fish, with a small quantity of bread and wine. I thus manage to allow the patient the quarter or half of his customary aliments in the course of the second week.

I do not recur to bleeding unless the operation has required an extensive wound, or involves a delicate and important organ, and where the patient is naturally plethoric and sanguine. Under such

circumstances I frequently prescribe bleeding, even the same evening of the operation, which I sometimes repeat the next day, and also the day after that. I likewise employ venesection at the natural period of the reaction, that is, from the third to the sixth day, if the fever seems to take on too much intensity.

The drinks which I prefer after the *eau rougie*, which is most suitable in simple cases, are the light infusions of the linden, if it is advisable to favor action upon the surface, the poppy when the nervous system is much affected, chamomile in lymphatic temperaments, flowers of mallows or marsh-mallow when there is cough, borage, or buglosse, or elder when we wish to promote perspiration, vegetable acids, citric, tartaric, &c., decoctions of barley or gruel—in fine, the different kinds of acidulated drinks—if the patient complains of too much heat and thirst. But this regimen must be understood only in a general sense; for we must not forget that all the accidents that occasionally succeed to operations may require a change of regimen or a particular treatment.

Many patients, soon after being operated upon, become *constipated*. This is owing to the necessary want of exercise, the small quantity of food allowed them, or perhaps to actual torpor of the intestinal canal. As the accumulation and retention of stercoral matters, in such cases, must increase the general uneasiness, the cephalalgia, pervigilium, and febrile reaction, they must be remedied in proper season. We must not, however, forget that a patient who has undergone a severe operation may remain three, four, or five days without stools, and without experiencing therefrom any actual inconvenience. The movements and displacements which the administration of enemata and the desire to void the excrements occasion, expose the patient, in certain cases, to such serious dangers, that we ought not to have recourse to these means unless they are urgently required; so that we may wait at least three or four days before prescribing laxative injections or mild purgatives. Enemata are proper when the operation has been on the upper part of the body, since, in this case, the movement of the pelvis involves but little inconvenience. For the other regions, unless it is contra-indicated by the state of the digestive organs, I prefer giving a few glasses of Seidlitz water, or two or three glasses of water of pullna in the morning, or a draught composed of two ounces of castor oil, four ounces of a weak infusion of mint, and one of sirup of lemons, to be taken by table-spoonfuls until it produces a purgative effect.

Changing the linen of the patient is a duty that must not be neglected. If the shirt has not been removed on the bed where he was operated upon, we must hasten, however little soiled it may be, to change it before leaving him in his new position. The napkins, sheets, and other parts of the bed must be changed every two or three days, or even more frequently, if they freely imbibe the liquid matters that exude from the wound. In other respects, the attention to cleanliness in those operated upon is not subject to any special rule.

§ II.—*Separation of the Ligatures.*

If the flat mode of dressing has been preferred, the ligatures placed on the arteries rarely fail of coming away between the fifth and tenth days. When immediate union has been attempted, they ordinarily hold on a longer time. I have seen them remain until the twentieth or even thirtieth day. When they are too long a time in separating, it is generally owing to two principal causes: first, because some lamellæ or threads of fibre are caught in the knot with the artery; or, secondly, that the knot itself of the ligature is at the same time imprisoned by the adhesion of the tissues at the bottom of a narrow passage. In other respects, it is not uncommon to see ligatures detach themselves on the third or fourth day, and that without the slightest inconvenience following. This is a fact that I have often been witness to after the removal of tumors, and even of some amputations. As for the rest, I shall, when speaking of particular operations, point out the means of promoting the separation of the ligatures.

Article II.—Accidents.

§ I.—*Spasms.*

One of the most frequent occurrences observed after capital operations, is spasm, or convulsive tremors. I do not speak here of the spasm and momentary chill which patients almost always experience until they are warm in bed, but of the convulsive movement which is prolonged, or tends to be prolonged to an indefinite period, by affecting the wounded part with spasmodic contractions that are sometimes exceedingly painful. We remedy this kind of spasm by giving warmth to the part as speedily as possible, by making strong pressure with the hand upon the muscles near their source, or by holding down the part by means of a bandage attached to each side of the plane of the bed; also, by giving anti-spasmodics and opiates internally, and by keeping the dressings thoroughly wet with mallows-water and laudanum. In hot climates, these spasms cause great uneasiness, because they are sometimes the preludes of tetanus. In our temperate climates, it is rare that they are of a serious nature.

§ II.—*Hemorrhage.*

After operations, the hemorrhage may still be renewed and excite apprehensions. This accident is owing to different causes. In some cases, the hemorrhage is owing to this: that many of the arteries, not bleeding at the time of the dressing, from being restrained by the revulsion of the blood to the interior, have neither been tied nor twisted; so that, dilating themselves in proportion as the circulation recovers its natural action, they finally commence bleeding. It is generally at the end of some days that this kind of hemor-

rhage takes place; and it is with the view to prevent it that some surgeons have advised that we should wait two or three hours before proceeding to the final dressings. Sometimes, also, the hemorrhage which supervenes the first twenty-four hours after an operation is excited by the irritation caused by the lint and other foreign bodies collected in the wound. The blood, in such cases, rarely if ever comes from such arteries as have been tied or twisted. After the first two or three days, the *hemorrhage* which is denominated *consecutive* never takes place but by exudation, the premature cutting through of the arterial trunks, or the loosening of the ligatures. It has been thus seen from the eighth to the thirtieth day. M. Guthrie saw it on the twentieth, thirtieth, and even fortieth day. It appeared in one of M. Roux's patients at the end of the thirty-fourth day. It is difficult to explain its appearance in such cases without admitting a diseased state of the vessels. In fact, the ligature scarcely ever requires more than two or three days for the effectual obliteration of the arteries. In my own practice, I have seen the ligature of the radial and ulnar arteries, of the dorsalis pedis, and even that of the brachial, both after amputations and operations for aneurism, come away on the third and fourth days without any hemorrhage resulting therefrom. The accident, then, in the cases referred to must be ascribed to an exhalation from the wounded surfaces, or to some ulceration in the tunics of the arteries themselves.

If the bleeding is not profuse, and the patient retains his strength, we need be in no hurry to arrest it. If it is only from the small arteries, they soon cease of themselves, and the bleeding from them is a kind of hemorrhage, which is rather useful than injurious. In other cases we begin by cooling the part, and keeping it wet with cold water. If that is not sufficient, we apply the tourniquet, the garrot, or some other means of compressing the track of the principal artery. Supposing that even this may not be effectual, we take off the dressings to clean the wound, and search and tie or twist the vessel which gives the blood. After the first twenty-four hours, the coats of the artery have undergone so much softening, (*ramollissement,*) that they are easily cut through by the thread, so that the ligature can no longer effect a solid obliteration. It might be advantageous then to imitate M. Sanson, by cutting all the tissues around their bleeding extremity in a circular direction, so as to make a cone, whose base would be formed by the wound, and whose apex, to which the thread should be applied, would be formed by the body of the vessel itself.

When these means are insufficient, or impracticable, we may try direct pressure, with agaric, lint, or sponge, and by some means or another stop up the wound. Plugs sprinkled with resin, or dipped into Rabel-water, (*l'eau de Rabel,*) or some other astringent liquid, or, even if it were possible so to do, the fingers of assistants, who should successively relieve each other, or some apparatus constructed on the principle of that of J. L. Petit, and to be employed for the space of from twenty-four to forty-eight hours, would often

be found to succeed. A last resource consists in searching for the principal artery of the part, and tying it at some distance above the wound. The kind of ligature that Delpech, Dupuytren, Sommé, MM. Roux, Ghidella, and some others have used with success, has nevertheless failed in many cases cited by M. Guthrie, or reported on the authority of M. Blandin. Again, we should not class under hemorrhages the exudation which almost always wets or soils the dressing, the napkins, and even the pillows, on the first or second day. This exudation, which soon dries and produces a great deal of stiffness in the dressings, is composed principally of a viscid serosity, rather than of blood. Moreover, while the force of the pulse is preserved, and the paleness does not increase, cold ablutions and the tourniquet will be quite sufficient, if, in fact, any thing is necessary.

§ III.—*Various Inflammations.*

If the inflammation which naturally ensues from the wounds of operations should take on the character of erysipelas, angioleucitis, or phlebitis, it comes under the class of accidents.

A. Ordinary *Erysipelas* is in general announced by chills, restlessness, loss of sleep, acrid heat of the skin, nausea, and much thirst. We afterwards notice, in the neighborhood of the wound, red patches, with scalloped edges, (*à bords festonnés*,) slightly elevated upon the surface of the healthy skin. When this kind of phlegmasia is not traceable to the constitution of the patient, nor to atmospheric influences, it is almost always caused by morbific matters retained or stagnating at the bottom of the wound. We remedy it by removing the plasters from the skin, if any have been applied, and by giving free issue to the offending collection, enveloping the whole part, in its naked state, with warm poultices, and observing the course adopted in the general treatment of erysipelas.

[*New and successful Treatment of Erysipelas Proper by Sulphate of Iron.*

Since this edition was published in 1839, Professor Velpeau has investigated the nature and treatment of erysipelas, *properly so called*, or ordinary erysipelas, in a more special manner, the results of which investigation are contained in a very recent paper published by him in the journal of the *Annals of Surgery*, at Paris, for February, 1842; from a copy of which, kindly transmitted to us by the author, expressly for this American edition of his work, we make the following *abrégé*, or summary:

I.—*Nature and March of Erysipelas.*

The experience which I have had, says M. Velpeau, and the observations which I have collected during twenty-five years past, authorize me to establish, among other facts:

1. That in a surgical point of view, the *predisposing cause* of erysipelas lies much more in inflammation produced by external atmospheric or meteorological influences, than in the condition of the health or general constitution of the patient.

2. That the *determining*, or *occasional cause*, may almost always be recognised in a wound, or in a crustaceous condition (*état crouteux*) of the part, or any irritation whatever, in some point upon the surface of the integuments.

3. That its *efficient cause* is in general a matter coming from without, or from degenerate (*dénaturés*) tissues, and mingling itself with the fluids of the diseased region, either secondarily or from the beginning.

4. That the fluids thus changed produce two orders of morbid phenomena, viz.: general and local; the first before the second when there takes place at first the introduction of the fluids into the general circulation; the second before the first if the change is effected only by direct absorption, (*imbibition.*)

5. That in the diseased inflamed skin, the fluids changed by the morbific element do not seem to circulate and advance but by *endosmosis;* so that, progressing more and more, and extending superficially and not in depth, the erysipelas spreads upon, or into, the dermis, in the manner of oil on a flat surface.

6. That a great proportion of the morbific matter remains, even to the termination of the disease, under the epidermis, or in the dermoid tissue, mingled with the blood in the inflamed organic region, (*plaque.*)

7. That the totality of an erysipelas is almost constantly formed of a number of small successive erysipelatous inflammations.

8. That an isolated erysipelatous patch (*plaque*) generally disappears of itself at the end of four to six or eight days.

9. That the duration of the whole disease is thus extremely variable, in consequence of the number of erysipelatous patches which succeed, or are superadded to the others.

10. That the remedies, whether internal or external, intended to remove such a disease, should have a special tendency to effect a modification of the blood.

Treatment of Erysipelas.

M. Velpeau states that his experience, to the present, extends only to *external* remedies. He has treated *one thousand cases*, or about *sixty* per annum, at his hospital, of which he has taken minutes of only *four hundred.*

Since the time he has drawn the line of distinction between erysipelas and other inflammations, twenty-five of these cases have been treated by *compression.* In these the erysipelas continued from six and eight to twenty days. The redness diminished under the bandage, but the itching continued, and also the pain on the points that were compressed. The inflammation continued to spread. If, says M. Velpeau, I once thought otherwise, it was because, like

the rest of the world, I confounded *erysipelas proper* with diffused phlegmon, angioleucitis, and phlebitis.

He made trial in *thirty-three* cases of the temporary *blister*, on the centre, and to beyond or only on the margin of the diseased regions; but in no case was the disease shortened; and it can afford relief only in the phlegmonous form, or in angioleucitis.

The *nitrate of silver*, (*azotate d'argent*,) in its natural state and concentrated, and also in all its modes of application, gave no better results.

Twice only he used the *hot iron*, after the mode of M. Larrey.

In *two hundred* he used the *Neapolitan* ointment, and without effect. "*The mercurial ointment*," he says emphatically, "*neither cures nor arrests erysipelas.*" It may shorten it, perhaps, a day or two, or render it a little less painful, the only reason for which I still sometimes use it, and for which it would still be in use, but for the repugnance patients have to it, the *danger of salivation*, and the soiling of the linen.

We find that *hogs' lard* (*axonge*) in *twenty-three* cases moderated the erysipelas, but did not abridge its duration—and was of less efficacy than mercurial ointment.

The disease in *twelve cases* was *aggravated* by an ointment of four grammes (*seventy-two grains*) of *white precipitate* to thirty of lard.

Sulphuric acid in *ten cases*, applied as a lotion on the skin, had no sensible effect.

The *hydrochloric* (*chlorhydrique*) *acid* in ten cases was not more satisfactory.

The *citric and tartaric* acids, the *oxycrate* (vinegar and water) and *salt and water*, (*eau salée*,) or solution of *chloride* (*chlorure*) of *sodium*, were each employed in six separate cases and without effect.

In six cases, the *nitrate acid of mercury*, in three as a lotion and in three as a caustic, proved useless.

Camphor and the *bird-peck punctures* (*mouchetures*) were equally unavailing.

Professor Velpeau had in despair renounced all the above remedies, though practitioners still believe in the efficacy of the blister, nitrate of silver, mercurial ointment and lard, until his attention was drawn to the *changes effected upon the blood by the preparations of iron.*

3.—*Special Local Application.*

Impressed with the idea that the inflamed tissues in erysipelas are impregnated with blood and altered fluids, he asked himself the question, if *ferruginous* applications might not have some efficacy upon a disease so superficially situated. In forty cases he determined upon a formula of the *sulphate of iron* in solution of thirty grammes (*nine drachms*) to about forty oz. (*par litre*) of water, or as an ointment of eight grammes to thirty of lard—after having tested it in various other proportions.

In *forty cases* the following were the results:

First, In a man in the prime of life with an erysipelas in the front part of the leg, caused by an ulcer from operation for varices, cloths wet with the sulphate of iron effected a cure on the third day.

Second, Same cure in a man of forty, for erysipelas in the face.

Third, In a young man with erysipelas on the forehead, nose, eyelids, cheeks, and upper lip, supervening on the tenth day, from a very extensive pain in the head. On the day after the use of the solution of iron the redness faded, the surfaces became wrinkled, and on the third day the erysipelas had disappeared.

Fourth, In an old man a vast erysipelas on the thigh and hip, above and below a sluggish abscess, (*abcès froid*,) the solution of iron was used on the first day, and the disease disappeared on the next.

Fifth, In a patient aged thirty-two, with erysipelas on the right side of the face. On the second day the solution; on the third the part wrinkled; the solution is neglected; on the fourth day the nose, eyelids, and forehead are involved; on the fifth day the solution and the patches disappear, but the left cheek and ear are attacked; on the sixth the cure was effected, and the itching ceased.

Sixth, seventh, and eighth cases, In three women the same symptoms and results.

Ninth, tenth, and eleventh, The same result in an erysipelas in the neck of a man in whom M. Velpeau tied the carotid, and in a boy who had erysipelas on the arm and shoulder, and in a man who had it on the thigh.

Twelfth, thirteenth, and fourteenth, An erysipelas of one, two, and three days on the lower half of the leg, with some outward appearances of angioleucitis, disappeared in twenty-four hours use of the solution, in three young men.

Fifteenth and sixteenth, In a man—abscess in the thumb—angioleucitis in the forearm—solution of iron; on the second day forearm redder; third day, erysipelas on the arm and shoulder—a measles-like eruption on the chest—solution; on the next day there was no redness but on the points which had not been covered by the compresses.

Seventeenth and eighteenth, An intense erythema, the consequence or effect of large burns in the hand in one case, and in the foot in another, in two women, treated by the solution, disappeared in twenty-four hours.

Nineteenth, twentieth, twenty-first, and twenty-second, In these four cases the disease was also immediately cured, but as it had already existed for many days, the author could not say that the sulphate of iron had any great part in the cure.

Twenty-third and twenty-fourth, In a woman recently operated upon for a tumor in the breast, and in a man affected with varix in the legs, erysipelas of great extent, after four days of previous restlessness, appeared on the thorax in the first case, and on the head in the second; in this latter the disease continued seven days, and even reappeared on the twelfth day after some premonitory symptoms, but spreading from one point, extended over almost the whole of the head, chest, neck, and arm.

In these cases, as in the others, the new patches of erysipelas never lasted over one or two days. He adds that the ointment, which, though less efficacious, is more convenient than the solution for large surfaces on the trunk, was used in these two cases.

Every thing succeeded in the same way as in the sixteen other cases.

Unless, therefore, says M. Velpeau, numerous and remarkable coincidences have on this occasion deceived me, as so often happens to others, there is good reason to believe in the efficacy of sulphate of iron as a topical application in erysipelas. In *no* case did the inflamed surface resist this means over twenty-four to forty-eight hours. It is only strange that the spreading (*ambulant*) erysipelas, extinguished at the point of its origin, continued, nevertheless, under this treatment to develop itself, even upon regions already covered and wet (*enduites et imbibées*) with the preparation of iron. Can it be that this remedy, like so many others, may be curative but not preventive? Is it necessary, in order that the inflammation should be modified, that it should be completely established?

The researches I am continuing to make will, perhaps, enlighten us on this subject.

The learned professor remarks, that he has also essayed the sulphate of iron in angioleucitis, erythema, phlegmon, phlebitis, and acute rheumatism, and internally to reach the general infection of the blood in erysipelas, but all without any definite results.

Mode of Application of the Sulphate of Iron.

If cases occur where we must use the less efficacious form or ointment, the sulphate of iron should be first triturated, that it may mix well with the lard, that it may be perfectly homogeneous, and not give the sensation of sand when rubbed between the fingers; the ointment should be applied freely three times a day over the whole surface of the inflammation, and some distance beyond its margin.

The *solution* is employed on compresses wet with it every *six hours*, and fastened on by a bandage. The essential point is, that the skin must be kept constantly moistened with it.

The *antiphlogistic action* of the sulphate of iron has hitherto failed in no case where M. Velpeau has used it. An objection to it in hospitals, where economy is so essential, is, that it stains (*rouille*) the linen to an excessive degree, and that no chemical reagents yet used have been enabled to remove this color without destroying the texture of the linen. A solution of sulphuret of potash (as suggested by F. d'Arcet) does it, but its odor is too disagreeable.

When the solution of the *sulphate of the protoxyde of iron*, according to M. Quevenne, is exposed to the air, it soon decomposes; a portion of its base gradually absorbs oxygen from the air and passes to the state of *peroxyde;* but as any base whatever exacts so much the more acid to become saturated, and to constitute it a neutral salt, in proportion as it is more oxydized, it results from this law,

in this case, that the quantity of sulphuric acid primarily required to constitute the neutral proto-sulphate, becomes insufficient to effect the complete saturation of the base which is partly super-oxydized: hence we have new arrangements in the elements of the salt. The sulphuric acid separates itself into two portions, one of which rests in solution, combined with protoxyde and peroxyde, forming thus a double salt with these bases, which remains in solution in the liquor and gives it a reddish color; the other portion of sulphuric acid, much weaker than the preceding, unites with a large excess of peroxyde to constitute a sub-basic sulphate of iron, which is precipitated in the form of an insoluble yellowish powder.

Such, apparently, is the process of the decomposition of the proto-sulphate of iron employed in a state of aqueous solution for dressings: the powder of the basic sulphate of iron (*sulfate de fer basique*) precipitates itself upon the vegetable fibre, to which it not only adheres, but forms with it an actual combination. It is to be remarked, also, that this is found to be favored by the greater or less proportion of the alkaline ley which the linen retains, which latter may give rise to the evolution of a certain quantity of oxyde of iron, which also combines with the organic tissue.

This combination is so close and so tenacious when the linen is strongly colored, that, in order to remove the iron, we are obliged to employ water acidulated with $\frac{1}{20}$ of sulphuric acid, and to favor the reaction by means of ebullition a long time continued; but during this operation the tissue itself is greatly altered, and has afterwards lost much of its solidity. The portions of linen, however, which are not greatly rusted, may be bleached by boiling them in water, containing $\frac{1}{100}$ of sulphuric acid.

M. Velpeau made trial also of the citrate, lactate, carbonate, and phosphate of iron, but without success.

The sulphate only proved efficacious, though M. Velpeau modestly says his trials, even of this, have not been sufficiently varied or numerous to be considered absolutely conclusive—much, he says, remains to be explored, and that his only object in publishing his experience has been to solicit the aid of chemistry, and to present a new remedy to practitioners for a disease which has hitherto baffled the efforts of medical skill.

We are not aware that this new remedy, which we trust will attract the general attention of the profession here, has as yet been made trial of in our country. Recommended, as it now is, by the great success which has attended its application in the hands of the eminent surgeon who had the good fortune and good sense to anticipate its probable utility, by a very natural course of reasoning, based upon his original and sound views upon the pathology of the disease, we feel very confident that its efficacy will very soon be tested in America. Especially may we hope for this, and also that its curative powers may be fully corroborated in our country, where, from the extreme and sudden vicissitudes of our climate during the long intemperate cold season, and from the intense drying heat of anthracite coal, in such general use for fuel in the north-

ern and middle states during that season, erysipelas in all its forms, especially in the one under consideration, more particularly in hospitals, manufactories, &c., is probably of more extensive prevalence than in any other country. The late researches of the celebrated Liebig, on the iron of the blood, and its change from a protoxyde to a peroxyde in the lungs in passing from venous into arterial blood, favor the idea of M. Velpeau relative to the *antiphlogistic* properties of the sulphate. General antiphlogistic treatment by the lancet and purgatives, &c., though not named by M. Velpeau, must necessarily be understood by him to be advisable in young, plethoric subjects, &c.—T.]

[*Leeches in Erysipelas.*

Professor Fergusson, of London, in his late work on Practical Surgery, (London, 1842,) not only uses leeches with advantage, he says, and without any bad effect, on the surface of *raw ulcers*, but on parts affected with erysipelas. These are certainly rather novel modes of application, and, in regard to erysipelas, appear to be specially contra-indicated from the well-known fact that a formidable erysipelatous œdema, or subcutaneous infiltration, particularly in the loose tissues, as about the face, penis, scrotum, &c., is often the consequence of leech-bites—and especially to be guarded against, as all forms of erysipelas have a natural tendency to gangrene.

Suppurative or Phlegmonous Erysipelas.

Professor Fergusson remarks, that he considers one of the characteristic features of the suppurative form of erysipelas to be, that "the matter is not surrounded by an effusion of lymph, such as happens in the cellular tissue in common abscess, but, on the contrary, the [purulent] fluid seems to permeate in all directions without restraint, further than is offered by the natural firmness of individual texture, and thus it will become extensively diffused under the skin or under an aponeurosis before it will burst through either of those textures." The remark is correct in so far as there is no circumscribed boundary of effused lymph enclosing the seat of the abscess, but, nevertheless, lymph of a hard consistence is more extensively and freely deposited, as in long caky ridges or plates in the phlegmonous form and in angioleucitis, (in which latter, the enlarged and indurated and inflamed condition of the neighboring lymphatic glands is a further evidence of it,) than it is in ordinary phlegmonous inflammation. In the simple or superficial form of erysipelas proper, Mr. Fergusson justly observes, that one or more small circumscribed abscesses occasionally form, surrounded by condensed cellular substance from deposition of lymph, the same as in ordinary phlegmonous inflammation. After the inflammation, too, has subsided, he remarks with truth, that such abscesses will continue to form for some time. We have, however, seen cases of what may be called a *suppurative diathesis* of this kind in the subcutaneous tissue, where such small abscesses of an elliptical or

oval shape would successively form from no apparent cause, and without at any time any preceding symptoms or outward appearance whatever, of erysipelatous or other diffused inflammation on the surface or in the tissues. I recollect two such cases while I had charge of the Seamen's Retreat, [Staten Island, New York,] the patients being both colored persons and of adult age. The abscesses in one forming at the upper and anterior part of the thigh below Poupart's ligament, and in the other on the loose tissues about the upper eyelids. In the first the patient had been mercurialized before coming into the hospital. Neither, however, could be strictly called erysipelatous, except for this peculiarity of successive formation of small, regularly formed, circumscribed, purulent subcutaneous collections. They were all speedily cicatrized by *freely laying* them open to the bottom of their cavities, (a practice too much neglected,) and by generous treatment internally, and tonics. The matter in these cases appeared to be more attenuated, and more rapidly collected than healthy, well-digested pus.—T.]

B. *Phlegmonous Erysipelas*, or diffused phlegmon, which takes place most frequently from the third to the twelfth day, is manifested by a deep-seated, dull pain, heat and swelling throughout the whole thickness of the part, while at the same time there supervenes a more or less active fever, together with all the symptoms of an unrestrained inflammatory reaction. Here the inflammation sets out from the wound itself, and extends to the cellular tissue, which unites, surrounds, or separates, the muscles, vessels, nerves, skin, and aponeuroses.

As it is often also caused by the retention of pus, it is important to give free exit to this secretion, and therefore to make some depending opening for it, by removing a part of the agglutinating dressings which may have been applied to the wound. At the same time we must employ emollient cataplasms, and it is in this kind of inflammation that it may be necessary to recur to large bleedings, and to apply a large number of leeches to the inflamed parts.

C. *Angioleucitis*, which almost all pathologists, and practitioners still more frequently, confound with one of the two preceding inflammations, or with phlebitis, begins like ordinary erysipelas, by irregular chills, much restlessness, heat, and dryness of the skin, burning thirst, nausea, or even vomiting, and also loss of sleep, and sometimes acute fever. After these first symptoms, it is found that the neighboring lymphatic glands increase in volume and become painful; then the vicinity of the wound becomes surrounded with patches and kernels, or reddish-colored bands, painful to the touch. Sometimes, also, similar striæ extend from the wound to the painful glands, but this last symptom is far from being constant. Angioleucitis is distinguished from erysipelas in this, that the inflammation which characterizes it is deeper seated, and develops itself under the form of kernels, (*noyaux*,) rather than of patches, (*plaques*,) that it seems to extend itself from the parts within towards the surface, that it has no fixed and well-defined limits, nor irregular margin elevated above the skin.

Its causes are the same as those of erysipelas, or diffused phlegmon. The treatment required consists of emollient dressings, general bleedings, and leeches in the neighborhood of the wound or the inflamed glands; but all this more sparingly than in diffused phlegmon, while at the same time we are not obliged to give as much attention to the burrowings that may exist at the bottom of the wound.

§ IV.—*Purulent Infection.*

The most formidable accident, unquestionably, that can occur after operations, is that which is known at present under the name of purulent infection, and which comprises also phlebitis. As it is seen quite often after small, as well as large wounds, and as it has been the subject of numerous researches since I pointed it out to the attention of practitioners, in 1823, and afterwards, in 1826 and 1827, I feel it incumbent on me to treat of it here in some detail. What has been more recently said upon this subject by Mareschal, Dance, Rose, Legallois, MM. Arnott, Blandin, and Tessier, not differing materially from the first descriptions and explanations which I gave of it, I shall, in consequence, have nothing to change in the substance of the article which I devoted to this kind of accidents in the first edition of this work.

A. *Symptoms.*—The march of the symptoms in such cases varies considerably. Sometimes they commence with a violent chill, which amounts occasionally to shivering, (*tremblement,*) and may last several hours; at other times with horripilation, and in other cases with mere coldness of the extremities. The skin becomes pale, assumes a yellowish tint, somewhat livid or bluish, and soon after a more or less earthy aspect. In contradistinction to marsh intermittent fevers, which resemble this in more than one point of analogy, this first period is rarely followed by a perfect reaction. If sweating takes place, it is unequal, and often unctuous, or clammy, (*poisseuse.*) After these symptoms have reappeared several times, under the form of exacerbations, at irregular intervals, they are ordinarily succeeded by a state of putridity, or adynamia, of a remarkable character. The eyes sink in their sockets, and become covered with a grayish bleariedness, (*chassie grisâtre.*) The conjunctiva, which is sometimes tumid, becomes yellow, as well as the circumference of the lips, while the whole face appears more or less dull. The tongue, which continues generally moist, without being very broad or pointed, as in intestinal affections, does not become incrusted till at an advanced period of the disease. The teeth and lips become merely of a sooty color. The pulse is frequent and hard, without being quick, and afterwards becomes smaller and smaller, and more feeble. Tympanites, sometimes diarrhœa, rarely delirium, though almost always stupor, now soon supervene.

In addition to these symptoms, we find in some patients vague indications of visceral inflammations. Sometimes a livid redness

is observed at intervals upon one or both cheeks, accompanied with slight cough, or pains in the chest and difficulty of breathing; sometimes a jaundiced suffusion, more or less developed, together with pain or uneasiness in the hepatic region or right shoulder; or, what is more rare, desire to vomit, with inflamed papillæ (*rougeur pointillée*) on the apex and margin of the tongue, which then becomes dry, as in dothinenteritis, or typhoid fevers; there are also, sometimes, acute pains in some part of the limbs, for example, in one of the larger joints. Sometimes there forms, in remarkably rapid succession, at different points of the surface, a series of purulent collections, or gangrenous inflammations, with swelling of the conjunctiva and destruction of one of the eyes. The thirst is not generally great. The breath, which is often fetid, exhales sometimes a strong odor of pus. The progress of cicatrization is also arrested in the wound; the lips separate, and also become pale, like the rest of the surface. Viscid and cream-like as the suppuration was in the beginning, it now suddenly becomes grayish, grumous-like, or resembling vitiated serum. It is not uncommon to see it wholly and instantaneously suppressed. The swelling of the soft parts then subsides with the same rapidity, and they immediately assume a strikingly cadaverous aspect. The muscles, bones, &c. separate from one another, as if the cellular tissue, which united them in the healthy state, had been destroyed. At a later period, blood oozes out in a more or less limpid state, which terminates, when the disease continues a long time, by taking on the character of washings of meat, and by causing hemorrhages which nothing can arrest. The patient, finally exhausted, dies from the twelfth to the twentieth or fortieth day.

B. *Pathological Anatomy.*—On opening the dead body, we find various lesions, all traceable to one cause. They consist chiefly of numerous points of suppuration in the tissue proper to the viscera, or collections, more or less abundant, in the serous cavities, of a grayish cream-like serosity, more of a *purulent* character than mixed with flakes. In some patients the large articulations, such as the shoulder, hip, or knee, are also found filled with the pus, which substance is likewise frequently met with, whether as a deposite or infiltration, wherever there exists relaxed cellular tissue to a certain extent, and also in all those localities where the least degree of pain was noticed during life. The arteries are almost always empty, or the blood they contain is found, in general, in a state of great fluidity. That in the veins is more abundant in quantity, and is still more evidently changed. The small clots that are here and there found in it, are of a mixed color, black, yellow, white, or greenish, and of a granulated texture, which is easily perceived on cutting into them, or breaking them down between the fingers. They sometimes enclose globules of pus, recognisable to the naked eye. Not unfrequently we find actual purulent centres (*véritables foyers purulents*) in the interior of the larger clots. I have observed some of these in every part of the venous system; in the iliac and uterine veins, and in the inferior cava, chiefly under the

liver and at its entrance into the auricle ; also in the superior cava, and in the principal cavities of the heart, &c. Many of these concretions are also soft, and are evidently only of some few days formation. Others have such a consistence, and are so dry, or friable, that it is evident they are not of recent formation. In the great majority of cases they have no pathological relation to the state of the vessel, in the region which corresponds to them, in the interior of the splanchnic cavities. It is entirely the reverse in the vicinity of the wound, where nothing is more common than to see the inflamed veins in a state of complete suppuration, both in the interior and the exterior, and that to a greatly variable extent, but never, however, or rarely, involving the two cavas.

I. *Abscesses.* The small abscesses which I spoke of in the beginning have been observed in all the organs. A subject which I examined at Tours, in 1818, had some dozens of them in the *brain* and in the tissue of the *heart.* A young man who died at the clinique of the faculty in 1825, from the effects of amputation of the ear, had them also in the *spleen* and in the *kidney.* The *lungs* and *liver* are not less frequently the seat of them. It is in these organs that they have always been recognised, and where they are found to exist when no traces of them are discovered elsewhere. Their characters are so well marked that it would be difficult to confound them with the results of an ordinary inflammation. In the first place, they scarcely ever exist singly, but most frequently a great number are found in the same part. The superficies of the organs seems to be more favorable to them than the deep-seated tissues. They but rarely acquire large dimensions. Under this point of view, they vary from the size of a pin's head to that of a large walnut or a small egg. By pressure we are enabled to distinguish them as so many tubercles, through the parenchyma of the lungs, whose periphery is as it were embossed by those that are more superficial. Often they appear to have an ecchymosis for a nucleus. In the liver, they are enclosed in an organic layer of a blackish or livid color, which is sometimes of several lines in thickness. They are more usually formed in the centre of the organ, and are generally larger than in the other parenchymatous structures. The substance of which they are composed is still more diversified ; very limpid, and greenish, flocculent, or of a milky whiteness in their centre, and very frequently grumose or concrete throughout, *especially* towards their surface. In the lung, we are still better enabled to note their appearances. In some points, we can distinguish only small spots like petechiæ. Further on, these spots enclose a small drop of pus ; in other places, the ecchymosis no longer exists, and the grumous purulent clots alone are observable. Then we find *nuclei*, concrete, like the caseous tubercles of lymphatic ganglions, or of different degrees of fluidity, as in the liver. The substance of some of them appears to have become confounded with the surrounding tissues, and to have penetrated and become imbedded in them. Others are, as it were, *encysted ;* in others, the walls of the sac are villous, and of a red lilach or hortensia color.

Farther on, the organ is found again in possession of all the characters it has in a normal state; and they are almost always separated by intervening sound texture. In many cases, it would appear, after removing the matter and cleaning the cyst, that the organ had never been diseased, but had been under the action of a mechanical process, for the purpose of excavating its substance into separate compartments.

II. The *Effusions* in the serous cavities are equally remarkable; it is the *pleura*, so to speak, which is their common rendezvous, though they may form also in the pericardium, the peritoneum, the arachnoid, the synovial cavities, &c. After some days, they become extremely abundant; the membrane is scarcely altered in character, and after being emptied, remains covered with a layer of greater or less thickness of genuine pus, while the rest of the fluid, which is of an ashy or dirty color, is far from bearing any resemblance to the milky serum found after extensive pleurisies, (*des pleurésies franches.*)

In the articulations, we are surprised at the condition of the tissues. Neither the cartilages, capsules, ligaments, cellular envelopes —nothing, in fact, presents the least trace of inflammation; and on removing the pus from them, a simple washing has not unfrequently served to create doubts if the joint had in reality been affected. Also, the cartilaginous surfaces may be partially destroyed or eroded, and the synovial membranes and the ligaments perforated, without the contiguous parts having lost any thing of their pliability or natural color. The same takes place with the subcutaneous or other deposites in the limbs. In other cases, these devastations are surrounded with ecchymoses, and more or less evident traces of inflammation.

If some patients who perish exhibit all these different kinds of collections at the same time, and seem as it were to be saturated with pus like a sponge, there are a greater number who have them only to a partial extent. Sometimes there are found germs of a tuberculous character only in the lung and liver, and no effusion. Sometimes the collections exist only in the pleura; at other times, they are only met with in the limbs, either within or external to the articulations. In many there are none to be found anywhere, and we must then seek for the cause of death in the blood itself, more or less profoundly altered in its own vessels. I frequently observed this last fact in 1835, 1836, and 1837, in the dead bodies of subjects who had exhibited in the highest degree all the symptoms of infection, or, as M. Tessier calls it, purulent fever.

C. *Etiology.* Every wound that suppurates may give rise to the changes of which we are speaking; the trephine, a simple incision on the head, the section of varices, ordinary bleeding, as well as lithotomy, amputation of the neck of the womb, excision of hemorrhoidal tumors, and amputation of the limbs. But it was not in our times that they were first noticed. Paré (*Œuvres*, Lyon, 1633, p. 269, in folio) already had made mention of them, and Pigrai (*Epitom., etc.*, edit. 1615, p. 368) says that on a certain year, almost

all the sick who died of wounds of the head had abscesses in the liver. Morgagni (*De Sed. et Caus. Morb.*, epist. 51, 52) describes them with some detail. Quesnay and Col de Villars (*Cours de Chir.*, Paris, 1746, t. iii., p. 36 à 41) make formal mention of them. J. L. Petit (*Maladies Chirur.*, t. i., p. 6 à 11) gives a very exact idea of them, and many modern surgeons had pointed them out in their lectures or in their writings ; but before I had described them they had not sufficiently attracted attention to lead any one to anticipate the importance that is now attached to them. In limiting themselves to saying that the *pus* had *fallen* from the wound into the organ where it was found deposited, the ancients reverted to their favorite ideas of humoralism, and proved nothing. The suggestion first made by Boyer and Dupuytren, that so much disorganization may result from simple idiopathic inflammations, which have themselves been caused by sympathetic revulsion (*le retentissement sympathique*) from the wounded part to the interior of the viscera, or be produced by the antecedent existence of tubercles, or by organic lesions that had not been previously noticed, was not calculated to awaken any very particular interest.

Struck with their frequency and importance, when I was yet at the commencement of my medical studies, I took an early occasion to make them the special object of a series of researches. Believing, from the first observation I made on this subject, at the hospital of Tours, in 1818, that I had conceived the true etiology, and confirmed in my opinion by what I afterwards saw of an analogous character at Tours and at Paris, I felt authorized to state my opinions in my public lessons, in 1821 and 1822, and then in my thesis of reception, in 1823. I maintained then, that the purulent deposites which so often supervene in the viscera, after operations, wounds, and suppurations of every kind, ought to be attributed, not to so many distinct idiopathic phlegmasiæ, but to an alteration of the blood, from the entrance of *pus* into the circulating mass, and to its transportation into the midst of the organs, whether it came from the wound or was secreted by the surrounding veins. It required some courage to advance such ideas at that time, when, in spite of the observations of Rodriguez, (*Journ. Compl. du Dict. des Sc. Méd.*, t. x., p. 150,) Erdmann, (Dezeimeri's, *Dict. de Méd.*, 2d edit., t. i., p. 100,) and Ribes, (*Mém. de la Soc. Méd d'Emul.*, t. viii., p. 614,) solidism reigned despotically in the midst of our schools, from whence the partisans of the doctrine denominated physiological, thought they had driven humoralism for ever ; in consequence of which they were, for the most part, unfavorably received. Nevertheless, the conviction which I had arrived at, and the facts which daily came to its support, did not allow me to renounce them. My residence at the Hospital of Perfectionnement furnished me numerous occasions of submitting my first thoughts to new proofs, of calling the attention of my pupils to them, and of showing how much they might enlarge the field of general pathology. The two memoirs on this subject, which I published in 1826, in the Review, and what I had already written in the same journal,

while treating of the alteration of the fluids, and what I advanced at the same time, or a little later, in the Archives, and in the Clinique of the hospitals, and the discussions which took place in the Academy, upon the fundamental proposition upon which these labors were based, finally awakened the public mind, and I soon had the satisfaction of seeing that Maréchal, (*Thèse*, No. 43, Paris, 1828,) and M. Reynaud of Marseilles, (*Thèse*, No. 232, Paris, 1828,) in their excellent theses, and Legallois, (*Journal Hebd.*, t. iii., p. 166 et 321,) in a special memoir at the same epoch, had arrived at the same conclusions as myself. While in a work still more complete, Dance (*Arch. Gén. de Méd.*, t. xviii. et xix.) deprived opponents of their last pretext, opinions supported upon facts of the same kind were professed at London by MM. Rose (*Med. Chir. Trans.*, vol. xiv.) and Arnott, (*Idem*, vol. xv.). M. Blandin, (*Thèse*, No. 216, Paris, 1824,) who, in the thesis he supported a year after mine, had adopted the hypothesis of pure and simple inflammations, and who gives the name of tuberculous masses to the abscesses in question, says, in speaking of one of his observations, *This is a most beautiful example of tubercles developed under the influence of inflammation.* M. Tonnelé and M. Rochoux have since ranged themselves under the same standard, although their theoretic views are not perfectly alike. Finally, the pathological *concours externe*, which took place at the faculty of medicine in the spring of 1831, and which afforded an opportunity to consider the question of metastatic suppuration from traumatic lesions, compelled us—to wit, MM. Bérard, Blandin, Sanson, and myself—to make known how public opinion then stood on this subject, and to give unquestionable evidence that there no longer existed any discordance of opinion on the nature of the principle with which I had set out, and which I believe myself to have been the first to lay down,—namely, that *the metastatic suppurations and abscesses caused by capital operations, are the result of an alteration of the blood.*

One problem, however, still remains to be solved. Maréchal, Legallois, and M. Rochoux, find in the absorption of the pus of which the wound forms the focus, a sufficient explanation of all the phenomena observed. Dance, MM. Arnott, Blandin, and Bérard, maintain, on the contrary, that an inflammation of the veins always precedes the general infection, and that the pus which enters into the circulation is always the immediate product of the phlebitis, which M. Blandin, (*Dict. de Méd. et Chir. Prat.*, t. ii., art. Amputation,) like Cruveilhier, unhesitatingly places in the venous radicles, (*veinules*,) whether of the soft parts, the medullary canal, or the spongy tissue of the divided bones, when the principal branches of the venous system offer no traces of it.

In the place of admitting a transfer without decomposition, a true metastatic deposite, these last authors think also that the blood, profoundly changed by its intimate mixture with the morbid secretion, merely permits here and there the escape of some of its particles that have become more irritating than usual, and that these globules, deposited in the tissues, are there like foreign bodies, (*rôle*

d'épines,) which immediately become the cause of as many centres of suppuration. This opinion, differing from mine only in this, that it supposes that there always exists, that which, according to me, happens only in some cases—it is difficult for me to comprehend how anybody has imagined that they could adduce the opinions of Dance and of M. Blandin to combat mine. In fact, far from denying the phlebitis in such cases, I had already said, in 1826, (*Revue Méd.*, t. iv.,) "The veins of the diseased limb are full of a grayish and very limpid pus, and *inflamed from space to space*, but only up to the entrance of the great saphena into the crural." Further on, I add: "The phlebitis was not sufficiently extensive, even admitting that it was primitive, to play an important part here as *inflammation*. In looking to the fluids, however, every thing is explained in the clearest manner," &c. In May, 1827, I maintained (*Clin. des Hôpit.*, t. i., No. 5) that, "in this frightful affection, (phlebitis,) authors have paid attention to but one of the causes of the danger, the facility with which the inflammation is propagated from the wounded point towards the principal venous trunks, whilst the pus secreted by the parietes of the vessel, and continually carried along with the blood, which it alters and decomposes, constitutes in reality the whole difficulty," (*en constitue réellement toute la gravité.*) Finally, in speaking of the same fact, when no one thought then of this etiology of infection of the blood by phlebitis, (*Tome* xiv., p. 504,) I said, moreover: "There the disease unquestionably was a phlebitis; but is it to the inflammation of the vein that we must ascribe all the symptoms? I think not; the pus, continually carried to the heart and distributed with the blood to all the organs, has produced the general infection," &c.

As to the formation of purulent collections, here is the theory which I gave in 1826, (*Rev. Méd.*, 1826, t. iv.): "We may explain in two ways the origin of these collections, (*foyers*): First—The blood, more and more changed from its natural composition, may begin by disturbing the organism in general, and finish by establishing a local phlegmasia of a particular species. Secondly, The inflammation, developed at first under the influence of ordinary causes, may, to a certain extent, compel the pus to be effused at the point where the organ is most irritated..... It appears to me to be demonstrated, that the inflammation, when that supervenes, is then only secondary; that is, established by an effused particle of foreign matter, *which forms a source of irritation*, (*épine*,) that it is at least a phlegmasia, *altogether peculiar, sui generis*," &c.

Thus, in my judgment, the question rested on two points: First—The mixture of the pus with the blood, as a cause of the visceral alterations observed; Secondly, The origin of this pus, whether from the blood or from the organs. The first head, which I anxiously desired to demonstrate the truth of, because it may have an immense importance in medicine, is generally now admitted as an incontestable truth. The other had not for me, I confess, the same interest. The aim of my efforts being to prove that the pus may circulate with the blood, and infect the organism in the manner

of poisons, it was of little importance for me at the time to show that it entered into the veins by absorption, or that it was simply formed on the inflamed surface of those canals, so long as it should be conceded to me that it is conveyed to a certain distance from the point of departure. The preceding quotations, however, sufficiently show that I had not altogether neglected these secondary questions.

The effects of phlebitis on the composition of the blood are so evident, that it appeared to me almost superfluous to enter into any detail to make them more apparent. It was not the same with absorption, which many sensible persons still refuse to admit, so that it is setting out from this point that a real difference seems to exist between Dance and myself. According to this author, phlebitis is the first and almost only cause of metastatic deposites, and the veins alone have secreted the pus which changes the blood. I have said, on the contrary, from the very beginning, and I believe so still, that the inflammation of the veins which we meet quite often, either as a cause or as an effect, is not indispensable; that the pus and other morbific matters of the wounded surfaces enter sometimes into the circulating fluids, whether by lymphatic absorption, by imbibition, endosmosis, or by orifices of the bleeding veins at the bottom, for example, of a wound from amputation. The proof, according to me, that this often happens is, that I have a number of times found pus in abundance in the midst of the viscera, though the veins which led into the exterior lesions were scarcely phlogosed, and that there was no trace of phlebitis on other points of their course; it is since the possibility of this fact has been denied, that I have again demonstrated its existence in a great number of cases; among others, in a woman who died in consequence of a deep traumatic lesion of the foot, at the hospital of St. Antoine, in 1829, and who was opened in the presence of M. Dezeimeris, a declared partisan of the opinions of Dance; also on one of the wounded of July, [i. e. in the *Trois Jours*, 1830,] who died on the 20th day after the amputation of the thigh, at La Pitié, in 1830, and in whom I pointed out the total absence of phlebitis to M. Bérard, who had also adopted the hypothesis of venous phlegmasia as the first cause of metastatic abscesses; also since then on twenty other different subjects.

As to the nature of these abscesses themselves, I have said that the pus traversing the tissues may be deposited there naturally, or may by its presence irritate different points of the viscera, and thus form as many different foci of inflammation or of pus, (*autant de foyers phlegmasiques ou purulents.*) Dance rejects the former of these two modes, and seems even to question its possibility. In spite of the reasons and objections he urges, I cannot yield to his opinion. If, as appears to him, the blood, rendered more fluid and altered by the pus, *always* commences by producing a small ecchymosis, and soon after a true inflammation, before causing the production of an abscess, a process which I have myself admitted in a majority of cases, it follows that he has not seen, like myself,

in the brain, spleen, kidneys, lungs, and liver, those collections, (*foyers*,) which are not larger than a hemp-seed, around which the most attentive and minute inspection does not enable us to detect the slightest lesion of the organic elements; and that he has not seen those purulent deposites which I have so frequently met with in the cellular tissue or in certain articulations, and which, after having been emptied and washed, do not leave the slightest trace of their existence in the midst of these tissues.

If the venous radicles which come from each purulent centre are sometimes inflamed, it is certainly far from being true that they are always so, or that we can admit the capillary phlebitis mentioned by M. Cruveilhier (*Anat. Pathologique du Corps Humain*, xi. livr., in fol., fig. col.) to be always present in such cases. Moreover, as soon as we admit the deposite of a molecule of morbid matter, there is no reason to refuse the possibility of a greater number. The pus mingled with the blood, is a heterogenous matter which has a constant tendency to separate itself from it, and to make its way by some channel or another towards the surface. So long as it is shut up in the large vessels, and the circulation has lost nothing of its activity, it can escape nowhere; but in the capillary system, where the movement of the fluids is only a kind of oscillation, where nutrition, the different secretions, and a thousand new combinations, as well of composition as of decomposition, are elaborated, ought not its elements to exhibit a tendency to become agglomerated and united together, and to cease to circulate with the other fluids? When this aggregation, which is altogether of a chemical nature, is once commenced, does it not tend to establish a centre of attraction for analogous molecules? Can more be required to determine the nucleus (*noyau*) of an abscess? There is nothing in this more difficult to comprehend than in the formation of bile, urine, saliva, and mucus. These latter are natural secretions and exhalations; the other, on the contrary, is a morbid secretion or exudation. That is all the difference that there is.

It follows, then, from these details, that Dance, M. Blandin, Le Gallois, &c., have scarcely done more than to reproduce, while they have corroborated under different forms, what I had said of purulent infection and phlebitis in 1823, 1824, 1826, and 1827. Let any one compare what these observers have written in 1828, 1829, and since, with the descriptions which I myself had given of this kind of lesions a long time before them, and he will without any difficulty be convinced that their labors are little else than confirmations of mine. Perhaps also I should have a right to add now, that the microscopic observations of M. Donné on this point, and the researches of another kind, to which M. Beauperthuis, Adet de Roseville, Mande, &c., have devoted themselves, come to the support of my opinions; that the experiments of M. Bonnet and of M. Denis stand in the same relation; that while denying the passage of the pus from the inflamed vessel into the circulating mass, M. Tessier, nevertheless, admits the purulent infection, and that I alone can, on this question, fall back, without rejecting

the labors of any one upon the position I maintained in 1823 and 1826.

Prognosis. Be that as it may, or in whatever way we may explain it, the metastatic collections of pus produced by serious operations are always traceable in their origin to the introduction or formation of a certain quantity of pus in the general circulation, and the prognosis is extremely unfavorable. The term *tuberculous*, which I had given to them at first, had reference only to their form; and I am surprised that any one has imputed to me the intention of comparing them to pulmonary tubercles under any other relation. The obscure and often rapid march of these lesions rarely permits us to observe their commencement, and is the reason why, at the moment when their existence is no longer doubtful, they are in general beyond the resources of art. As soon as the surgeon sees violent chills, with change in the features, continued fever, pains or not in certain parts of the body, or that a diarrhœa supervenes or not in a patient who has been recently operated upon, or who has going on in his own system any suppurative process whatever, accompanied with traumatic lesion, he ought to expect the most serious accidents, and to apprehend that death may be the inevitable result. Nevertheless, if such symptoms reappear only for two or three days, and at the end of this time a general perspiration, or some other critical evacuations, bring about the solution of the fever and arrest the organic derangements just pointed out, we have still grounds not to despair. I have seen many patients recover from genuine chills of this kind, as well as from the other signs of purulent infection. Such examples, it is true, are rare, but they do occur, and the practitioner ought not to forget them.

The *treatment* of purulent infection is not yet established upon a firm basis. Bleeding, either by venesection or by leeching and cupping, is evidently proper only in the beginning, and in robust or plethoric subjects, unless there are certain pains or local inflammation clearly defined. I have used them and seen them used, and carried as far as possible, in a large number of persons operated upon, without ever having been able to affirm any real advantage from them. The patients who have been seized with hemorrhages from the wound and from the mucous surfaces have not been more fortunate. Purgatives opportunely given have appeared to me to succeed in some cases. Large blisters to the legs or thighs, or to the parts of the chest or belly that suffer pain, are not to be lost sight of. The sulphate of quinine, when there are intermissions, and the stomach is not too irritable, is also not without its use. Tartrate of antimony in large doses, extolled first by Laennec, has not saved the patients whom I have subjected to its use. It is the same with white oxyde of antimony, in doses of from one to two drachms a day. As to the preparations of opium, camphor, ether, acetate of ammonia, and other diffusible or exciting substances, they have always appeared to me to accelerate the march of the symptoms, and in many cases to hasten the fatal termination.

In fine, when we discover the symptoms above indicated, we

should hasten to recall the fluids to the wound. We first envelop it, morning and evening, with a thick and large cataplasm of flax-seed meal placed naked on the skin. At the same time we apply one or more blisters to the legs. We give also a weak infusion of the linden or elder, to be drunk warm as a tisan. Bleeding, from eight to ten ounces, may be performed, if the pulse is strong, and the patient has not yet been reduced. In case the wound is pale throughout, and the tissues have no longer their original firmness, we must wash it at each dressing with a decoction of bark, and cover it with lint besmeared with storax and balsam of Archæus mixed with cerate. Should it have swollen and inflamed, or have exhibited signs of phlebitis from the beginning, a large blister on the stump would also be indicated. Compression by means of a roller bandage, from the upper part of the limb to the wound, is another means to be employed so long as the disease has not infected the system, and continues to be local. After these first means, we may give Seidlitz water as a purgative, or pullna water internally, provided the tongue remains soft and is not red. Emetics in small doses ought not to be administered till a later period, and after the accession of stupor, tympanites, or a sooty appearance of the mouth. Bark, in decoction or in substance, is not proper till the typhoid state is clearly established. We give it in union with gum or rice-water when there is looseness, or the digestive organs do not bear it well. The sulphate of quinine, in the dose of from five to eight grains at once, at the end of each exacerbation, would be more proper when there had been an intermission and sweat. [If there were in reality any similitude whatever in the pathology of this terrific and peculiar disease, and that of fevers of an intermittent type, then might we hope for benefit from the quinine treatment now after the proper preliminary steps of depletion or otherwise have been taken, proved to be a positive specific in such fevers, and more entitled to the name of a *specific* than any other medicine whatever. But recent experience has also established the fact, that to be made a specific, and to give full effect to its virtues, it must be administered, not in small, futile, and tantalizing, if not irritating doses, but to the extent of *at least* twenty-five, and *more frequently fifty* to *one hundred* grains at once, *twice in twenty-four hours*. In the intervals, the paroxysm never returns, and the only inconvenience following is a slight ringing or deafness in the one or both ears, and occasionally a little giddiness. This practice was first introduced by myself while I was Physician to the Seamen's Retreat Hospital, N. Y., 1831–2–3, and is now general in Europe, but more so in this country, and especially in our army.—*T.*] The drinks ought, moreover, to be varied according to the predominant symptoms and the desire of the patient. Vegetable and mineral acids, acidulated decoctions of tamarind, &c., will be preferable if the thirst is considerable. In the contrary case, infusions that are slightly bitter or aromatic agree better. Decoctions of rice, barley, gruel, and rhatany, and the white decoction, diascordium, gum kino, and the cashew nut, and extract of

rhatany, are also to be used when the bowels are loose, or a copious diarrhœa is exhausting the patient. In fact, the whole of this treatment, being the same exactly as that of phlebitis and purulent absorptions in general, cannot be but imperfectly given in this place. It is in treatises of pathology that we must seek for its details. My object has been to give only the summary of it, which was necessary in order to excite the solicitude of the practitioner, and to warn him against the dangers of a false reliance upon a mode of cure whose efficacy is yet so unsettled.

For details relative to alterations of the blood in general, I must, in respect to my own researches, refer to the theses which I supported in 1823 and 1824, to the memoirs which I inserted in the *Archives de Médecine* in 1824, 1826, and 1827, and in the *Revue Médicale* in 1825, 1826, 1827, 1829, as well as in the *Clinique des Hôpitaux* for the year 1827.

[Mr. Mayo remarks, that wounds from dissection are less apt to produce the peculiar train of distressing symptoms from this source than wounds from post mortem examinations, because the subjects in the former case are more usually in a considerably advanced state of decomposition, the absorption of the products of which lead ordinarily to a series of much milder symptoms than the poison from the secretion of inflamed serous membranes, in existence, even sometimes a few hours after death. Mr. Mayo recommends the student, if he should prick himself, to wash the wound, suck it strongly with his lips, and bind a strip of adhesive plaster an inch wide twice round the part, and not to remove it for three days; and if the subject be recent, or have died of puerperal fever, phlebitis, or peritonitis, it is well, also, after cleaning and sucking the wound, to touch it with the point of a probe that has been dipped in nitric acid. Medical Gazette, Dec. 17, 1841.—*T.*]

[*Late Experiments of M. D'Arcet, M. D., on Purulent Infection.*

M. D'Arcet (*Thèse—Recherches sur les Abcès Multiples*, &c., Paris, 1842.—See also *British and Foreign Med. Review*, Jan. 1843) seems to think that purulent infection is agreed on all hands to be owing to the presence of pus in the blood. According to his experiments, however, the opinion, that where these purulent deposites are found none of the usual evidences of inflammation are present, but that the pus seems as if deposited without any previous process of the kind, is entirely erroneous. On the contrary, he says a red spot of inflammation precedes their appearance—and where pus is actually present, coagulable lymph is deposited around it, which becomes organized and resembles a cyst, the internal surface of which is as flocculent as that of the chorion.

M. D'Arcet found that healthy pus of phlegmonous inflammation absorbed through living intestine, a volume and a half of oxygen gas producing only a *fifth of carbonic acid* gas—and that the pus-globules then ran together and formed an amorphous coat, or layer, floating on the subjacent liquid. By exposure to air the whole became offensive and putrid, without the layer becoming redissolved, which

last, separated by the filter, left a *yellowish green fluid*, blackening silver, and evidently containing *sulphureted* compounds upon which a portion, yet not all, of the poisonous properties depend, seeing that these remain when the former have been removed by mixing litharge with the fluid. Injecting the above insoluble inert amorphous layer, after it had been repeatedly washed, into the jugulars of rabbits and dogs, the effects, where it did not kill immediately, were hurried respiration, hard, frequent pulse, and death within forty-eight hours, quietly and without diarrhœa or vomiting. *Phlyctænæ* were found in the lungs, sub-pleural ecchymoses penetrating into the parenchyma with a nodule of well-marked hepatization in their centre. In two instances (dogs) where the lungs were covered with ecchymoses, a circumscribed purulent deposite, identical with those met with in man, was found in several of them. In both cases, also, there was effusion of serum in the cavity of the pleura. None of those terrible symptoms seen in man were present. There was disease and death, but no *diathesis*. These effects, corresponding to those from injection of quicksilver by Cruveilhier and Gaspard, of powdered charcoal by Magendie, of cerebral substance by Dupuy, of the blood of the slug by Gaspard, and of particles of gold by D'Arcet himself, he attributes to a common cause—the insoluble, amorphous, and pulverulent nature of the substances injected, rendering them incapable of elimination, and, from *their size*, of circulating in the capillaries. The effect was always a local lobular phlegmonous inflammation in the part. On injecting, however, after freeing it of all insoluble matters, the *yellowish, green, putrid fluid* above, which resulted from the spontaneous decomposition of the pus, the results were, first, hiccup, vomiting, diarrhœa, rigors, fever, dyspnœa, followed by marked adynamia, depression, stupor, involuntary evacuation of urine and fœces, pale appearance of the mucous membrane, different hemorrhages, abdominal pains, and the most complete prostration, and death in *five* hours. On dissection, the lungs were found of a *violet color*, infiltrated and indurated as in œdema, their surface covered with small spots of sub-pleural and interlobular ecchymoses. Similar ecchymoses existed in the spleen, liver, and intestines; the inner membrane of the aorta was reddened; the blood *fluid, black, greenish*, containing grumous portions *which broke down under the fingers*, without communicating the sensation of fibrine. These effects show a general diathesis and disease of the whole system, the *poisonous liquid*, like a leaven, having communicated its deleterious properties to the whole blood. In injecting healthy pus before it is decomposed, M. D'Arcet only twice in eleven or twelve experiments obtained purulent deposites. In most of the cases the putrid symptoms alone supervened, whether the pus was human or of the animal.

He finds in the above results an entire correspondence with those in man, and considers *purulent absorption, phlebitis, purulent infection*, and *purulent diathesis*, a *complex malady* of *two distinct* classes of phenomena often confounded:

1. A disease of the respiratory, hepatic, or other organs; a local

inflammation dependent on a mechanical cause, the capillary tissue being embarrassed by insoluble or pulverulent principles developed in the pus by its exposure to the oxygen of the air, (in the lungs,) and not producing other constitutional effects than those of phlegmonous inflammations of the same organs.

2. A miasmatic poisoning, caused by the absorption and circulation of some principles of the pus, itself becoming putrid, acting on the blood in a special manner, and producing grave general symptoms, especially characterized as adynamic—such as indicate a class of diseases where the entire organization is intimately deranged, as the plague, typhus fever, purpura, glanders, &c.

M. D'Arcet thus explains the chemico-organic mechanism of this process: The purulent matter in the vessels reaching the lungs undergoes such changes, by the action of the oxygen, as would happen to it as an unorganized substance out of the body. Its elements separate into two parts—the globules absorbing oxygen *increase in size by their reunion*, and become incapable of traversing the capillaries, the caliber of which they obstruct, in the same way as mercury, gold, or charcoal, and hence the phenomena from those substances introduced into the circulation. The liquid part, under the same influences, acquires putrid properties, which produce the effects as described in those of the simultaneous circulation of blood and putrid matter. He does not think pus in substance can be absorbed by the capillaries—the laws of endosmosis allowing only soluble substances. But the purulent serosity of the pus, deprived of its pus-globules, is readily absorbed, and hence, in addition to inoculation, there is another road opened for putridity entering the system. M. D'Arcet had noticed, in cases where purulent deposites were found to have existed, that the urine had been albuminous during life; and to this last organic process he imputed the dispersion of such abscesses without producing harm. This sufficiently accounts for the serous or largest portion of the pus. The pus-globules are supposed to remain in the part, constituting the greasy, putty-like substance met with by Dupuytren and others in the seat of chronic abscesses which had spontaneously disappeared.—*T.*]

TITLE II.

MINOR SURGERY,

(*Petite Chirurgie.*)

Operative Surgery, such as we understand it in common language, is divided into two great sections: *Minor* (*petite*) or auxiliary Surgery, (*chirurgie ministrante,*) and *Great Surgery*. This division has nothing logical in it, and would, in truth, be difficult to justify on principles of reasoning; but it is tacitly admitted, and seems to have

for a long time assumed a place in practice. It is, besides, impossible to establish natural limits between small and great surgery. Guy de Chauliac, whose book was one of the first, if not the first, to take the title of Great Surgery, says nothing of what we are to understand by *petite* surgery, (small or minor surgery ;) and the Bertheonée or small surgery of Paracelsus has no resemblance to any that we to-day call minor surgery. Since La Faye especially, authors have appeared to understand under this last name, the surgery which in practice we allow to be performed by pupils.

In this section, therefore, are consequently given the most elementary principles of surgery ; it is under this form that the elementary book of La Faye, that of Mouton, and also that of M. Legouas have been given to the public. In our day *petite* surgery, confined to the mechanical part of the most simple processes, has become the subject of works still more exclusive, and of a nature that requires almost of necessity that it should occupy a place at the head of treatises upon operative surgery.

The embarrassment which a great number of pupils experience in the duties about the sick or in the hospitals, induces me for that reason to return to the plan which I had traced out in the first edition of this work. I have felt more and more that minor surgery was scarcely less indispensable than greater surgery, and that we cannot in reality, in a didactic work, separate these two branches of operative surgery.

In other respects, without restricting myself to a rigorous definition, I shall include under the name of Minor Surgery, (*petite chirurgie*,) every thing that relates to the dressings, bandages, elementary operations, and the employ of the means which we are in the habit of confiding to the care of pupils, whether out-door (*externes*) or in-door, (*internes*,) attached to the hospitals.

PART FIRST.

ART OF DRESSING.

We understand by Dressing, every methodical application of the mechanical and topical means, whose object is the cure of surgical diseases. They are the little operations that the pupil or the surgeon is obliged to practise every day. The art of dressing is, perhaps, the most useful in surgery. Wounds badly dressed, simple as they may have been, become serious. Without a correct application of the dressings, operations that have been performed in the best manner succeed badly. It is also important that we should study these kinds of processes with care, and devote a long time to them, if we wish to practise the profession of surgery with advantage. Lecat (*Prix de l'Acad. Royale de Chir.*, edit. 1819, t. i. p. 103) and Lombard have shown by their writings that this subject was not unworthy of the meditation even of great practition-

ers. If students of medicine better understood the real value of dressings properly applied, they would occupy themselves with the subject with more ardor and perseverance than they generally do. We would not then see them hurrying through this duty in hospitals as quickly as possible, as if it were a tax, thereby neglecting its most simple requirements.

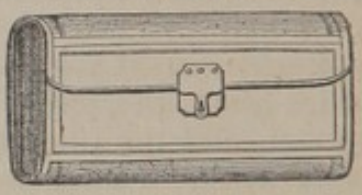
The dressings are made with the aid of instruments, topical applications, and various bandages.

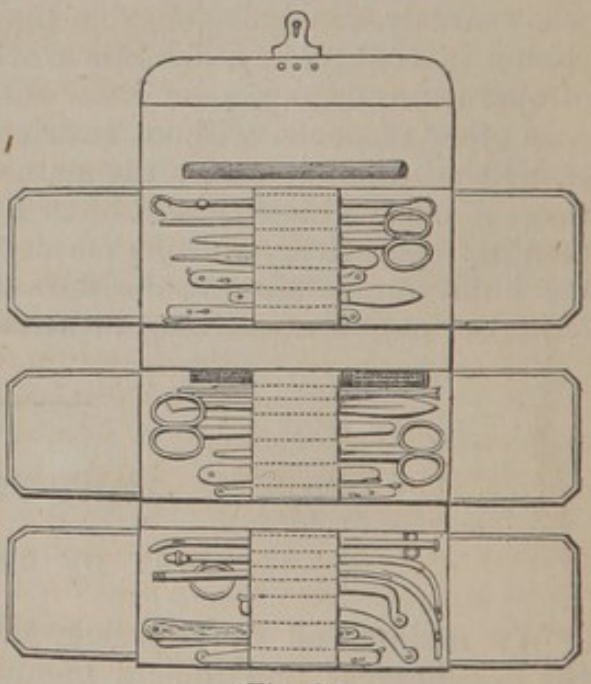
CHAPTER I.

INSTRUMENTS REQUIRED FOR DRESSING.

The articles which serve for dressing, and which every surgeon ought to carry with him, are usually collected in a sort of port-folio known under the name of the pocket-case (*étui* or *trousse*) of the surgeon, (Fig. 1.) The form of this case and its dimensions vary according to the taste or wants of each. We arrange it in such a manner as to contain conveniently a ring forceps, artery forceps, scissors, spatulas, a porte-crayon, probes, sounds, a grooved sound, a porte-mèche, thread, needles, and lancets, (Fig. 2.)

(Fig. 1.)





(Fig. 2.)

Among these instruments, to which a razor should be added, there are none which a pupil may not stand in need of, even for the slightest kind of dressing. I will not, however, speak in detail of the sounds, needles, and lancets, until when treating of catheterism, and of sutures and bleeding.

Article I.—Forceps.

§ I.—*Dressing Forceps,*

Better known under the name of ring forceps, (*pince à anneaux,*) the dressing forceps, always composed of two branches which cross and are jointed to each other in the manner of scissors, presents nevertheless some varieties in its form. The rings of the modern forceps, instead of being borne, as was formerly the case, (Fig. 3,)

(Fig. 3.)

on the extremity of each branch, are now placed entirely without their axis, (Fig. 4.) It results from this that, when shut, the instrument is reduced to a cylindrical stem, and that in opening it, we do not want as much room to obtain the same separation.

(Fig. 4.)

It is well not to have the point too blunt, and to see that the inside is cut into grooves, that it may have a better hold upon the objects. In other respects, we must take care that the joint works easy, that the instrument may be used without effort. Whether there should be any chasings near the place of union or not, is a matter that must be left to choice.

The ring forceps serves to remove the portions of dressing which cover the wounds, to carry different objects to the bottom of cavities, and to extract from cavities or the depth of wounds all those substances that should be removed. In fact, it is an instrument designed to replace the fingers in situations which the latter cannot reach without difficulty.

§ II.—*Artery or Dissecting Forceps.*

The artery forceps, which are the same that we use in dissecting rooms, resemble scarcely in any thing the ring forceps. Separating themselves by their own spring, and unable to shut without the pressure of the fingers, which generally grasp them as we do a writing pen, the artery forceps should be sufficiently pliable not to fatigue the hand, and sufficiently elastic to open readily; also grooved like a file in the middle portion, (Fig. 5,) that they may not slip through the fingers. Those whose two branches are smooth and convex towards the middle outside are now scarcely ever used.

(Fig. 5.)

The forceps called *valet à patin*, (Fig. 6,) and which, by means of a cross piece and double button, are kept open at such space as we desire, are also rarely now in use. I shall, however, have frequent occasion to speak of them in the course of this work.

(Fig. 6.)

(Fig. 7.)

The same remark applies to the different kinds of spring forceps, (*pinces à ressort*,) and grooved forceps, (*pinces à coulisse*,) (Fig. 7,) that are designated at thepresent day under the name of torsion forceps.

The artery forceps, still known under the name of the ligature forceps, are at first designed to seize hold at the bottom of wounds of the different vessels which we intend to tie or twist. They afterwards serve to remove shreds, eschars, and foreign bodies, of which it is proper to free the wound or injury. In fine, we employ them to maintain or to fix in a deter-

minate position the edges of certain wounds, the borders of certain natural folds, and the different layers of tissues that we find it useful to divide in the course of operations. It is true that we can, in a great number of circumstances, substitute the ring forceps for them, in the same way as this latter might be sometimes replaced by the dissecting forceps. Only that we soon find from practice that this last is better adapted to objects that are loose, (*déliés*,) slippery, or moveable, and the other for cases which require less force, attention, or address.

A dissecting forceps ending in three small mouse-like teeth, two on one side and one on the other, is, in a number of cases, of extreme advantage. It would be advisable, therefore, to add this to the others in the common pocket case.

Article II.—Scissors.

After the forceps, the most indispensable instrument in dressing is that which is called scissors. I do not mean to speak here of the specific kind of scissors required for hare-lip, staphyloraphy, excision of the tonsils, and certain polypi, or, for example, for the different operations practised on the eyes. Those which serve for dressing are of three principal kinds: the straight scissors, (Fig. 8,) (*ciseaux droits*,) the scissors curved on the flat part, (Fig. 9,) and those curved on the edges, (Fig. 10.)

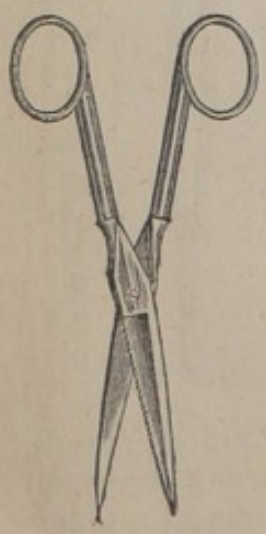
(Fig. 8.)

(Fig. 9.)

(Fig. 10.)

Formerly the ring of all these kinds of scissors was, like those of the dressing forceps, fixed at its middle to the extremity of the handles. At present, good workmen do not any longer make them in that way, and they are now placed on the outside of the handle. These instruments, which, as with forceps, may be made of steel, silver, or even gold, ought to be very sharp, and not catch (*se macher*) upon the blades. As the objects placed between their blades tend to escape by pressure, a cutler named Mericant has contrived a scissors, one of whose cutting edges has a great number of small indentations upon it, (Fig. 11,) similar to those of a sickle, the object of which is to prevent the slipping spoken of. It is a modification that I have made use of, but it appears to me of little value. It does not absolutely hinder the tissues from escaping, and the cut the instrument makes is not so neat. The sliding that the artist Mericant wished to prevent is besides often more advantageous than hurtful.

(Fig. 11.)



The straight scissors are used to cut the different portions of linen, lint, or plaster that we have

need of. It is to these, also, we have recourse for the section of the tissues that are not to be divided with the bistoury.

We use the scissors that are curved on the flat of their blades, to remove excrescent growths that we wish to excise at the surface of the skin, or at the bottom of some cavity. They may also prove of use for making holes in certain compresses, and for giving a particular form to certain wounds.

As to the scissors that are curved on their edges, they are now scarcely ever used. Formerly they were frequently used, by guiding their convex branch upon a grooved sound into cavities whose external opening it was desirable to enlarge; but we have everywhere substituted the straight scissors and bistoury for them, and with advantage.

There is no necessity of pointing out the manner of holding the scissors. Natural instinct alone, and the example of all women, suffice to enable us to understand it. Besides, we shall speak briefly of this under the article on incisions.

Article III.—Razor.

Almost all dressings require the use of the razor. In men especially, there are few parts of the body where the skin is not covered with hair. Whether we are treating a wound, or, for some cause or other, have occasion to apply a fatty substance, unguent, or plaster, &c., to the teguments, these hairs collect in irritating masses, or are glued together to portions of the dressing, so as to render each dressing more or less painful. It is easy to see from this, that it is always proper to shave the regions destined to receive the portions of the dressing, or that are to be operated upon. If the customs in use formerly, which, so to speak, forced the pupil of medicine to learn with a perruquier the art of handling a razor, tended to degrade the profession of the surgeon, do not those of to-day, which do not exact of the student any exercise of this nature, possess the disadvantage of rendering him less dexterous?

Article IV.—Spatulas.

(Fig. 12.)

The spatula is a metallic blade, (Fig. 12,) slightly curved. That which we generally use in France, terminates at one extremity, after the manner of an elevator, in a beak with which, as with a lever of the first kind or with a scraper, we may displace certain hard bodies. The other extremity represents a blade in form of a sage-leaf, with the edges a little blunt, and shelving on both sides.

The uses of the spatula are to extend and equalize in all directions topical applications of a soft consistence, wherever they are placed. We also use it to remove plasters and other objects which may adhere to the skin, and to relieve this latter of scabs and fatty matters, and all other impurities which it may be desirable to take away.

Myrtle Leaf and English Spatula.—Formerly the blade of the spatula resembled rather a myrtle leaf, which name some surgeons gave to it; but under this form it was evidently less useful than the modern spatula, (Fig. 13.)

(Fig. 13.) (Fig. 14.)

Grooved Spatula.—Still more to increase its utility, M. Vidal (*de Cassis*) proposed to hollow out a groove in the spatula on its concave side, (Fig. 14.) Under this form it is an excellent director in releasing the stricture in strangulated hernia.

Article V.—Porte-Crayon.

The cases which require the employment of nitrate of silver in surgery are so numerous, that this substance is almost as necessary in the pocket-case of the student, as the spatula and forceps. As it consists of small cylinders that are brittle, and may tarnish the linen or skin, it is necessary to enclose it in a protecting instrument. This instrument, which is a species of case made of ebony, ivory, silver, or gold, contains a sort of cleft tube, opened or shut by means of a small moveable ring, and intended to hold the cylinder of the caustic, (Fig. 15.) Some porte-crayons are much more complicated; but in that case, the intention is to be enabled to change them at pleasure into a writing pencil or portable pen, and they are made with a second cavity in their upper part to hold the pieces of nitrate of silver. It is near the middle of the instrument-case that the porte-crayon is generally placed. It should never be put there after the nitrate has been moistened, until we have carefully dried it; otherwise, the caustic salt which it consists of might, in decomposing, corrode the instruments near it. The manner of using it, after removing the case, is the same as in holding a writing-pen. We touch with it the parts that are to be repressed or excited, following the rules that cannot be conveniently pointed out but in detail, under the head of each special article.

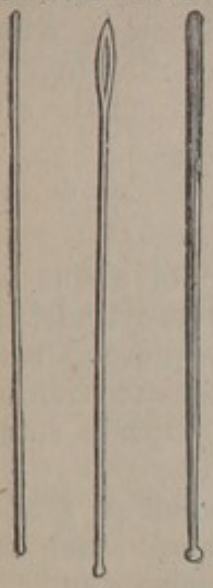
(Fig. 15.)

Article VI.—Probes.

§ I.—*Ordinary Probes.*

The probe is a metallic rod, designed for exploring the bottom of wounds, or the somewhat deep passages that are found below the solution of continuity of the skin. Almost all probes are blunt pointed: that is to say, one of their extremities terminates in a small, rounded head. Some, however, are entirely cylindrical, (Fig. 16,) and end merely in a blunt point. They should be sufficiently pliable to adapt themselves easily to the curvatures we may wish to give them. The iron probes, however, are infinitely less serviceable than those of silver or gold. This instrument takes

(Fig. 16.) (Fig. 17.) (Fig. 18.)



the name of eye or needle probe, (*stylet à fenêtre ou en aiguille,*) when it has at its other extremity a large eye. (Fig. 17.) Under this form it is used to pass a mesh of scraped linen or small strips through wounds or openings in the skin, or the different kinds of ligatures under vessels. It is called the *grooved probe* and *whitlow probe*, (*stylet à panaris,*) when, in place of an eye, it has on its upper surface a groove, which converts it into a kind of grooved sound, (Fig. 18.) Then it may serve to direct the bistoury into very small openings, and become a useful guide when we wish to explore narrow passages, or to have a sort of axis by which to introduce with safety certain kinds of tubes to a considerable depth into the organs.

(Fig. 19.)

In fact, the probe is an instrument of which the name should be changed, because of the terror it creates in the minds of most patients. If it were possible to have an understanding on a subject of so little importance, I would propose to substitute for it that of *cylinder*, which could also be qualified as the probe-pointed cylinder, the eye cylinder, and the grooved cylinder.

§ II.—*The Chest Sound.*

The ordinary probe, being only five or six inches long, does not answer in all cases. Occasionally, when it is desirable to reach to the bottom of extensive devastations, or into some deep cavity, we feel the want of a much longer probe. The one we employ in such cases bears the name of the chest sound, (*sonde de poitrine.*) It is about a foot in length, and to render it portable, it is divided into two halves, (Fig. 19,) which may be screwed together or separated at pleasure. Its name, which was doubtless given to it when it was a rule to probe wounds of the chest, would lead to error at the present day; for any surgeon would be censured who should attempt to insert it into the thorax through a wound of this cavity.

Article VII.—Catheters (*Algalies*) or Sounds.

We apply the name of catheters, or hollow sounds, to tubes of different kinds, designed to draw off natural or morbid liquids from certain cavities. These tubes serve also to conduct medicated substances to the bottom of certain organs, as well as to explore the interior of certain viscera. Surgery, for this purpose, has sounds for the Eustachian tube, the nasal canal, the larynx, œsophagus, and bladder, and even for the rectum. These instruments are of gum elastic or metal. They take, however, the name of catheter only when they have been

constructed for the purpose of being introduced into the urinary bladder. Before discussing in detail the use of catheters, when speaking of vesical catheterism in the male, I will confine myself for the present to some remarks upon the catheter, which the student sometimes has need of in the business of dressing.

§ I.—*Female Catheter.*

The female catheter, so called, is a metallic tube of about six inches length, and two to three lines in diameter, cylindrical, (Fig. 20,) slightly curved at its blunt extremity, pierced with two lateral openings on that end, and at the other extremity slightly widened like a funnel, and furnished with a small ring on each side.

(Fig. 20)

This catheter, constructed for the female bladder, serves also to drain the liquid contents of certain deep and extensive abscesses, to explore the interior of the nasal fossæ, and to introduce, in the manner of a probe, into the bottom of any burrowing wound.

Thus made, the vesical catheter is an instrument that can rarely be dispensed with. In pregnant women, and whenever the bladder is forced up into the hypogastric region from some disease in the pelvis, it is neither long enough nor sufficiently curved to be introduced with ease. In those cases, the male catheter, which may equally be substituted for it in ordinary cases, is manifestly more convenient.

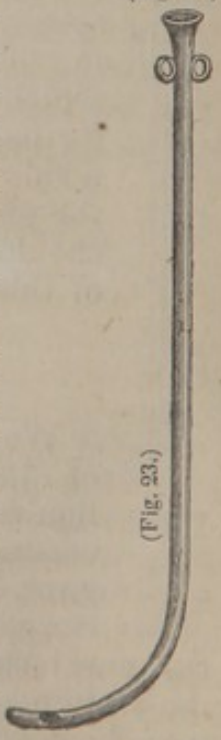
§ II.—*The Male Catheter.*

The male catheter differs from the preceding only in being a third or a half longer, and in having a much greater curvature. This form, which rendered it difficult to place it in the instrument-case until a mode was found of dividing it, renders it applicable to a great variety of uses. At the present day, it may be said that the catheter, with which every student should provide himself, is composed of three pieces: one the stem, and two belonging to the beak. The first, common also to the two others, resembles in some sort a sleeve, (Fig. 21,) that is, the straight portion of the instrument. The other varies according as it is a female or male catheter. For a female, it consists only of a segment of a circle of two inches in length, (Fig. 22.) For a male, this segment may extend to five inches, (Fig. 23.) In screwing the stem upon one of these portions, we obtain at pleasure a short and almost straight catheter, that is, a female catheter, or a long and curved one, (Fig. 24,) that is to say, a male catheter.

(Fig. 21.)

(Fig. 22.)

(Fig. 24.)



(Fig. 23.)

In the instrument-case, it should be carried in the form of a female catheter, while the curved half of the male catheter is kept separate.

This catheter should have walls sufficiently thick and solid to prevent its being easily indented. The orifices known under the name of eyes, and which are placed near the beak, should be at a certain distance from one another, and sufficiently wide to give free issue to the liquids. The place of division is a point that should be guarded. When the two pieces of the male catheter are loosely screwed together, they lead to an inconvenience which it is important to understand, and of which I shall again speak in treating of vesical calculi. The beak of the instrument, when obstructed by some resistance in the bladder, is unscrewed at the bottom of the urethra, while we are endeavoring to turn the broad end in another direction. There is then noticed a sound which might readily convey the idea of a calculus, and induce us to believe that we had explored all the regions of the bladder, when, in fact, the curved part of the catheter had not moved at all. It is true that, by means of a particular kind of grooving, the artist named Charriere has contrived to remedy this inconvenience. But however improved we may suppose them to be, the catheter in two pieces can never have, under a given volume, the same strength as ordinary catheters; so that if it is advisable to have one of the first kind for contingent cases, this is no reason for neglecting the others when we have it in our power to choose.

The species of punch (*mandrin*, called *stylette* in English) or little probe that every metallic catheter has connected with it, being of no other use than to clear out the eyes of the catheter when they are stopped up, should always be withdrawn before sounding the patient, or at least when we desire to ascertain the absence or presence of calculi in the bladder. To conclude, I cannot here conveniently point out the manner of employing catheters. I will only remark that gum elastic catheters should be added to those of metal in the surgeon's instrument-case.

Article VIII.—Director, (*Sonde Cannelée.*)

(Fig. 25.)

The instrument known as the Director, resembles in no respects the catheter, properly so called; it is a stem of steel, silver, gold, or silver gilt, which has scarcely one to two lines in diameter, and but four to six inches length. It is rounded upon its lower side, and has channelled upon the other a groove of considerable depth, (Fig. 25.) One end is shaped into a cleft plate with blunt edges, to be used in securing certain bridles, such as the frænum of the tongue, which we are obliged to keep in a state of tension, while the surgeon divides them. At the other end, the channel of the grooved sound ends sometimes in a cul-de-sac, at other times without any stop. This sound, which is often substituted for the probe as an exploring

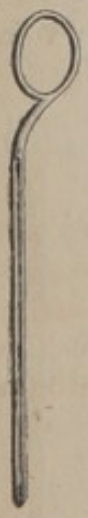
instrument, is principally used for directing the bistoury or the scissors into incisions in the neighborhood of organs which it is important to avoid. We then hold it in the left hand as a lever of the first kind, the thumb being applied to the flat plate, and the forefinger extended upon the middle portion, while the point serves to support or raise the parts, (Fig. 26.) It is used also to break down

(Fig. 26.)

those tissues that make but little resistance, or to detach and remove certain vessels. In this case, the point of the sound ought to be a little curved on its concave part; and the surgeon holds it as he would a pen, taking care to keep it horizontal, and to communicate to it, while pressing it firm, slight motions backwards and forwards. Upon this instrument, also, we pass the porte-ligature probes, and different mèches, and cylindrical stems which it is important to introduce through certain passages. It is, in fine, the most useful director instrument we have in surgery.

The director also presents numerous varieties. Some persons, for example, approve of having it perforated near the point with several holes. Others give to its groove a considerable depth and a form nearly square, while, according to some others, this groove should be triangular and nearly superficial; and others again prefer having it in form of a gutter; but none of these differences are worth discussing.

(Fig. 27.)



English Director. In place of terminating in a bifurcated plate, the English Director (Fig. 27) has on its extremity a lateral ring, situated like the ring on one branch of a scissors. It is evident that under this form, the director is less convenient in handling, gives less power to the surgeon, and loses some of its advantages.

(Fig. 28.)

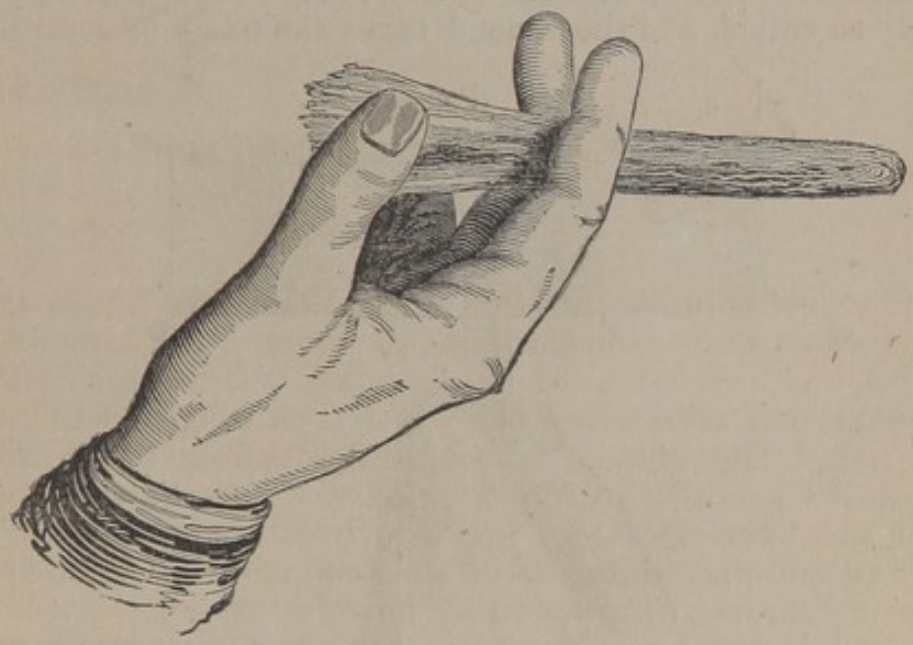
Article IX.—Porte-Meche.

The instrument called Porte-Mèche (Fig. 28) is a sort of probe, terminating at one extremity in a small fork, and at the

other in a lenticular button. Its use is very limited, and might be more so, seeing that the ring forceps may, in most cases, be easily substituted for it. To use it, we fix the bifurcated extremity on the middle of the mèche, whose flattened extremities ought to cover it, so that it can push them before it to the depth that is desired. The right hand also embraces its other extremity in two different ways. Sometimes, in fact, the button, fixed in the palm of the hand, permits us to hold the stem with the two middle fingers and the thumb flexed, while the fore-finger is extended and placed in front.

In other cases, and this is the mode I prefer, the two middle fingers reach and press the mèche against the instrument, while the thumb, supported on the button, (Fig. 29,) makes it advance in the

(Fig. 29.)



direction of the organs. The button of the porte-mèche has also the advantage of enabling us to introduce certain portions of dressing into the midst of resisting tissues, and of thus replacing an instrument formerly employed under the name of *Meningophylax*.

Article X.—Needles and Thread.

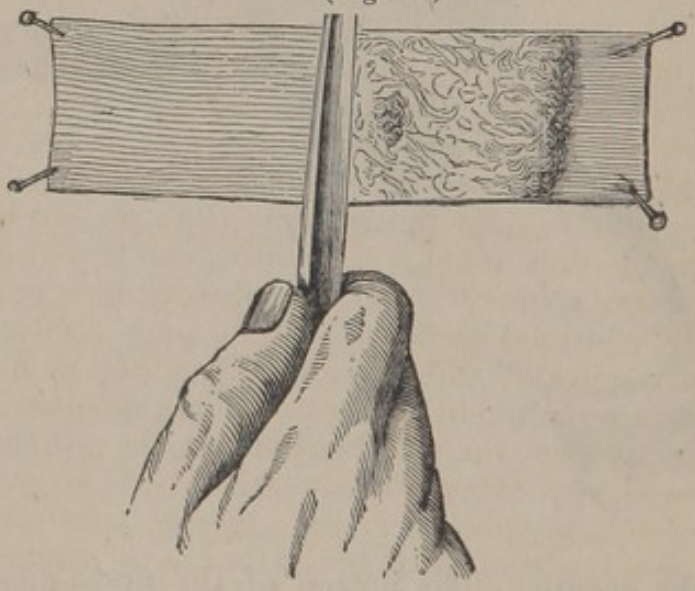
We must have in the case ordinary thread and needles, to sew different pieces of linen; silk threads, and some that are waxed, to serve for ligatures, as accidents may require; suture needles, straight and curved, of different sorts, for the union of wounds; but it will be under the head of particular operations that we shall treat of these objects.

CHAPTER II.

LINT

Lint is among the articles most frequently required in dressing. It is a spongy and pliable substance, made out of linen that has been partly worn. To make it, it suffices to destroy the texture of the linen, and to separate its threads from each other. Lint is seen under two forms: one composed of threads extracted from small pieces of old linen, and the filaments more or less intimately mingled with them; the other, obtained by scraping with a knife or some other metallic blade portions of the linen extended between two fixed points, or on some solid body, (Fig. 30.) The first is lint properly so called, and the second takes the name of scraped lint.

(Fig. 30.)



Lint is employed in a crude state, or in masses of particular forms. Crude lint exists in the form of unequal masses, made up of threads intermingled in every sort of way, such, in fact, as it appears when taken from bags or other places where it is kept. To have it good, it is necessary to select such as is pliable, porous, and white, deprived of all mixture with crude substances, clean and not too old, with the threads not too large, and made of linen neither new nor too much worn.

Some have supposed that lint made of new linen absorbs better and quicker than such as I have just described. Not only is this erroneous, but lint of new linen is too irritating to the surface, by the hardness of its threads and its roughness, ever to deserve the preference over lint made of old linen.

When we employ lint, it is to cover certain wounds, or to favor uniform pressure by padding certain vacuities, or to absorb morbid fluids, or to compress some surface or cavity, or to keep asunder

the lips of a wound which we do not wish to cicatrize. If it is to fill up certain depressions upon the surface of the body or limbs, we confine ourselves to the crude lint, taking care to equalize the pelotons. In other respects, the lint is arranged in pledgets (*plumasseaux*), or in layers (*gateaux*), in small balls (*boulettes*), dossils (*bourdonnets*), cushions (*pelotes*), rolls (*rouleaux*), wicks (*mèches*), plugs (*tampons*), or tents (*tentes*).

Article I.—Pledgets (*Plumasseaux*) and Layers, (*Gateaux.*)

§ I.—*Plumasseaux.*

Plumasseaux are so formed as to give them a shape conformable to the surface that we wish to cover. Generally they are in pledgets (*plaques*) of an elliptical form, (Fig. 31,) of thickness and dimensions necessarily very variable, so constructed however, that they may extend in every direction beyond every part of the circumference of the wound, and be sufficient for the absorption of all the fluids that may exude from it in the space of twenty-four hours. The plumasseaux are made of the lint properly so called, and the surgeon arranges them in the following manner: holding in his right hand a mass of crude lint, he places the loose end of it between the upper portion of the fore-finger and the thumb. Held firm by the pressure of these two last-named fingers, the threads thus pinched become detached from the others. The common mass, thus treated successively for a great number of times, finally parts with all its fibres, and produces a regular layer of nearly parallel threads, and of the thickness of from three to six lines or an inch. In general, the plumasseau ought to be a little thicker towards the middle than at the circumference. To add to its regularity, some surgeons trim its edges with a scissors, while others merely fold over the edges or loose ends with their hand. All this is a matter of but little importance. Provided the contours of the plumasseau are freed of borders (*bourrelets*) or knots, (*nodosités,*) it is all that we can desire. Whether they are afterwards trimmed with scissors or merely turned back, is left to the option of our taste. Their regular form itself, also, is a matter of fancy rather than of real utility. It is nevertheless true, that the pupil who would desire to arrange speedily and in a proper manner a plumasseau which shall be soft, uniform, and sufficiently porous, should practise the art frequently and with care.

(Fig. 31.)

Arranged in this manner, the lint readily receives the different kinds of greasy substances and ointments that we wish to apply to it. Applied upon wounds, it covers without irritating them, protects them against the action of atmospheric air and the shock of foreign bodies, preserves them in a mild temperature, and guards them from all painful pressure, at the same time that it imbibes their secretion in proportion as it is given out.

§ II.—*Gateaux.*

In reality, the plumasseaux of lint might well bear the name of gateaux also. We reserve, however, this name for the pure and simple agglomeration of coarse lint that we wish to apply to wounds under the form of layers (*plaques*) of more or less regularity of shape. To make a gateau, we take a sufficient number of masses of crude lint, spread them out without altering the irregular mixture of their threads, thin them so as to increase its pliancy, and give nearly everywhere the same thickness and density to the layer, so that the whole may resemble in character a slice (*lame*) of sponge.

(Fig. 32.)

At the present day, when lint is scarcely ever applied naked to the edges of a wound, the form of the gateau is generally more suitable than that of the plumasseau. We obtain by it an arrangement more porous, pliable, and advantageous in every respect, than by placing the threads of the lint in any systematic order whatever. The gateau presenting an areolar aspect, which manifestly resembles that of the sponge, is more absorbent and less irritating than the plumasseau, which is but slightly changed from the fibrous form of the linen. It is, however, proper to recollect that the gateau does not answer so well for the application of ointments and unguents, and that the plumasseau only is conveniently adapted to receive those matters.

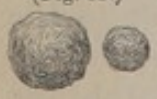
Article II.—Different Rolls (*Rouleaux*) of Lint.

In place of arranging lint in layers, (*plaques,*) there are also other forms given to it.

§ I.—*Boulettes, (Small Balls.)*

Boulettes of lint, a sort of small globes, (Fig. 33,) that are made by rolling this substance between the palms of the hands, should in certain cases be made extremely soft and porous, when, for example, we wish to fill up suppurating cavities, or the bottom of a fresh wound that does not need compression. In that case, they should resemble so many small pieces of sponge, which should be made as uniform as possible as to their density at every point. At other times, on the contrary, the boulette should be sufficiently solid to become rather a compressing than an absorbent body. They are used in this form when we apply them in greater or less number upon vessels that we do not wish either to tie or twist, at the bottom of cavities that it is important to support, and upon points whose exuberance we desire to repress. Different sizes are given to them, according as they are to be applied to such or such a surface. In general, however, the size of boulettes is scarcely ever less than that of a pea, and rarely reaches that of an egg. Having the advantage of

(Fig. 33.)



moulding themselves with ease to all the inequalities of the wound or cavernous passages, the spongy boulettes are of frequent use in surgery.

§ II.—*Rolls properly so called.*

We may give the name of rolls (*rouleaux*) to masses of crude lint gently rolled into a cylinder, (Fig. 34,) or into the form of a spindle. Sometimes, however, these rolls are a little more flattened on one side than on another, or contracted at some point of their length. We apply them between the edges of any large wound, or along the lateral grooves of certain abscesses, at the bottom of any wound from amputation, between the labia majora and the upper part of the thighs, and on the sides of the scrotum in certain diseases. As in the construction of boulettes, the lint, when their object is to absorb the fluids, should be rolled in a manner to resemble rather an elongated sponge, or like a cylinder of linen when we wish, on the contrary, to establish a certain degree of compression.

(Fig. 34.)

§ III.—*Bourdonnets, (Dossils.)*

Formerly surgeons made frequent use of *bourdonnets.* Now they are scarcely ever employed. They are a kind of hard boulettes, a little lengthened, bulging in the middle, (Fig. 35,) where they are frequently tied by a thread. Also they should be made of crude lint, and their principal purpose is to make pressure from the centre to the circumference, or from before backwards, from below upwards, or from above downwards, also upon the interior of certain natural passages, the nasal fossæ for example, or some morbid cavity, such as that of an abscess.

(Fig. 35.)

§ IV.—*Pelote.*

We apply the name of pelote to a mass of lint enclosed and pressed in a piece of linen, which is tied in the manner of a sack, and which has thus the appearance of the larger extremity of a gourd, or of a head included in a narrow collar, (Fig. 36.) To make a pelote, it is sufficient to place on the middle of a square piece of linen a mass of crude lint, according to the size we wish to give the pelote. After having raised up the linen on every side, it is tied by several turns of a thread between the free portion of the linen and the cul-de-sac occupied by the lint. In some cases, it is made in another way: the lint, being previously introduced into the cavity where we wish to place it, remains free outside. We then, piece by piece, force

(Fig. 36.)

into the bottom, as into a purse, all the lint required, until there is enough to prevent its coming out, and to give it the form of a collar, when we draw upon the portion outside. With this precaution, we introduce without difficulty pelotes of a sufficiently large size within openings of the most narrow and difficult character. It is when we wish, therefore, to obtain pressure from the interior to the exterior, to arrest hemorrhage, in wounds of the intercostal artery for example, or operations on the lower extremity of the rectum, that the pelote of lint is specially indicated.

§ V.—*Tampons*, (*Plugs.*)

When boulettes or numerous masses of crude lint are to be accumulated, either at the bottom of a wound to distend it, or at the bottom of some cavity to compress it, whether they are naked or enclosed in linen, they generally take the name of tampon. We see, then, that tampons may in turn resemble boulettes, bourdonnets, rouleaux, or pelotes of lint.

Article IV.—Meches and Tentes.

§ I.—*Tentes.*

We give the name of tents to rolls which are sometimes cylindrical, sometimes conical, (Fig. 37,) or a kind of lint-stopper. In general, the lint is, in that case, rolled between the fingers, so that its threads, which are at first parallel, are thus made to twist around each other in spirals. The most common way of forming a tent consists in folding double a bundle composed of a greater or less quantity of the filaments of this substance. There results from this a cone whose base answers to the point of flexion, and the apex to the free extremity of the threads.

(Fig. 37.)

We also sometimes form tents by rolling up a piece of old linen, or by cutting out some pieces of prepared sponge, or some porous root, like that of gentian, for example. Though formerly much used, tents at the present time are scarcely ever employed. Designed for keeping open fistulous passages, and to dilate certain openings that are too narrow, and to prevent the too rapid adhesion of certain circular apertures, they have the inconvenience of obstructing the exit of fluids, of painfully compressing the parts, and performing the office of a stopper. We should do wrong, however, absolutely to proscribe them in practice, since there are cases where the effects which they produce are precisely such as we wish to obtain. Lint is much more suitable when we desire to have a gentle pressure. Sponge, on the contrary, should be preferred when our object is to dilate speedily some opening which is too contracted, particularly the neck of the uterus. Tents of gentian and of carrots hold in some sort an intermediate place in this re-

spect between sponge and lint. The tent of gentian may also be replaced in some cases, either by the extremity of a sound or of a gum-elastic bougie, by a bit of bougie-plaster, or a piece of common taper, called by the vulgar name of *rat de cave*. Finally, we may substitute for all these articles a cone of diachylon cerecloth, rolled upon the surface which is free of the plaster. It is in this manner, for example, that we may keep open the meatus urinarius in certain cases of wounds, and that we might compress a vessel opened by a puncture through the walls of the abdomen.

§ II.—*Mèches.*

There are three principal kinds of mèches in surgery—mèches of lint, mèches of ravelled linen, and those of cotton.

A. To make a lint mèche, we take a bundle of greater or less size (according as is required) of the threads of this substance, which we double after the manner of an ordinary skein cut off at one of its extremities. A band restrains the whole at the point of flexion, and prevents the threads of lint from being displaced. We thus obtain a regular cylinder, which is now scarcely ever used but for dressing diseases of the anus, or to dilate the nasal canal in some operations for fistula lachrymalis. We, however, use mèches of lint for some other fistulas, for certain kinds of abscesses, and also for certain cases of diseases of the urethra. Sometimes these mèches are drawn by means of the thread which is tied to the loop —more frequently they are introduced by means of the porte-mèche.

B. The *linen mèche* is made with a strip of pliable linen, half-worn, ravelled on the edges, so as to leave a breadth of two to four lines of fringe, and a middle and unaltered portion of three to six lines wide, (Fig. 38.) This mèche, whose edges are very pliant, is employed under the form of a seton in a great number of cases. When one extremity only is to rest in the interior of a cavity, whether that cavity is natural or the effect of disease, it is often unnecessary to ravel the edges.

(Fig. 38.)

(Fig. 39.)

C. The *cotton mèche* is nothing else than a cord of threads of the same kind, arranged in the manner of wicks for bougie or other candles, and for small oil lamps, (Fig. 39.) We find them, therefore, all prepared in commerce, and their use is the same as that of the preceding.

Article V.—Scraped Lint.

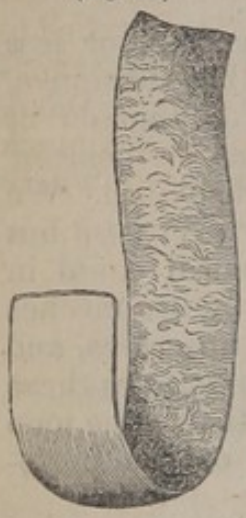
Though it is taken from linen, either of flax or hemp, the scraped lint differs nevertheless in essential particulars from ordinary lint. Deprived of threads and every kind of filament,

it is in reality composed only of down or hairs. So also is it very absorbent, and infinitely more pliant than ordinary lint. Applied to wounds, it becomes speedily glued to them, and tends to dry them much more than the other kind. For this reason, it evidently irritates the edges of the wound, and cannot be used but in a small number of cases, as, for example, for suppurating surfaces in flabby tissues of pale color.

Article VI.—English Lint.

For a long time the surgeons of England and of many northern countries have substituted for our lint (*charpie*) a particular tissue, which they call *lint*, (patent lint, Fig. 40,) and which, according to them, they have had much reason to extol. This tissue, in some respects resembling wadding, (*ouate*,) is villous, like ours, on one of its sides, and smooth or glossy, (*lustré*,) like fine linen, on the other side. Under this form it appears in commerce, in rolled bandages like linen. When we wish to use it, we cut off portions of it of such form and dimensions as we desire. The plumasseaux and gateaux are thus made with care and despatch. We may compare this tissue, as to its form, to velvet, whose villous surface has been much thinned out, or to those mats of down used in our rooms for wiping the feet upon.

(Fig. 40.)



If it is admitted that the patent lint is more convenient than the French, it is also true, from its thickness not being susceptible of increase or diminution at pleasure, or in one point more than another, that it cannot accommodate itself so well to the form of parts. Moreover, its glossy face renders it less adapted than ordinary lint for the drying of the wounds, the absorption of pus, &c.; so that, every thing considered, the patent lint is not so good as ours, or in reality preferable to simple pieces of linen.

Article VII.—Filasse.

The difficulties that are sometimes experienced in obtaining good lint, have induced persons to seek for substances that might take the place of it. Flax, (*la filasse*,) wool, (*la bourre*,) tow, (*l'étoupe*,) moss, (*la mousse*,) employed on all occasions by country people, when they have nothing better, were the first that offered.

It is true that *filasse* really represents lint under its two principal forms. In the state of prepared flax it is similar in some measure to lint in the form of plumasseaux. In that of tow, (*l'étoupe*,) it would be coarse lint, or the same as gateaux. The difference is this, that tow and flax have not been made pliable by friction, or that they retain a spring, and elasticity, and hardness in each of their fibres, which render them at the same time irritating, and not sufficiently well adapted to the absorption of liquids.

M. Ganal, it is true, thinks that we may remove these defects

of flax by beating it and then submitting it to chlorine gas. But the trials to which I have subjected this kind of lint, called *Vierge* by its inventor, have convinced me that it was far from being equal to ordinary lint. In respect to the skin and wounds, tow and flax are to good lint, what coarse new and rough linen would be to that which is fine and half-worn. Those substances, however, answer very well for lint when we wish to pad or fill up certain voids or cavities in the neighborhood of parts that require gentle pressure. Thus, in the apparatus for fracture, or beneath certain compressing bandages, or to distend some natural cavity, we may employ them under the form of pledgets, rolls, tents, and gateaux, in the place of lint, which, in all such cases, has the disadvantage of knotting (*de se pelotonner*) and lumping (*de se grumeler*) more easily than tow or flax. In fine, these substances being cheaper and easier to procure than lint, it is advisable to use them among the poor, whenever lint is not indispensable, or where we can do no better. Wool, or the hair of the single-hoofed animals, the ox, camel, &c., is much inferior to flax, and ought not consequently to be used, except where nothing better can be had.

Article VIII.—Typha, (*Cat-Tails.*)

The plant known under the name of typha bears upon its free extremity, when fully grown, a sort of cylindrical mass, whose efflorescence furnishes a down somewhat analogous to lint. Other plants afford a similar down; but typha is that which furnishes by far the greatest quantity. This plumage of typha, which may serve for making cushions, and even small paddings, has been for a long time in use, in place of tow or lint, among the peasants in the marshy districts of France. Nevertheless, surgeons have not attempted to employ it until it was ascertained that it cured with sufficient celerity certain wounds of the skin. It appears, also, that in the department of the Aube, typha, among others, (*Vignal, Thèse, No.* 152, Paris, 1832,) has been for twenty years the domestic remedy for different kinds of burns. Knowing that this substance had been used in some of the hospitals of Paris, particularly by M. Cloquet, and that much success was imputed to it, I wished to make trial of it myself. Unfortunately, I soon became convinced that the fibrils of the typha were more irritating and evidently less absorbent than lint; that if it was possible to substitute them for any thing, it could be only for scraped lint. If we had neither lint nor flax, typha would be better than nothing, or even better perhaps than wool; but certainly lint and tow, where we are permitted to choose, should always be preferred.

Article IX.—Cotton.

Cotton, like lint, is seen in commerce under two principal forms —carded cotton (*cardé*) and the crude (*ouate*) or glossy cotton, (*coton lustré.*) It is a substance whose introduction into surgical practice ought to be encouraged.

The crude or glossy cotton could be easily substituted for English lint—[that is, what is commonly known as *patent lint*]—and would certainly in many circumstances answer much better; being more fibrous and pliant, it would have the advantage of more readily imbibing fluids, and of not so readily rolling itself up on the surface of wounds. Carded cotton has yet more resemblance to crude lint, and like this, lint may be adapted to the construction of gateaux or plumasseaux, intended as coverings for all kinds of wounds; it is also undoubtedly practicable to form it into tents, rolls, bourdonnets, pelotes, and tampons.

As cotton is cheap, and to be procured everywhere, the question has been proposed, whether it should not everywhere be substituted for lint. An American surgeon, M. Anderson, has maintained that it is a sort of specific in burns, and M. Larrey was in the use of it for a long time in many of his dressings; but no one has more strongly insisted than M. Mayor (*Nouveau Système de Déligation Chirurgicale*, etc., p. 71, Paris, 1838) on the virtues of this material. If we may believe the surgeon of Lausanne, cotton is much better adapted for use than lint; once put on, it does not become displaced, and adheres so exactly to the wound that we may dispense with a bandage; furthermore, that it is found everywhere, and is so well adapted to all purposes, that nothing can be compared with it.

Cotton is preferable to typha, and to wool and flax; it may almost always take the place of scraped lint, and can often be substituted for ordinary lint in making gateaux and plumasseaux.

In the treatment of extensive burns upon the surface, it is of unquestionable advantage; applied to the suppurating surfaces, it becomes adherent to them, and protects them from contact with the external air; absorbs the fluids and prevents all painful pressure, and finally transforms itself, by combining with the excreted matter, into a crust, which dries and permits the cicatrization of the wound to go on underneath. Nor has it the disadvantage of rolling or lumping, (*se tasser*,) or of readily forming into small balls (*pelotons*) and hard and irregular knots, under the action of the humidity which escapes from the skin or wounds; composed, however, of a sort of down of extremely fine short hairs, it becomes too closely adherent to the surface of wounds, so that it is more difficult to remove than lint, and also irritates and dries faster.

In fine, without sharing all the enthusiasm of M. Mayor, I am bound to declare that cotton is preferable to lint in some cases; that it may be substituted for it in an infinity of others; but that it is less adapted to ordinary dressings, or to ulcers and wounds in general.

[With all due deference, we must beg leave to differ altogether from the too favorable recommendation of the author on the propriety of substituting cotton for lint. He has been rather misled, we judge, by the warm eulogies of others than enlightened by his own personal experience. So far as the experience of Dr.

Mott goes, and it accords fully with mine, cotton *never* should be used as a *direct application* to any incised, abraded, or wounded surface whatever, whether in a state of suppuration, ulceration, or otherwise. In this cotton-growing country its uses are familiarly known; and if it is in general employment as a common application, the most readily to be had in sudden emergencies of scaldings, burns, &c., so frequent in steamboat explosions, that does not prove that the same surfaces would not have done much better under the use of *lint*, or whatever soft substance there may be of a similar nature to lint, and fabricated out of *flax*, or even *hemp*. It is unquestionably true, that there is something peculiarly irritating, *acrid*, and unfriendly, either in the short mechanical form of the spiculæ themselves of cotton down, or in the qualities of the plant, to all wounded surfaces; and no better test of this could be given than the manifest injury and inflammation almost always excited in the wound in the vein in the arm after ordinary bleeding, if we apply a pledget of *cotton cloth*, or cotton itself, instead of linen—even wool or tow of flax or hemp being, as is well known among the poor and in our dispensary practice, greatly preferable to cotton. As to the possibility of substituting cotton for *English* or *patent* lint, that we think entirely out of the question, as much so as the latter is of fine fibrous threads and down of linen, &c., and the other of cotton; in truth, it is far more probable that the convenient, light, smooth form of prepared patent lint will, on the contrary, from its great and manifest utility, (as far as we can judge from much use of it,) entirely supersede the employment of scraped or crude lint. Another evidence of the injurious effects of cotton, and the more injurious from its external application over large scalded surfaces, is, that, in those disasters where there is so wide a field for testing its value, it has now for the most part been to a great degree laid aside, to give place to the mild, soothing application of pure sweet oil, or other equally pure oil. Even the lubricating qualities of spirits of turpentine, it is found in such cases, better compensates for its stimulating properties, than the more soft feel or lightness of weight in cotton coverings can neutralize the chemical or mechanical irritation of a very acrid and heating nature, produced by the minute short spiculæ of the cotton down, which in truth, from their close juxta-position and variant direction, give a peculiarly confined interstitial texture to the cotton fibre, and by thus making it a powerful non-conductor of caloric, as all the world familiarly know it to be, add greatly to the *retention and increase of heat* in the wounded surfaces. Many persons in truth, as is familiarly known, in summer, in our country and in the more permanently heated latitudes of the West Indies, have their skin naturally so sensitive that they cannot endure the heating, irritating effect of even a cotton shirt, or sheet, or pillow-case. We must for ourselves proscribe cotton in any shape in surgery, except occasionally only as an external covering, or padding, or matting, as the author has indicated, and then with this reservation, that it must never come in contact with the naked surface, and must be

used chiefly for warmth or wadding, or, as we term it, *filling*—taking care to dispense with it in hot weather, or wherever much inflammation exists in the wound or reaction in the system.—*T.*]

Article X.—Substitutes for Lint.

§ I.—*Silk.*

Silk, which some persons have also advised, might, in case of necessity, be also employed; but its high price on the one hand, and its long compact threads on the other, and its want of porosity, will never permit it to be compared as a dressing to lint, cotton, or even tow, (*étoupe.*)

§ II.—*Wool*, (*Laine.*)

The extreme fineness and irritating qualities of wool, joined to the high price of this article, are alike obstacles to its ever being substituted generally for the substances of which we have been speaking; so that fine lint, as it appears to me, will triumph over the objections that have been directed against it for years past, and maintain, as an article of dressing, the preference which it has enjoyed for near a century.

§ III.—*Sponge.*

Some other substances, however, are still employed in certain cases in the place of lint; sponge, for example, separated into fragments, serves for small balls, bourdonnets, or plugs, when we wish to compress or dilate the interior of a wound, and to absorb the liquids of certain openings. By selecting wide and large sized sponges, we may effect moderate pressure upon certain flaccid or uneven regions of the body—for example, the abdomen; nevertheless, sponge cannot be compared to lint but in a very few points of view, and it is scarcely other than in the first dressings that it can be indicated. [It is, in the opinion of Dr. Mott, a valuable and powerful absorbent, and very serviceable in extensive suppurations, compound fractures, &c.—*T.*]

§ IV.—*Agaric and Punk*, (*l'Amadou.*)

These substances are nearly similar in character. They are useful for equalizing the contour of the articulations, and as a filling in for all uneven surfaces, and of more decided advantage still when it is desirable to repress any large or projecting part—the mamma, for example, or some point which is exceedingly circumscribed; but are rarely suitable, after the first dressing, for covering wounds properly so called. In using them, we must select such pieces as are smooth, pliant, and of uniform consistence throughout, and also in good preservation. They are shaped into pieces of different dimensions—sometimes very small, sometimes very large; at other times applied in a single piece on the diseased part, more frequently by piling pieces together, placing one on the top of the other, so as to

form a sort of pyramid, the apex of which either rests on the skin, or is situated externally. In general, we use agaric or punk to replace the different kinds of graduated compresses, while sponge is rather intended as a substitute for cotton or masses of lint, gateaux or boulettes.

CHAPTER III.

LINEN.

The kinds of linen that we employ in dressing are the same as those used in domestic life. Thus we use the tissues of thread, flax, cotton, silk, and wool.

Hemp cloth is that in most frequent use. It should neither be too thick nor too fine. That of coarse thread, like the new, would be too irritating and inconvenient. The very fine, or that which has been too much worn, has not sufficient strength and tears too easily. Linen cloth would be better than all, if its price made it attainable by every body. Ordinary linen, therefore, when made pliant by being worn, is the best, and in general best adapted for use.

It is generally thought that linen for dressing should not be washed with ley, except in some cases, since, when thus prepared, it draws (*tire*) the humors with more force and dries up the wound too much. This common opinion is based on a fact which the pupil ought to be acquainted with: linen washed in pure water is much harder and rougher and infinitely *less porous* than that washed in ley; so that it does not so easily allow fluids to penetrate it, and is better adapted to serve as a plaster to the wound. It is easy, in fact, to conceive that the alkaline salts dissolved in the ley must remove from linen which has been soaked in it many of those impurities that cannot be got rid of by washing in ordinary water.

Other things being equal, white linen, which has been soaked in ley, is the best for dressing; and we ought not to use any other but from necessity.

Cambric muslin, *calico*, and all the *tissues* of *cotton*, may also be used for that of hemp in a great many cases. People who attribute to cotton cloth (*linge du coton*) poisonous qualities, and are reluctant in applying it to wounds, are not so entirely in error as one would at first think. We find in fact in cotton cloth a fine and penetrating down, of which I have just spoken. Owing to this texture, the cloth quickly becomes adherent to the wound, and is certainly more irritating to its edges than ordinary linen. This, however, only holds true if the textures be applied directly to the wounds themselves; for, if they are to be employed as an envelope, filling in, or bandage, we may very well substitute cotton tissues for those of hemp, and vice versa. [See inserted note on cotton, page 108—supra.]

Wool in the state of cloth is used but in few instances, and almost always under the form of flannel. In this form it is used only for applying to a part, by means of friction, the oily substances known under the name of liniments; it is thus used for embrocations, oily, emollient, or mucilaginous; in other cases for the purpose of maintaining a sufficiently elevated temperature about the part; but in no case is it directly applied to wounds.

Article I.—Dry or Wet Linen.

Ordinarily portions of linen for dressing are applied in a dry state. It is thus they serve for wiping the skin, cleansing off the matters formed on the surface of wounds, and in this way are in daily use in most dressings. Sometimes, however, we use wet linen. Then it may be moistened in different ways—sometimes by merely dipping it in tepid or cold water, that it may shape itself better to the parts, or press them gently as it dries. I will speak further on of the virtues of moistened linen in the treatment of surgical diseases. When the linen is not wet until after we place on the dressings, it cannot be compared with that above mentioned, but belongs evidently to the description of dry linen. A point not to be forgotten is, that the pressure is less under linen that has been wet before applied, whilst it increases under that which is wet afterwards; and this is because the fluids, by swelling the threads of the linen, necessarily shrink and thicken this substance, (*s'épaississent*,) which, for the same reason, must resume its original dimensions, and become thinner [and looser] by drying.

Article II.—Perforated and Fringed (*Decoupé*) Linen.

There is now consumed an extraordinary quantity of perforated linen, (*linge troué*.) This is nothing more than pieces of the finer kinds of old linen that are perforated with holes, so as to give the appearance of a skimmer or watering-pot. These holes are cut out by scissors, or by means of a punch, (*emporte-pièces*,) or by machines constructed for this purpose. The manner of doing this is, in other respects, very simple, and has no other inconvenience than requiring a good deal of time and causing considerable fatigue. We take a piece of linen, folded twice or four times, and cut out with the scissors each angle that is thus made upon the principal fold. We may accomplish the same by cutting, by means of the flat curved scissors, portions of this linen on one of its sides, (*faces*.) The way to make this perforated linen with most precision, is to draw out from space to space two or three threads, first in one direction, then in another, so as to convert it in this manner into a sort of net-work, having a great number of square holes.

(Fig. 41.)

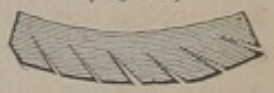
This kind of dressing is of very great utility; greased with cerate, or clothed with any fatty substance whatever, and placed

upon wounds, this does not prevent their being covered with absorbent gateaux and plumasseaux, while it protects them from painful adhesions and from too rapid a desiccation. By this means, we run no risk of leaving a painful traction upon wounds in dressing them. The holes by which it is pierced permit the suppuration to escape; the oily matter which covers one of its surfaces hinders it from drying, and sticking, and forming a crust with the edges of the wound; the lint with which we cover it is thus freed of one of its most serious inconveniences.

Lawn, gauze, or *muslin*, which, in case of necessity, might be substituted for the perforated linen, have not, however, all its advantages. Forming a simple net-work, these tissues can retain no fluid, and are incapable of preventing the desiccation and agglomeration of the dried matters, as the lint that we often have occasion to apply to them does; but (as I shall mention farther on) they are better adapted than perforated linen to the surface of cataplasms that we do not wish to apply next to the skin.

Fringed linen (*le linge découpé*) is a small bandage of six lines to an inch in width, which is cut by the scissors from space to space upon one of its edges, so as to convert it into a species of fringe or border, (Fig. 42.) This small bandage, previously covered with cerate, is applied upon the edges of wounds, so that its fringed border extends outside, and the other overlaps by a line or two the edge of the wound. The gateaux or plumasseaux, applied over it, are thus prevented from the possibility of unpleasantly adhering to the edge of the suppurating surface. Within the last half century, the perforated linen has superseded them in almost all those cases where they were formerly employed. I think they have been too much excluded from use; for they are better than the perforated linen for ulcers and wounds of a pale and flabby character, and for all wounds that require the use of scraped lint or carded cotton.

(Fig. 42.)



Article III.—Linen spread with Ointment, (*Linge enduit de Pommade.*)

We no longer use now, in the dressing of wounds, those numerous medicated compounds to which so many virtues were ascribed in former ages. Thus the linen applied on wounds is scarcely ever covered with any ointment, unguent, or plaster. At the present time we use it in the natural state, and either dry or wet; or if we desire to prevent its adhesion to the subjacent parts, it is with cerate only that we besmear one of its sides. The linen, which then takes the name of cerated linen, (*linge ceraté*,) exists under three forms—in the natural state, when we wish to cover an inflamed or naked portion of the integuments where there is no wound; in the state of perforated linen, as I have just described it, and in that of fringed bandelettes.

CHAPTER IV.

COMPRESSES.

The name of compresses is given to various pieces of linen used in covering wounds. They are also of very different forms. They are made of the cloth of hemp, flax, or cotton, or of silk, or flannel, but especially with linen.

Article I.—Form of Compresses.

When the linen which takes the name of compress has the same dimensions in its two principal diameters, (Fig. 43,) it is called a *square compress.* If this linen is twice as long as it is broad, so as to form a square when doubled on its length, it is called an *ordinary* compress. We call it by the name of *long* compress (*longuette*) when it exceeds by twice or thrice in one direction its other diameter, (Fig. 44.) The *triangular* compress is made with a square piece of linen, folded so as to bring two of its angles together, (Fig. 45.) If this triangle is afterwards twice or thrice folded from the apex to the base, it is transformed into a *cravate* compress, (*compresse en cravate*—Fig. 46.) The *fichu* compress, (*compresse en fichu,*) requiring more pliancy, is ordinarily of silk, cotton, or muslin. All these forms of compresses having a special application, I shall be obliged to recur to them again.

(Fig. 43.)

(Fig. 44.)

(Fig. 45.)

(Fig. 46.)

Article II.—Divided Compresses.

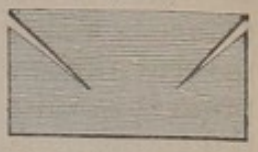
We are sometimes obliged to divide, to greater or less extent, the free edges or extremities of compresses.

The Cross of Malta. If we cut upon a small square piece of linen, formed of four folds, in a direction from the most salient free angle to within some lines of its folded angle, we obtain a Maltese cross, (Fig. 47.) This cross, which it may be useful to perforate in the middle, to fix it by its centre upon the extremity of projecting parts of the body—upon the extremity of the fingers, for example, or on the wound which succeeds to the operation of phymosis, or from amputation of the penis, or upon the apex of the mamma, or, as was formerly used, on the stump in most cases of amputations—ought to be small, and not to have a diameter greater than from four to five inches.

(Fig. 47.)

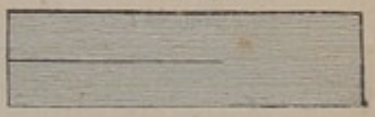
The *half-cross of Malta* (Fig. 48) is a piece of linen divided like the preceding, but after having been doubled once only. It is particularly adapted to the stump of the shoulder.

(Fig. 48.)



Cleft compresses, (*compresses fendues.*) If we merely divide into two equal halves the extremity of a long compress, which is either single or double, to the extent of a third or half of its length, there results a compress cleft into two heads, (Fig. 49.) This compress, one of the halves of which remains undivided, is chiefly used to draw up the flesh in amputations of the limbs, at the moment when the surgeon performs the section of the bone. In some cases it is necessary to divide it into three heads, (Fig. 50,) as in amputation of the leg or forearm. The middle head is then passed through the interosseous space, while the two lateral heads are drawn up outside the bones. [This last is the *retractor* of English and American surgeons.—*T.*]

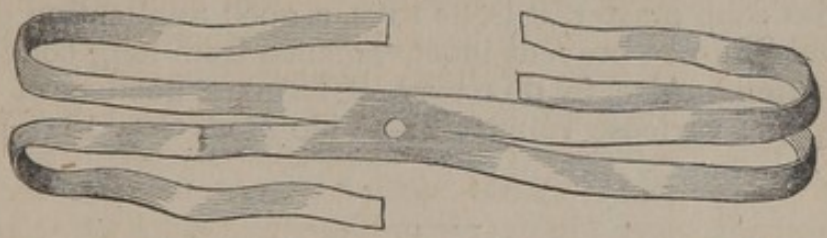
(Fig. 49.)



(Fig. 50.)

Sling, (*fronde*—Fig. 51.) The long, narrow, single compress takes the name of sling, if it is divided throughout its whole length, with

(Fig. 51.)



the exception of a few inches of its middle part which are left uncut; it is often useful to pierce a hole through the central point of this middle part. It is scarcely ever used but in diseases of the chin and of the lower jaw.

The window compress, (*compresse fenêtrée.*) Some persons understand by *compresse fenêtrée* the perforated linen (*le linge troué*) of which we have already spoken; but it is better to reserve this name for compresses which are to have large perforations on one or more points of their extent, in order to be adapted to particular kinds of ulcerations. We have thus compresses with circular openings, (*compresses en lunette*—Fig. 52,) those with square openings, (Fig. 53,) rhomboidal, ellipsoid, &c.; for example, for the dressing of blisters upon the arm, the application of some kinds of caustic, and the dressing of certain ulcers.

(Fig. 52.)

(Fig. 53.)

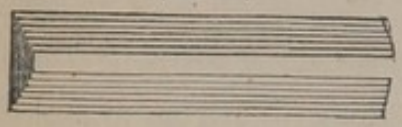
Article III.—Folded Compresses.

All compresses that are not folded may be denominated single. They are used in this manner in a great number of cases where

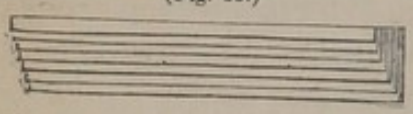
the linen is not separated from the skin or wound by any other substance. But the compresses most generally employed are once or several times doubled. If the linen is folded only once, the compress is said to be only doubled; if this double is folded upon itself, the compress has two doubles; and so on in succession.

A kind much used is the *graduated compress;* it is made with a square double, or with a wide long compress. The linen is then folded a great number of times upon its base, so that each new fold is a little less in width than that which preceded it, (Fig. 54.) In order to maintain the shape of the graduated compress, it must be immediately moistened, or its centre stitched together by means of thread from space to space. The graduated compresses which have much more length than breadth, resemble a kind of prisms, pyramids, and staircases, (Fig. 55,) and are intended to fill up cavities, or to compress certain parts of the circumference of a limb in the manner of wadding.

(Fig. 54.)



(Fig. 55.)



[*Amadou*, or *Punk*. Mr. J. Wetherfield recommends amadou, (or punk,) from its soft elastic nature, as a graduated compress in umbilical hernia in children, and over fistulous ulcers. Also, when spread with soap plaster, it is, he says, a good application over the sacrum and ilium, to prevent inconvenience from long confinement in one position. Also, in this way, it forms a good corn plaster, and to support varicose veins.—*T.*—Vide *Med. Gaz.* 1841.]

CHAPTER V.

BANDS, (BANDES.)

The name of bands, in the art of dressing, is given to certain kinds of ties which are used for fastening the other pieces of the dressing, (*appareil,*) and which ordinarily make many turns on the diseased part. These portions of the dressing may be of different tissues. They are made of tissue of hemp, or flax, or of muslin, calico, flannel, or caoutchouc. For a piece of one of these substances to acquire the name of band, (Fig. 56,) it is necessary that

(Fig. 56.)

its length should be at least six times greater than its breadth; otherwise it would only be a bandeau or long compress.

The length of bands is extremely variable. Some are not over a yard; others exceed ten; nevertheless, they are most generally from three to six yards—that depends upon the size of the diseased part, and upon the number of turns or circuits we wish to make with it. The width of bands is rarely less than that of the finger, and rarely exceeds that of four inches. The wide bands of three fingers breadth are the most common, and at the same time the most convenient. The narrowest are only used for the fingers, ears, or penis. The widest are employed about the belly and chest.

Article I.—Linen Bandages, (*Bandes en Toile.*)

Being designed to hold the other parts of the dressing, or to make pressure on some region of the body, these bandages require a certain degree of strength. The ordinary linen cloth (*toile ordinaire*) also has the preference. Only it is necessary, as for compresses, not to make use either of new linen or that which is of too coarse texture. Old linen is the best: we cut it in the direction of the warp, (*à droit fil,*) and we thus cut up into strips our sheets, shirts, napkins, and table-cloths, that have already served their household purposes.

As the strips resulting from this division of the pieces of linen are rarely sufficient for each of them to form a bandage, it becomes necessary to unite several of them together by their ends. This union, which might in cases of necessity be made by means of pins placed crosswise, ought to be effected by means of a whip-seam pressed down, so that as little inequality as possible may result from it. The linen bandage thus prepared should be freed of its hem and of every other seam. Then, however, it has the disadvantage of readily unravelling on its edges, and of incommoding the bandage with troublesome filaments while we are unrolling it. If, to avoid this inconvenience, we protect the edges by a hem, it becomes hurtful in another respect. Each one of its edges thus arranged, presenting a greater degree of firmness and resistance than the middle portion, is sure to compress and restrict, in the manner of a cord, the points that it embraces. If in the place of a hem we merely have a selvage, (*un faux fil,*) we avoid the unravelling of the bandage; but there still results from it a compression less regular and less uniform than with a bandage that is entirely plain. It is, however, true, that the employment of bandages without selvage or hems involves serious difficulties for certain kinds of dressings; it would be desirable, therefore, that an article of such general use might be made in some other way.

It appears that in Germany surgeons have contrived a way of making bandages without being obliged to use linen, properly so called. They are made like the ordinary bandage, but with a softer and more porous thread. They are so arranged that the transverse thread leaves, at intervening spaces, small loops on the edges of the bandage, by which means nothing is more easy than to attach the edges of such bandages together. I cannot conceive why in

France art has not yet profited of this contrivance. The only reason that can be given is, that bandages, such as are used amongst us, may everywhere be made as we want them. It is nevertheless true, that if we had not contracted the habit, it would be much more handy to take from a roll of bandage the portion that we required for dressing a wound, than to cut it from a sheet or napkin.

Article II.—Bandages of Cambric Muslin or Calico, (*Bandes en Percale ou en Calico.*)

The tissues known under the name of cambric muslin, or calico, being finer than ordinary linen, have, therefore, appeared to some persons more suitable for bandages. This is but partially true. Before having been washed or used, this tissue is not sufficiently porous to answer the principal indications that we have in view; it also slips too readily for the bandage to be easily kept in its place. If we do not employ it until after it has been softened by use or washing, it has no longer sufficient firmness, and plaits or rolls up into a cord with extreme facility; whence it follows, that, with few exceptions, the bandages of cambric muslin or calico are not so good as those of ordinary tissue.

Cotton bandages would be preferable, if their down was less irritating, and if old cotton cloth retained the solidity of linen.

Article III.—Woollen Bandages.

Woollen cloth, which is but rarely employed under the form of compress, would often be preferred to linen for bandages, if it was less dear. Though we might for this purpose make use of any kind of woollen cloth, or stuff, we generally, however, prefer flannel, and that almost exclusively, for woollen bandages. Pliable, porous, and resistant at the same time, flannel bandages have the advantage of adapting themselves exactly to the parts, and with very little tendency to become displaced, or to plait or roll up upon themselves; also, they increase the temperature of the part, and readily absorb all its fluids; they are, besides, very extensively used in England. There is, however, the objection, that they keep up a certain degree of irritation upon the skin, uselessly heat the parts, and soon become badly soiled; also, that they do not answer as well for the establishment of reverses (*renversées*) as linen bandages, and are, besides, too distensible, and of a kind that cannot be readily had on all occasions.

Article IV.—Caoutchouc Bandages.

Gum elastic, or caoutchouc, which has been a long time used in commerce under various forms, and advantageously employed in the making of suspenders, gaiters, cinctures, corsets, &c., may also be used for the construction of bandages. A young physician, M. Barthélemy, (*Thèses*, No. 322, Paris, 1836,) has discovered a mode of flattening and attenuating (*filer*) caoutchouc, so as to convert it readily and at pleasure into pieces as thin, wide, or long, as may be

desired. He has shown me bandages made in this manner, and I have remarked that they roll and unroll with the same facility as those of linen.

The pliancy and elasticity of caoutchouc would seem to ensure for it a more uniform compression upon all the parts without any restriction anywhere. There is no necessity of reverses or folds, and we have no trouble from creases, (*les godets ;*) if any reaction takes place under the bandage, its flexibility permits it to yield on a given point, while it is making the proper resistance required upon the others. There is no doubt then that the caoutchouc bandages would be an incalculable acquisition in practice, if they could be brought into use, and if it were possible to procure them at a cheap price. They are nevertheless not free of disadvantages. Liable to relax under the influence of heat, and to contract during cold, they easily give rise to dangerous inequalities. Yielding, too, without difficulty to muscular action, and to the different movements of the articulations, they might, in elongating themselves in an unequal manner, fold over crosswise, and in a great number of dressings not answer the purpose intended.

[*Caoutchouc ligatures and bandages.* In addition to what is given in the text, we must add here some further details: Mr. Thomas Nunneley, of Leeds, England, has introduced caoutchouc ligatures, and extols their advantages over all others. Their superiority consists in these particulars: They may remain on a much longer time without producing irritation of any kind; from their elasticity, they hold the divided parts in contact with much less stretching and in a more natural manner, and at the same time keep up an equal degree of tension, for, if the part swell, the ligature gives way in proportion to the pressure; so, too, when the parts contract, they also contract, and an equal approximation is maintained. From their smooth and unirritating properties, also, a greater number may be applied, and as they do not induce ulceration, the scars left are much smaller than after silk ligatures, which is an important consideration in wounds of the face and neck.

As they become smaller by stretching, they should be larger where much pressure is to be used. The ends should be knotted three or four times to prevent their giving way, and to effect that better, the cord should be twisted twice before making the first knot. But the very properties of caoutchouc ligatures which give them the advantage for wounds, obviously make them most unfit for tying vessels.

The thickness of the thread should be one-sixteenth of an inch in diameter when cold. The application of the warmth of the hand contracts it to one-sixth its length. In his experiments, Mr. Nunneley found that a cord of one-sixtieth of an inch diameter, when stretched out to eleven feet long, contracted by warmth (of 90° F.) to eighteen inches, but no farther by any addition of temperature up to 212°. Hence, before the suture is applied, he recommends it to be immersed in warm water of not less than 90° F. A uniform degree of elasticity is thus obtained, and we thus adapt it to the

tension required by the part. Thus, if we apprehend much swelling, it should be drawn so tight only as to keep the parts in apposition; if, on the contrary, there be much tumefaction, it should be drawn so tight as to anticipate the subsidence of the swelling. The danger, however, is of drawing the ligature rather too tight than not enough so. If they make too great tension, they soon cut their way out. The eye of the needle should be large, and of the character of the seton needle, as the cord when contracted is bulky. The sutures should all be introduced with one thread, which is to be afterwards cut into the separate ligatures.

Mr. Nunneley thinks the caoutchouc ligature especially advantageous for dressing wounds where the adhesive plaster cannot be retained, or is too irritating to the skin, and where it is desirable to apply lotions. In lacerated wounds of limbs, Mr. Nunneley proposes to bind up the wound with caoutchouc thread, thus dispensing with sutures and plasters, while intervals are left for the free discharge of matter and the application of emollients and lotions. In the event of using cold lotions, goldbeater's leaf may be interposed upon the raw surfaces of the wounds. Mr. Nunneley suggests that this method of bandaging might be of great use in reducing old hernias when the ring is large. The turns of the thread should commence at the bottom of the hernia, and pass uninterruptedly up to the neck. The thread should be double the thickness of ordinary sutures, and also wound around the hernia spirally. He thinks this mode of graduated pressure much preferable to the taxis, the irritation of which latter, he is of opinion, often does great injury.—*T.* Vide *London Lancet, March* 13 *and July* 3, 1841.]

[*Caoutchouc bandages.* The same properties of caoutchouc which, in the opinion of Mr. Nunneley and others, should induce us to give a preference to cord or tape ligatures of this new, useful, and remarkable material in the art, may, in the opinion of M. Rigal, of Gaillac, be urged in favor of *caoutchouc bandages* under certain circumstances. He has used both for some years, and he particularly instances hare-lip and operations for the restitution of lost parts as adapted to the ligature; while he remarks that the elastic bandages are very useful in maintaining oblique fractures of the lower extremities in perfect apposition, opposing a force in constant operation to the irregular action of the displacing muscles. In this way, also, they may assist in the replacement of parts after tenotomy.—*T.*—Vide *British and Foreign Med. Review, July*, 1841.]

Article V.—Thread-Riband Bandages.

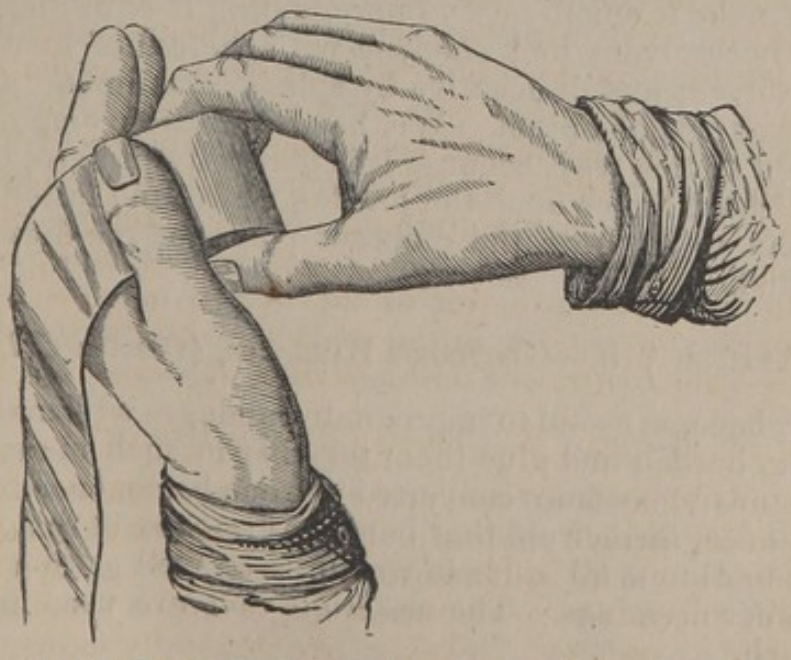
There are ribands of common thread, also those of flax or cotton, and of all sorts of tissues, and of different thicknesses. Among these ribands, which in domestic life have altogether a different destination, there are some sufficiently wide to use for bandages. These riband-bandages, however, are generally unpleasant, hard, and stiff, as if glazed by ironing, or by the starch with which they are impregnated. They are without porosity, and slip so easily that they can scarcely ever be kept in place. Their edges, like

cutting instruments, wound the skin; the reverses with these are difficult to be made, and they generally adapt themselves badly to the form of the parts. I should not advise them, therefore, unless no better can be had.

Article VI.—Roller Bandages.

Almost all bandages are presented to the surgeon under the form of a cylinder; they are then called roller bandages. One of the extremities is found on the surface of the cylinder, while the other occupies its centre. Bandages are thus rolled up into one head, or into two. Every bandage has two extremities or heads and a middle part, (*le plein.*) The manner of rolling a bandage is an essential point for the student of medicine. It is important, in fact, that he should perform this small operation with ease, quickness, and some degree of dexterity, if he does not wish to be excelled by the nurses. For that purpose, we are to fold the internal extremity or central head of the bandage four or five times upon itself, that it may form a sort of axis. We then hold this nucleus of the cylinder between the thumb and fore or middle finger of the right hand by the two extremities of its greatest diameter. The loose portion of the bandage, being thrown across the radial side of the fore-finger of the left hand, is held flat in that position by the thumb of that hand, while the other hand, drawing the bandage towards it by half-turns, successively winds it upon the initial pivot, and thus forms it by degrees into an entire roll of bandage. Two methods may be followed to arrive at this result—in one the belly or bulging part of the first cylinder looks downwards, and the right hand rolls it from the beginning to the end by drawing it from below upwards and from behind forwards, (Fig. 57.) In the other, on the contrary,

(Fig. 57.)

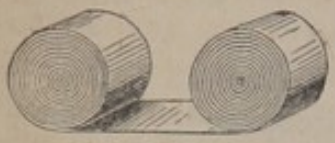


the free part of the cylinder looks upwards, and the hand which moves it draws it from above downwards, and at the same time from before backwards. The bandage thus wound up to its termi-

nation is said to be rolled into a head, (*globe*—Fig. 58.)

(Fig. 58.)

(Fig. 59.)



To roll a bandage with two heads, (Fig. 59,) it is held as in the preceding manner, only we stop for the first cylinder at the middle of the length of the bandage, so as to do the same with the other extremity. In this case, the bandage with its two ends in the centre has no free extremity. The portion of the bandage which unites the two heads, and holds the place of its outer extremities, takes the name of the middle (*plein*) portion. We generally give less volume to one of the rolls than to the other.

Article VII.—Wet Bandages.

Bandages are ordinarily applied in the dry state; it is generally preferred, however, to have them a little damp. If it be true that dry bandages are very generally employed at the present time, it is also true that damp ones are likewise often useful. We dampen bandages by dipping them into various kinds of liquids.

With water. Impregnated with water only, they adapt themselves to the parts with more facility than in the dry state. Adhering slightly to the skin, they render the reverses more uniform, and are less liable to puckers. The wet bandage, however, unravels easier, and soon shrinks a little by drying. [Bandages tighten or shrink when wet, and vice versa. See above, where M. Velpeau admits these well-known facts. So in ships with new rigging, it has to be slackened when wet, or it breaks.—*T.*]

With medicated solutions. If we dip the bandage into medicated fluids, it transmits their properties to the diseased parts. It is thus we may make it emollient by impregnating it with marsh mallows, or slightly resolvent and anodyne with the aid of lead water, still more resolvent and desiccative by spirits of camphor, and narcotic by preparations of opium. We, however, rarely employ bandages dampened in this way, because it is generally preferred to sprinkle the medicated liquor upon the bandage, after the latter is once applied, than to saturate the different pieces of the dressing with it beforehand.

Article VIII.—Glutinous Bandages, (*Bandes Collées.*)

It may become useful to impregnate bandages with matters which, in drying, harden and glue them together in such manner that the whole bandage becomes converted into one homogeneous substance. We shall see, farther on, that bandages applied in this manner are suitable to almost all kinds of fractures, as well as to a great number of other dressings. The materials that are used in such cases vary much.

White of Egg. A mixture of the white of eggs, spirits of camphor, and lead water, beaten together, soon gives to the tissue a ligneous hardness. It is the liquid eulogized by M. Larrey.

The essence of turpentine, with which linen is easily impregnated, has the same effect. Veterinary surgeons have long used it in their dressings. It is a substance which has the disadvantage of sticking with tenacity to the skin and hair, and of being more difficult to detach than the liquid of M. Larrey.

Flour. Rye, and all other flour dissolved in vinegar or water, so as to form a clear bouillie or glue, also causes the turns of the bandage to become adherent to each other and to acquire a great hardness. This application, which I have employed, and which was shown to me by M. Bretonneau at the hospital of Tours, was used as the base of the plaster called *calotte*, of which I gave the formula in 1823, (*Thèses de Paris*, No. 16.) It may be substituted for the other applications I have mentioned, and also, in cases of necessity, for those of which I am now going to speak.

Glue, (*colle.*) A solution of gum in water, or a solution of Flanders glue, produces a result nearly similar.

Starch. It is the same with starch, boiled in the manner it is for the purposes of washerwomen and for starching. It is in that case well to besmear the turns of the bandage with it, as we unroll it.

Dextrine. In the place of starch we may use a solution of dextrine. One part of dextrine, gradually diluted in as much pure water, or in a mixture of water and brandy, cold or hot, furnishes a solution into which we may dip and saturate the bandages, which afterwards glue together and harden, in the space of two days, to the point of acquiring the solidity of wood. Thus prepared, they serve to form all kinds of immoveable bandages, and are destined, if I am not deceived, to be of great utility in surgery. Up to the present time, diluted dextrine has the advantage, over all other substances that I have tried, of being at a low price, of requiring no preparation, and of gluing the linen when cold; and the power, also, of penetrating it like water, of hardening rapidly, and of allowing itself to be readily softened again by means of hot water.

[*Dr. Van Buren on Glutinous, Starch, and Dextrine Bandages.*

A very interesting paper on the different kinds of glutinous, starch, and dextrine bandages, the history of their origin, and their present modes of application, was published in the *American Journal of Medical Sciences*, (Philadelphia,) for May, 1840, by William H. Van Buren, M. D., formerly an élève of M. Velpeau, and now of the city of New York. We avail ourselves with pleasure of the valuable practical remarks in Dr. Van Buren's learned paper, an accurate summary of which is here subjoined.—*T.*

It is not only of late years that the attention of the profession has been directed to this subject. The inefficiency of the ordinary apparatus for fractures was asserted by Hippocrates: "Nam neque in quiete, ut putant, crus continent, neque dum reliquum corpus in hanc vel illam partem convertitur, canales prohibent quominus crus sequatur, nisi homo ipse diligenter advertat," (*Hippocrates: De Fracturis,*)—and by a later and more familiar authority, Boyer: "Malgré l'opinion généralement adoptée, il est facile de démontrer, que les

bandages ne servent que très peu, ou même point, à maintenir les fragmens dans leur rapport naturel."—(*Dictionnaire des Sciences Médicales*, tome xvi., p. 535.)

We have evidence that the Arabians, and some of the eastern nations, were in possession of an "*immoveable apparatus*" with which they treated fractures. It is generally believed that the idea was first suggested, in modern times, to M. Geoffroy, on the inspection of some ancient Egyptian relics. M. Sedillot, in the early part of the past year, exhibited before the Royal Academy of Medicine, of Paris, an apparatus used by the Arabs for fracture of the fore-arm; it consisted of numerous narrow splints made of split cane, each less than an inch in width—these were firmly attached to a sheep-skin with the wool on it, and bound to the arm. Of this the splint recommended by Benjamin Bell (*Bell: Surgery*, Philad. ed., 1814, *App.* p. 15) is but a modification; it is a thin strip of light wood glued on leather, and afterwards split longitudinally at intervals of half an inch.

A splint consisting of strips of whale-bone, attached by linen in the manner of women's stays, formerly much used by the English surgeons, is also on the same principle. This plan calls to mind the instructions of Ambrose Paré, when suffering from a fractured leg, to his friend Richard Hubert, who attended him: "You must fortify," said he, "the sides of my limb with junks made of tents or little sticks, and lined with linen cloth." (*The Works of that famous Chirurgeon, Ambrose Paré, translated by T. Johnson*, London, 1642.) According to M. de Bouqueville, (*Voyage dans la Grèce*, Paris, 1820,) the modern Greeks habitually use a consolidating mixture for curing broken bones—gum mastic is said to form its principal ingredient. A similar though essentially different expedient is adopted in Spain, Corsica, and the Brazils, introduced most probably by the African Moors.

The Italians have long made use of an immoveable apparatus, which has been brought into notice by Assalini, in the modifications which he applied to it, consisting chiefly in the substitution of moistened pasteboard for the original materials. The itinerant bonesetters of Switzerland and the southwestern provinces of France, some of whom have become quite notorious for their success in the treatment of fractures and sprains, employ pasteboard and willow splints, and solidify their apparatus by means of resin, pitch, mastic, and other varnishes. Guy de Chauliac, one of the earliest writers on surgery in France, speaks of a composition he employed, consisting of slaked lime with different gummy and resinous substances. Ambrose Paré (*Op. Citat.*, p. 584) recommends at length the following "*Plaster to hold fast restored bones:*—℞. Thuris, mastich, aloës, boli armenii, ana, ℥j; aluminis, resinæ pini siccæ, ana, ℥iij; farinæ, ℥jss; albi ovorum, q. s.—make thereof a medicine, and let it be applied all around the leg."

Among the English surgeons, Cheselden (11th ed., Lond., 1778, p. 38) is the first who makes mention of an apparatus. In his "Anatomy," he speaks of a bonesetter of Leicester, who employed a mix-

ture of wheat flour and whites of eggs, with which he smeared his bandages to render them solid; subsequently he adds: "I think there is no better way than this to treat fractures, *for it maintains so perfectly the position of the limb.*"*

Mr. Lawrence, the celebrated surgeon of London, in a lecture which I heard him deliver on this subject, (Jan., 1839,) ascribed the first employment of whites of eggs and powdered chalk, as a solidifying mixture, to a namesake of his, a Mr. L., of Brighton, Eng., within a few years past. He recommended the practice very highly, and went through the process, before his class, of applying the apparatus.

Mr. Alfred Smee has lately published an account of certain "moulding tablets for fractures," consisting of a composition of gum-arabic and whiting interposed between two layers of coarse linen. (V. *Phil. Med. Exam.*, vol. ii., No. 14, from *Lond. Med. Gaz.*) These appear to be equal, if not superior to those splints made of felt soaked in gum-shellac, which, on account of their being patented by the inventor, are placed, to a certain degree, beyond the reach of the profession. Lecat, a French surgeon, in the year 1735, in an essay on the treatment of fractures, to which a prize was awarded by the *Acad. Royale* of Paris, asserts that a "simple fracture, when reduced, requires only to be maintained; and need be examined but once before its consolidation—oftener is unnecessary." In 1768, M. Moschati, acting on these principles, presented to the notice of the Academy several cases of fracture which he had treated successfully by means of an apparatus consisting of compresses and bandages saturated with the whites of eggs. The idea was again neglected until resumed by Baron Larrey, in his well-known apparatus employed with so much success after the battle of Moskwa, (*Larrey's European Campaigns;*) this consisted of cushions and compresses, retained by the 18-tailed bandage, and rendered immoveable by saturation with camphorated spirits, acetate of lead in solution, and whites of eggs; this apparatus, thus applied, remained undisturbed until the consolidation. Of its efficacy and advantages, especially in military surgery, Larrey speaks in the highest terms.

The use of plaster of Paris, made to *set* around a limb, generally in Europe ascribed to Dieffenbach, who employed it extensively, was originally derived from the Moors of Spain, (*Eaton's Travels in Arabia*,) and first noticed in Europe by Prof. Kluge, of Berlin, in 1829, and Drs. Muttray and Rauch, (*Muttray—de cruribus fractis gypso liquefacto curandis*, Berlin, 1831,) who wrote theses upon the subject. I saw several cases of club-feet, which had been operated upon by a section of the different tendons, retained thus in a plaster-mould, in Middlesex Hospital, London, under the care of Mr.

* In *Gataker's* translation of *Le Dran's Operative Surgery*, with observations by Cheselden, p. 543, the latter surgeon recommends the same mixture for *contorted or club feet*. He also gives a case in which he applied it to a fracture of the fore-arm which happened to a gentleman while travelling: he continued his journey, and, at the end of forty days, the bandages were removed, and the cure found perfect. At a much later period, John Bell recommends the same materials, under similar circumstances. Vide *Principles of Surgery*, p. 137, New York, 1812.

Mayo. This plan has some advantages, but many inconveniences.* In the year 1834, M. Seutin, Professor of Operative Surgery in the University of Brussels, and Surgeon of the Hôpital St. Pierre, having under his care many of those wounded at the siege of Antwerp, made trial of the different varieties of the immoveable apparatus, and finally chose starch as the material best adapted for surgical purposes. His practice and success are published. This material has been variously used by different surgeons since its first application by M. Seutin; for instance, M. Laugier, of Paris, employs stout wrapping-paper, cut in the form of the eighteen-tailed bandage, in place of linen or cotton rollers; M. Lafarge de St. Emilion uses a mixture of boiled starch and plaster of Paris, and others substitute tin, lead, zinc, and carved wooden splints for those of pasteboard. M. Seutin called his starch bandage *l'appareil amidonné*. Among the surgeons of Paris who gave to the improvement of M. Seutin the fullest and fairest trial, the celebrated Velpeau stands first; and after much experience, he has substituted for the starch a substance known by the name of dextrine, as being superior in many respects, and equally firm. (For a description of the dextrine, vide Dr. Van Buren's paper—*ut supra.*) Dextrine is one of the proximate elements entering into the composition of all amylaceous vegetables and plants, in combination with fecula, amidine, diastase, gum, &c.; it is used to a considerable extent in commerce and manufactures, especially in Paris. It is sold by the quantity in Paris, at about eight sous per pound.

The following is the manner in which M. Velpeau applies it: For a fracture of the tibia, about ℥iv of the powder of dextrine are necessary; this is to be moistened with camphorated spirits, and dissolved in sufficient water to form a solution of the consistence of molasses. In applying the apparatus to the leg, after reducing the fracture, a dry roller is passed from the toes to the knee; two splints cut from the common binders' board, and previously moistened, so as to mould themselves exactly to the inequalities of the limb, are then placed one on either side; these are smeared over with the mixture, and then a second roller, thoroughly soaked in the solution, is applied over them, and afterwards perfectly covered externally by a coat of it. The limb should then—in the case before us—be suspended from a fracture-bridge, and surrounded by vessels of hot water to dry the apparatus, which, in about six hours, will become as firm as a case of sheet-iron. When the period has elapsed necessary for consolidation of the fracture, it is easily removed by soaking for a few minutes in warm water.

In the use of dextrine in this manner, M. Velpeau has been gratified with excellent success. During a period of eight months of constant attendance in his wards, in which time upwards of fifty cases of fracture came under his care, I saw there no apparatus but that of dextrine, and the bandage of Scultetus for immediate

* Strange as it may seem, two English surgeons, Messrs. Beaumont and Sweeting, were contending a year or two since for the honor of having first used the plaster. The latter gentleman speaks in the highest terms of his success.

use in compound fractures. Part of the time I was actively engaged in his *service*, and had frequent opportunities of applying the apparatus under his inspection, and of closely watching its action during the whole progress of cure.]

CHAPTER VI.

ADHESIVE PLASTERS, (BANDELETTES.)

The word *bandelettes* seems to imply a mere diminutive of *bandes*, [or bandages.] It is true that we might give the name to ribands of linen of the width of the finger, and from one to three feet long, for example; but use confines the application of the word almost exclusively to certain strips of plaster, (*lanières emplastiques.*)

Article I.—Plasters of Vigo or Diapalme.

The Vigo plaster and the diapalme plaster, spread upon linen, known under the form of cerecloth, (*sparadrap,*) may be cut into strips or ribands of variable length and width. Strips obtained in this manner may be applied around the limbs and upon all parts of the body. The diapalme does not adhere with sufficient firmness; and it breaks and falls too easily into scales to have any great efficacy under this form.

The Vigo plaster, more adhesive, and of a closer texture in its composition, would be better for compression and to fasten certain parts of the dressings. Perhaps, also, it irritates the skin less, and favors less the development of erysipelas, than diachylon plaster. But its greenish color, and tendency to liquefaction by heat, and the difficulty of removing it from the skin, will always render its employment inconvenient.

Article II.—Adhesive Plaster, (*Bandelettes de Diachylon.*)

The cerecloth with diachylon is almost the only one we use at present. The strips of this plaster are employed in the treatment of ulcers, in the following manner: they ought to be sufficiently long to make a turn and a half upon the part, and we give them a breadth of from eight to twelve lines. The first strip is applied one or two inches below the ulcer, and without its being as important, as some surgeons pretend, to place its middle portion (*le plein*) on the side where the ulcer is, rather than on the opposite. We then successively apply the others from below upward, and in the same manner, taking care that they lap over each other by two-thirds or at least a half their width on their inferior edge, like the tiles of a roof. The highest must also be an inch or two above the suppurating surface. An important precaution here is, that each strip should be applied in a direction exactly perpendicular to the surface that they are to compress or embrace. It is also necessary that they exercise a uniform moderate compression, the same as an ordinary bandage, and that they should, when they are all applied, act like a kind of gaiter or buskin, as regularly as possible.

These strips of diachylon are also used as a means of union for most wounds, and after a multitude of operations; they are also known under the name of adhesive plasters, (*bandelettes agglutinatives.*) I shall return, then, to the manner of using them in treating of dressings, properly so called.

There is another mode of using strips of diachylon: as a means for fastening the pieces of linen which serve in the dressings, they are ready substitutes for bandages. Thus, strips of diachylon, of sufficient length to go several inches beyond the limits of all the compresses or gateaux with which a wound is covered, attaching themselves to the skin, take the place of every other sort of bandage, because we may apply thus any number of them, and cross them in various directions. It results from this, that the portions of the dressings cannot be misplaced, and that no compression is made on the diseased part. This is an important advantage, upon the face, cranium, chest, and abdomen, and also in some cases of wounds of the limbs. Under this form, the strips, which may also be made to make the entire circuit of the part, have nevertheless the disadvantage of favoring the development of erythema and of erysipelas upon the skin, and of causing in some patients an insupportable itching. The bandages imbued with dextrine may, as it appears to me, often be substituted for adhesive plasters.

[*Isinglass Plaster.*—Mr. Liston has been in the habit of using, for many years, a plaster made with oiled silk covered with a coating of isinglass. An ounce of isinglass is moistened by two ounces of water, and let to stand for an hour or two till quite soft; then add three ounces and a half of rectified spirit, previously mixed with one ounce and a half of water. Plunge the vessel into a saucepan of boiling water, and the solution will be complete in a few minutes. Having perfectly stretched out and securely fastened the oiled silk on a board, apply the isinglass smoothly and uniformly with a brush, as in applying a coat of varnish. When hard and dry, apply another layer in an opposite direction, and so on to a fourth or fifth; the last layer should be reduced in strength by adding a little more water. The isinglass must be well soaked in the water before the spirit is added. The brush used is a flat hog-tool. The solution, when cold, should be of the consistence of blanc-mange. Gelatin will not answer as a substitute for isinglass. Mr. Liston has now substituted for the oiled silk, the peritoneal covering of the cœcum of the ox, rubbed down and carefully polished in the manner of goldbeater's skin. Mr. Ancrum, assistant of Mr. Liston at the North London Hospital, states that, from the extreme thinness of the membrane plaster, the wound can be examined without its removal—that it adheres much better than when the isinglass is spread on oiled silk, and becomes firmly joined immediately—that its tenuity makes it as unirritating as goldbeater's leaf, and when once applied, it is so accurately adherent that it need not be changed for many days—finally, that ample experience proves it to be the best uniting material ever produced. In making it, the same precautions are observed as above for the oiled silk,

except that a layer of drying oil is to be spread upon the other side of the membrane.—*T.* —Vid. *Pharmaceutical Transactions;* also *Med. Gazette, Oct.* 15, 1841.]

CHAPTER VII.

VARIOUS ARTICLES.

Dressings demand also some other articles for certain special cases: for example, in treating diseases of the bones or joints. It is for this purpose that they have devised fanons, the false (*faux*) fanons, cushions, splints, fracture-boxes, (*gouttières,*) tapes, (*les lacs,*) cords, hoops, (*cerceaux,*) and also beds that might be called surgical beds.

Article I.—Fanons.

Fanons comprise three principal varieties: 1. The drap fanon; 2. The fanon properly so called; 3. The false fanon.

§ I. The name of drap fanon, or splint-holder, (*porte-attelle,*) is given to a piece of linen somewhat longer than the fractured limb, and upon which the other parts of the dressing are first laid. Properly speaking, this is a simple alèze, or a napkin, destined to envelop the different objects that are placed about the fractured leg or thigh. In other respects, the use of the drap fanon is easy to understand. If, for example, it is the leg we are treating, we spread out a napkin, deprived of its hem; upon this napkin we place the strips of Scultetus; and upon these strips we place, opposite to the fracture, some long compresses. When these latter are placed upon the limb, and then fastened by the strips of Scultetus, we roll up the lateral splints, from right and left, in the edges of the primitive napkin, or drap fanon; we thus bring each splint, by degrees, up to the distance of an inch from the surface of the limb; the cushions are then introduced between the limb and the splints thus arranged; the cushion and the splint in front are also placed; and we then fasten the whole by means of circular bandages.

(Fig. 60.)

It is easily conceived, that in treating a fracture of the thigh, the drap fanon must be of much greater length, and also that less length would be required for the arm or fore-arm.

Meanwhile, the drap fanon is nothing more than the envelop of linen (*la toile d'enveloppe*) which we sometimes have occasion for in dressings somewhat complicated.

§ II. The ancient surgeons frequently made use of fanons, properly so called. They understood by them, cylinders of coarse straw, (*de forte paille,*) (Fig. 60,) designed to take the place of splints, in fractures of the inferior extremities, especially of the leg, still employed in our day by some practitioners, especially by M. Larrey, senior. These cylinders, which have the advantage of bending and accommodating themselves easily to the elevations and depressions of the parts, while they at the same time present a certain degree of

resistance, have been for a long time past generally abandoned. Their tendency to be displaced, their cylindrical form, the pressure which they necessarily make upon a very narrow space, their want of solidity when it is important to guard against powerful causes of displacement, are the reasons why the splints used at the present day are almost always substituted for fanons.

(Fig. 61.)

§ III. The false fanons (Fig. 61) are nothing but linen folded upon itself a certain number of times; in a word, a species of graduated compresses. These faux fanons, chiefly employed for the leg, serve at the same time for cushions and fanons, but principally for cushions. That which has been preserved in practice under the name of the anterior tibial compress, was placed in front, and a little to the outside, while the others were introduced on each side, between the bandage of Scultetus and the drap fanon, the splints, or the bandages. They were made to reach, the first, from the tuberosity of the tibia to the instep, the two others, from the sides of the knee to below the ankles. In reality, the fanons and the false fanons cannot be useful but in a very small number of cases, since cushions or splints are with reason everywhere preferred. Now, however, when the dressings for fracture have undergone a complete revolution, it is to be hoped we shall no more have occasion to call these objects to our aid but for certain kinds of dressings of an altogether peculiar description, and which I have not now under consideration.

Article II.—Cushions, (*Coussins.*)

We employ in surgery two kinds of cushions, or mats, (*paillassons.*) Sometimes we place cushions beneath the diseased parts, or between the bed and other portions of the dressing. These are a species of pillows, filled with the chaff of oats; in a case of necessity we could, instead of oat-chaff, use feathers, wool, cotton, bran, sand, cows' hair, or leaves of certain plants; but the cat-tails, (*typha,*) and the oat-chaff, are infinitely better than the other substances. The form of these paillassons varies with that of the parts they are intended to support; that of a simple square, (Fig. 62,) or of an oblong, (*carré long,*) (Fig. 63,) however, is the most convenient. It is important

(Fig. 62.)

(Fig. 63.)

not to fill them too full, but only about one-half, for we almost always find it necessary to increase or lessen their thickness, sometimes on one part, sometimes on another, so as to place them, in fact, in perfect relation with the form of the part that they are intended to support. To prevent their irritating the skin, it is well to enclose them in a single or double fold of linen, a sort of alèze, or tick, (*taie*,) before insinuating them under the wounded part.

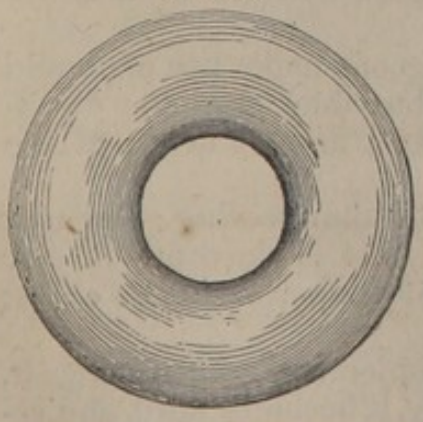
At other times, the object of cushions is to adjust and protect certain parts which we think require to be supported by means of more solid substances, or by a considerable degree of pressure. Thus, according to the ancient mode, they always placed some between the bandage and the splints around the fractured limbs, while they arranged one between the chest and arm in fractures of the clavicle, or neck of the humerus, &c. Then they resembled a kind of wedge, (*coin*,) or cylindrical sacks, a little longer than the broken limb, and from three to six inches in diameter, (Fig. 64.) As it is scarcely ever found necessary to place them in contact with the integuments, there is no absolute necessity to have them enclosed, as the others should be, in a linen case.

(Fig. 64.)

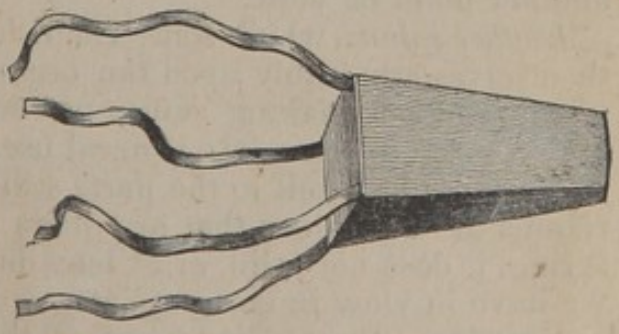
The new method of treating fractures will soon also do away with this kind of paillasson. It is right to say, however, that certain wounds, also certain diseases of the joints, and some kinds of inflammations, requiring one side of the limb to be exposed at pleasure, while the other is left in a state of perfect immobility, will make it necessary to retain them in practice.

As to cushions of sand, or bran, or ashes, substances employed formerly to increase the heat of the parts, and designed to prevent limbs operated upon for aneurism from becoming cold, they have scarcely any value at the present day. Like the satchels (*sachets*) of medicated powder of herb leaves, they will continue to be used remedially for certain cases, but not among the usual articles employed in dressings. In fine, paillassons are in truth pillows, either square-shaped, cylindrical, elongated,

(Fig. 65.)



(Fig. 66.)



rounded, spectacle-shaped, (Fig. 65,) or cuneiform, (Fig. 66,) adapted, in a word, to the part which we desire to raise up,

envelop, or support, and, when they are small, denominated *coussinets.*

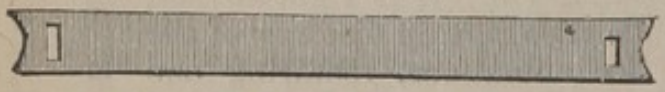
Article III.—Splints.

Already used in ages past, under the name of ferules or éclisses, splints acquired a great reputation under the patronage of the Royal Academy of Surgery, and in the school of Desault. They are pieces of wood whose form would be sufficiently well represented by a portion of bandage. Destined to maintain in a state of immobility the fragments of the broken bone, and to serve as a point of support to the bandages used to envelop the fractures, and to support certain diseased parts that we are fearful of disturbing, splints, like cushions, present a number of varieties.

Some are plain, (Fig. 67,) that is, entire (*pleines*) throughout their length, and devoid of notches, (*échancrures ;*) others have at one or the other of their extremities, and sometimes on both ends, a notch in the shape of a half moon, of greater or less depth. These latter often have also one or two mortices (Fig. 68) in the vicinity of each notch, in the same manner as some others are furnished with similar openings from space to space throughout their whole length, or at least in their middle portion. These notches and mortices serve for the passage of bandages, and to keep these latter from being displaced.

(Fig. 67.)

(Fig. 68.)



In fractures, the splints should, as far as it is in our power, be made to extend a little beyond the length of the affected limb. Their width varies from two to four or five fingers' breadth. Their thickness should scarcely be less than a line and a half, nor have more than three to four lines. If too narrow or too thin, they would have the disadvantages of fanons; if too thick or too broad, they would have too much weight, and would sit badly on the parts. All this, however, is applicable only to splints of wood, iron, or tin; for those of pasteboard, leather, or lead, must be considered under another point of view.

Leather splints, which some English surgeons make use of, mould themselves admirably upon the organs; but they have the disadvantage of not making sufficient resistance, and of being at too high a price to come into general use.

Lead moulds itself to the parts still better than leather; but as it retains the inflections that are given to it, and is destitute of any spring, it does not fulfil, or at least but very imperfectly, the object we have in view in using splints.

Pasteboard (*carton*) is free of all these objections; by wetting it, we can mould it like lead; when once dry, it becomes hard and resisting like wood. It is in very general use, and may be had everywhere cheap; and, unless there should be immediate necessity of

considerable resistance in the dressings of the fracture, the pasteboard, in my view, will for the future supersede wooden splints, in the small number of cases where these latter might still offer certain advantages.

It is easy to conceive that the pasteboard of which the splints are to be made should be of variable thickness, and that it is necessary to dip it in water so as to soften it properly before applying it. [*Felt*, says Dr. Mott, made into slabs, sheets, &c., often half an inch thick, is much better than pasteboard, and when wet in warm water, or over steam, perfectly soft and flexible. When dry, they are as hard as a board, and harder than pasteboard. They are very cheap and serviceable.—*T.*]

Article IV.—Trough-Boxes, (*Gouttières.*)

Troughs (*gouttières*—literally, *gutters* or *troughs*) are a sort of half-tunnels (*demi-canaux*) designed to support some parts of the limbs. They are made for the forearm, arm, leg, and thigh. Some have extolled them as a substitute for splints in the treatment of certain fractures; but they are chiefly intended to place the diseased articulations in the state of immobility in which it is proper that they should be preserved. It is impossible to conceive how advantageous it is for patients laboring under arthritis, whether from gout, rheumatism, syphilis, or other cause, to have the painful part supported in a properly padded trough. This contrivance, from which M. Champion, of Bar-le-duc, has for so long a period derived such important advantages, has procured for me also extremely fortunate results. Enclosing half the circumference of the limb, trough-boxes have over splints the advantage of not being displaced, and of exacting no compression, serving at the same time, in some degree, as a cushion and splint to the part. In other respects, the troughs that are made of tin, iron plates, (*tôle,*) pasteboard, or even wood, should be as light as possible, and sufficiently long to extend at least to the middle of the limb, above and below the diseased articulation. Those which the natives of Brazil or America make with flexible stalks or reeds, and which have been improved upon by M. Smith, have the advantage of being widened or narrowed at pleasure, and of even being transformed into a cylindrical canal; but they are not so convenient as ours of pasteboard.

Article V.—Hand-Board (*Palettes*) and Foot-Board, (*Semelles.*)

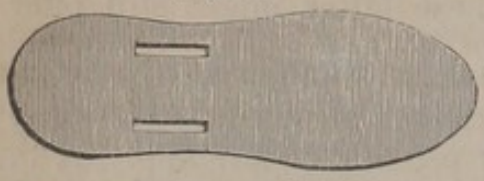
In connection with plain and grooved splints and trough-boxes, are to be considered the articles known under the name of palettes and soles.

(Fig. 69.)

The palette is a plate of wood (Fig. 69) designed to support the hand and fingers. Ordinarily divided like the fingers when they are expanded, it ought to be of

sufficient length to be prolonged in the form of a splint to near the elbow upon the side of the fore-arm. The semelle is another plate (Fig. 70) perforated with morticed openings near its edges, and shaped, it may be said, to the sole of the foot, which it is intended to support or protect in certain cases.

(Fig. 70.)



Article VI.—Tapes (*Lacs*) and Strings, (*Cordons.*)

Certain dressings require the use of cords. These generally consist of ribands, and pieces (*des bouts*) of bandage or strings. Tapes (*les lacs*) of riband or thread, in fact have the same uses in surgery as in domestic economy. They are designed to fasten the different pieces of certain apparatus, as, for example, in the case of fractures. At other times their purpose is to stretch, while they retain uniformly in their place, particular portions of the bandages, such, for example, as the suspensory, triangular, and square bandages, and the clavicle cushion. For this purpose we generally make use of ribands of coarse thread, or such as are new or half used, according as they are to press next the skin or not. We may employ also the common riband; the important point is, that they should be sufficiently strong to resist the traction that we may have occasion to use upon them with the hands. We also use bands made of bandages, sheets, or napkins folded cravat-fashion, wherever we desire to make extension or counter-extension, as, for example, in the reduction of fractures or luxations. In that case it is necessary to choose bandages sufficiently strong, or to double them.

Cords may be made of bandages or ribands rolled upon their axes; but it is more easy to employ merely the ordinary cord. This kind of cord is rarely employed to retain the dressings about the limb, but for want of better. But they are used with advantage in fastening certain parts, either to the edge of the bed, or to some solid substance in the neighborhood. We have recourse to them in the strait-jacket, to secure patients whom we wish to restrain while laboring under a furious delirium, also to exercise extension when using tackles or pulleys, in cases of luxations, for permanent extension in certain apparatus for fracture, &c. Finally, we may use them wherever it is desired to employ great force, and where the band (*le lien*) cannot be applied directly to the body itself.

Article VII.—Surgical Beds.

Almost all patients should be dressed in bed. In general, they are dressed in the ordinary bed; if, however, it were permitted to the surgeon to make choice for this purpose of the most convenient bed, he should prefer one that is narrow rather than wide, that the surgeon and his assistant, being placed one on either side, might act without being fatigued, or obliged to move the patient.

Metallic beds, being light, and less liable to bugs, and more favorable to ventilation, are infinitely better than those of wood. The upright and horizontal shafts with which these beds are constructed, resemble a kind of arbor-work with large windows, which is of great advantage where a number of assistants are obliged to work together upon the same wounded limb. Extension and counter extension may be thus made permanently, and secured upon the frame of the bed, without the necessity of recurring to a special apparatus. It is the same with all the articles that we wish to preserve immoveable about the patient.

It is important that the bed of the patient should be sufficiently firm to prevent it from being easily depressed; and that the bottom be furnished with a thick straw bed, unless we can procure those elastic mattresses which have been introduced into commerce for some years past. Above this mechanical hair quilt, or straw bed, we place one or two ordinary mattresses, and not a feather bed. If it were desirable to have still greater solidity, and to prevent every kind of projection or depression upon the plane which is to support the wounded part, we might, as is still practised sometimes for fractures of the lower extremities, slide a wooden board between the mattress and the straw bed. But it is rarely that this last precaution is indispensable, and the surgeon should keep in view that a too great hardness of the bed fatigues and disturbs the repose of the patient.

If the surgeon had constantly at his disposal a sufficient number of assistants, or persons capable of understanding him clearly, the bed of which we have just spoken would fulfil every indication. But as the contrary is too often the case, and as it is essential in certain patients that we should be enabled to change them with the least possible disturbance or movement, there have been devised certain mechanical beds, which might be denominated *Surgical Beds*, (*lits chirurgicaux.*) Among these beds, there are two that are distinguished at the present day above all others: that of Daujon, and that of M. Nicolle.

Daujon's bed is a sort of sacking bottom, (*fond sanglé,*) supported by four cords which suspend it to so many pulleys, and which may be raised entire at the head, or the foot, or at one or the other of its angles, or on the right or left side only. Having also a part which is a kind of moveable cushion towards the seat, it allows the patient to have his stools without moving him the least from his place. Its simplicity, and the real advantages it procures for the patient, have contributed in a remarkable degree to bring it into general use for the last twenty-five years.

It is nevertheless true, that the newly devised bed by M. Nicolle, is manifestly still more useful. With this, in fact, we may have successively, and temporarily or permanently, all the comforts of a chair, or an arm-chair, upon a plane more or less inclined, and in whatever direction we may wish; we may raise or lower the head or foot without being obliged to incline the rest of the body. With this bed, we displace this or that part without difficulty, and

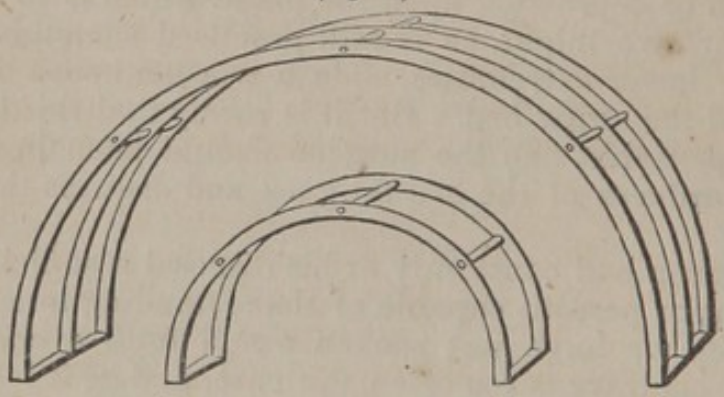
nothing is more convenient for patients who suffer, and whom we do not wish to disturb.

Many other mechanical beds have been constructed; but those of Daujon and M. Nicolle, up to the present time, appear to unite all the best qualities in this kind of article.

Article VIII.—Hoops, (*Cerceaux.*)

After the dressing is finished, it is sometimes required to protect the wounded parts from the pressure of the sheets and bedclothes. In such cases, we use an apparatus known under the name of *Cerceaux*, and whose design is, to keep all the surrounding objects at a distance from the dressings. In the country, or where it is necessary for us to construct one on the spot, and to have it immediately, we generally use a cask hoop, cut off at one of its extremities; this allows the two extremities to be separated and fixed between the edges of the bed and the sides of the straw bed or mattress; while the ordinary hoop (Fig. 71) rests upon the bed. We have

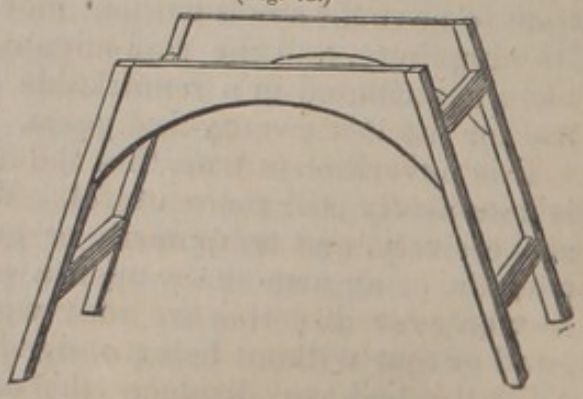
(Fig. 71.)



thus a large or a small arc, (Fig. 72,) which sufficiently well supports the bed-covering that we wish to surround the patient with, leaving the wounded part in a kind of void. If a single arc, thus arranged, should not suffice, nothing would be more easy than to place a second, or even a third, at some distance above.

The hoop, arranged as in figures 71 and 72, is, in part, the preceding one systematized. It is made with rods of metal, or some splittings of a bushel measure,(*quelques plaques de boissellerie,*) joined together by transverse pieces somewhat more solid, so as to resemble two or three arcs fixed together, and which should rest with their base upon the mattress on each side of the injured limb; other cerceaux resemble more a kind of square, (Fig. 73,) which is constructed in the shape of a box or cage. The important point is, that they should be of height, width, and length sufficient effectually to isolate and protect the diseased part. It is also evident that the cerceaux ought to be divested, at their

(Fig. 73.)



base, of every kind of cross-piece, that we may raise or remove them without being obliged to disturb the rest of the dressing. [Common wire, says Dr. Mott, makes an excellent cerceau. Take three or four pieces, and bend them into semicircular arcs, and then fasten them at the base with a piece on each side running horizontally; and this makes a light and capital cradle in a few minutes.—*T.*]

CHAPTER VIII.

BANDAGES.

It would be quite difficult in the present day to give a definition of the term bandage. We indifferently use, in fact, the words *bandage* and *appareil* to designate the same thing. It, however, seems to me that we ought, by the word appareil, rather to understand the ensemble of the articles which we may have occasion for in the dressing, while bandage should be applied to the containing pieces only, or to all the portions of the dressing, after their definitive adjustment.

However this may be, the bandages are intended to fasten, and retain in their place, the different portions of the dressing, or of the diseased part. Moreover, bandages have been divided by surgeons almost to infinity, according to the purpose for which they are to be used, or the form or figure they present. There are those which, fulfilling every indication, are applied in every case, and merit the name of general bandages. Others, having been rather designed for certain parts or regions, should take the name of special bandages.

Article I.—General Bandages.

We find, in works that treat of this matter, uniting, preservative, dividing, expulsive, compressing, retaining, (*retentifs*,) suspensory, and containing (*contentifs*) bandages; but it is evident that a great number of bandages may serve, at the same time, for all these indications. There are none of them, for example, which may not be preservative and have other qualities at the same time.

The *uniting* (*unissant*) bandage, which is intended for approximating divided parts; the *dividing*, (*divisif*,) which is for keeping them separate; the *retaining*, (*retentif*,) for restraining their protrusion; the *expulsive*, (*expulsif*,) which is intended to expel them; all exercise, at the same time, a certain degree of compression, and, therefore, come, more or less, under the *compressing* (*compressif*) bandage.

The *suspensory*, (*suspensif*,) the object of which is to give gentle support to parts that are naturally pendent, is moreover *preservative*, (*préservatif*,) and *containing*, (*contentif*.) This last, intended to

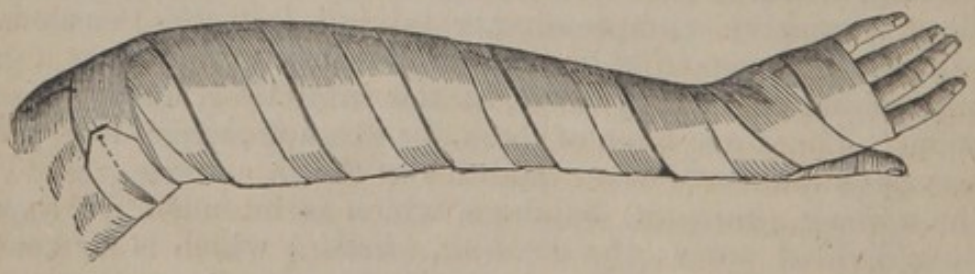
fasten the other pieces of the dressing, is found equally comprised in all the others. It differs from the compressing bandage, however, in this, that it has no other use than to prevent the displacement of the parts. All these bandages may be made out of bands, (*bandes,*) from which, in fact, they receive their name. Some of them may be made with simple pieces of linen or compresses, as there are others in whose construction enter ribands, tapes, (*des lacs,*) or twine, (*des cordes.*) Certain bandages, such, for example, as are employed for containing hernia, include also other substances, such as steel springs, pieces of leather, gum-elastic, or caoutchouc, &c. In fact, the ancients had so multiplied the number of bandages, that they created confusion, while we seem to have fallen into the opposite extreme. If it is true, that it is useless to have fifty species of bandages for the head alone, as in the time of Galen, it is no less certain, that the pupil who knows how to make useful bandages properly, dresses better and quicker, and is more serviceable to patients, than he who acts without rule and without principles.

In the application of the dressing, we must not sacrifice the useful to the agreeable; but, if it be possible to give some elegance to the bandage, while we have made it at the same time better, why should we not do so? If it belongs to the surgeon to manipulate the objects which he uses with more address than the world in general, why should he not seek to distinguish himself also from the vulgar in the matter of dressings?

§ I.—*Containing Bandage.*

In more general use than any other, the containing bandage is employed everywhere. Applied around wounds, its intention is a very moderate compression, which has no other object than to fix the compresses, lint, &c., in their place, while it renders them immoveable. This bandage sometimes represents a spiral around the limb, (Fig. 74,) and sometimes lozenge-shaped turns, (*losanges,*) or a

(Fig. 74.)

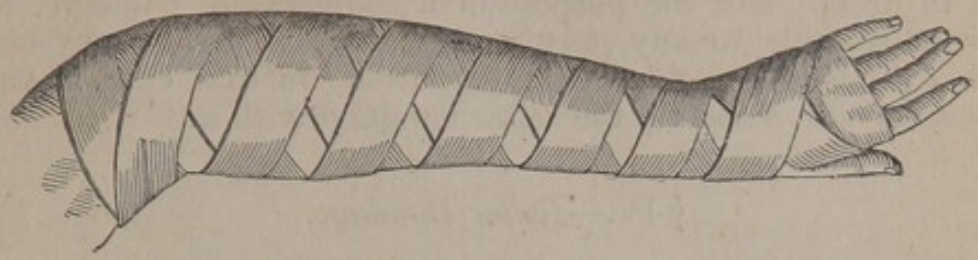


double spiral crossed, (Fig. 75,) as the ancients often made it; sometimes a true roller bandage.

It is the containing bandage that we apply after luxations: almost all hernia bandages are of this description; we may say the same of certain pessaries supported in the vagina, and of some pelotes that are kept in the anus. Many of the dressings of fractures are also containing bandages. There is scarcely, properly speak-

ing, any other in surgery but the containing and compressing bandage.

(Fig. 75.)



§ II.—*Compressing Bandage.*

We apply the term compressing to a bandage, as often as, in addition to its constraining qualities, it is intended so to act upon some points of the diseased region as to cause pressure upon it, and approximate some of its tissues. This bandage comprises the simple compressing bandage, the expulsory, the retaining, the uniting, and the dividing bandage. By it, we effect on the circumference of the limb, a pressure sometimes circumscribed, sometimes diffused, often partial, and occasionally general.

When the pressure is exercised only upon a circle of the part, it takes the name of strangulation, (*étranglement*,) or *ligature*. Compression, in fine, has for its general object, to force the fluids into the interior—to moderate their afflux to the part—to flatten and repress vegetations and tumors, and to bring into contact parts that have a tendency to separate—to destroy morbid growths from openings or dependent parts where they tend to accumulate—to restrict others of them to the cavities where we have confined them—to arrest or suspend the circulation in certain vascular trunks, and to cause mortification by producing an eschar upon some point of the skin. But the compressing bandage may, like the containing, assume an infinity of different forms. Hence we employ it under the form of a circular, roller, crossed, (*croisé*,) or recurrent bandage, that of a T bandage, or cruciform, (*bandage en croix*,) suspensory, sling-shaped, (*fronde*,) or special bandage.

§ III.—*Circular Bandage.*

(Fig. 76.)

If, with a bandage of greater or less width, we make several circular (Fig. 76) turns around any part whatever, so as to give it the appearance of a collar, as is sometimes done at the wrist, arm, bottom of the leg, and under the knee, at the inferior part of the thigh, and at the elbow, whether for the dressing of certain wounds, blisters, or cauteries, the bandage takes the title of circular bandage; it is with this also that we begin a great number of other bandages; but it then soon loses its primitive name.

The circular bandage alone is suitable to all regions that are throat-shaped, (*en forme de gorge,*) that is to say, to all parts of the body that increase in size above and below the region which we wish to dress. For the purpose of a compressing bandage, it is scarcely suitable to any part, seeing that its action may be so quickly changed into that of strangulation; in that case, it would be necessary to associate the roller bandage with it.

§ IV.—*Roller Bandage.*

The most common of all bandages, the roller bandage, is, in respect to dressings, in some sort what the bistoury is to operative surgery; therefore I shall describe it with more detail than any of the others.

By roller bandage, (*bandage roulé,*) we mean a series of turns of bandage which lap over each other by the half or two-thirds [their breadth,] and which, in their ensemble, constitute a sort of stocking, or gaiter.

This bandage answers all kinds of indications; often it is only containing, at other times uniting, and it may equally be dividing, expulsory, or retaining; but the purpose which it best fulfils is compression.

To be enabled to apply the roller bandage well, it is necessary that we should have been much practised in the expert use of bandages.

A.—*Rules which should govern in the application of Bandages in general.*

The bandage rolled into a cylinder, (*globe,**) and the only one almost in use at present, should be held in the hand by the two extremities of its axis. Its end, that is, its head, which is free—and which we often find in hospitals, by a reprehensible custom, fastened with several pins to the other part of the roll—should be applied by its outer surface on the point opposite to that on which the wound is situated. While the fingers or thumb of the left hand retain this head in its place, the right hand draws moderately upon the rolled head to unroll it while traversing the circumference of the limb.

To prevent the free head of the bandage from slipping, or being displaced, it is well to fasten it by two or three circular turns, or, what appears to me better, to fold it back on the first turn, in order to cover it by the second, that we may afterwards have no more trouble with it. In continuing to unroll the rolled head of the bandage, we must take care to hold it as little distant from the surface as possible, and never to unroll more of it at one time than is required for half a turn.

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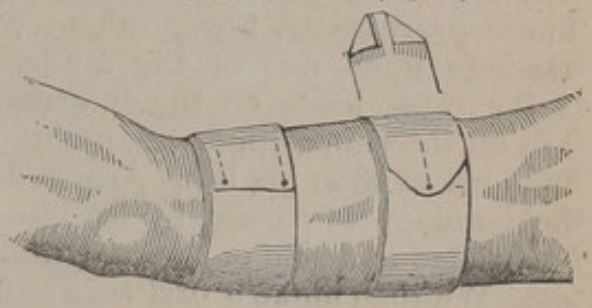
* Though the term *globe* may be specific enough in French, it is, in our language, too constantly and intimately associated with the mathematical idea of *sphericity*, to be used in English for the true *cylindrical* shape of a roller bandage.—*T.*

We proceed in this manner until the cylinder in the hand is exhausted, and that the central head becomes free. Then we have only to fasten that, and it is ordinarily by means of pins that the operation is terminated.

In this respect, we may adopt three modes: 1. With a single pin on the middle of the length of this edge, we attach it to the subjacent turns; in this case, the pin should always have the head turned toward the free side of the edge; otherwise it would constantly tend to be displaced, and its point would soon become entirely detached before the next dressing. 2. If the bandage has more than two fingers' width, the edge of its free extremity being fastened only at the middle part, soon turns up at the angles, and gives it a disagreeable look. It is better, therefore, to place a pin near each extremity of this edge, (Fig. 77,) or still better, after doubling in its two corners, so as to shape it into a triangle, to fasten on the point (Fig.78) as in the first case.

(Fig. 77.) (Fig. 78.)

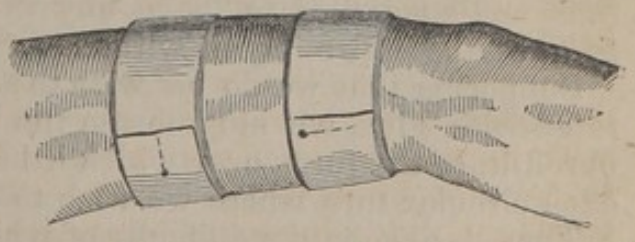


3. Some persons prefer attaching two strings to the end of the bandage, with a view of fastening this latter by a bow knot, in the manner of ribands. When the bandage is narrow, like that, for example, which is used for the fingers, it is easy, by slitting its free extremity to the extent of four to six inches, to convert it into two strips, which will answer for ribands, and which we must take care to cross under each other, (Fig. 79,) before tying them.

(Fig. 79.)

4. The student also should not forget, that in placing the pins crosswise, (Fig. 80,) or the head turned towards the middle of the bandage, (Fig. 81,) he proves that he has never studied the art of bandaging.

(Fig. 81.) (Fig. 80.)



In unrolling a bandage, we make—1. Circular turns, when the turns are placed directly over each other; 2. Portions of a spiral, when, acting on a conical part, we proceed from one end to the other of the surface of the limb, by making all the points of the outer surface of the bandage bear perpendicularly upon the limb; 3. These turns, which are also called oblique, and by means of which we form crossed (*croisés*) bandages, take the title of *doloires* when they lap by a third, two-thirds, or a half [of their width.]

To make the manner of applying the roller bandage understood,

I will suppose that we are treating the lower extremity. We must procure a bandage of the proper length, rolled into a cylinder, three fingers wide, dry or wet, according to the indication, and begin by surrounding the foot with it. If the surgeon is accompanied by assistants, one of them holds the heel fast with one of his hands, and the digital extremity of the foot with the other, while a second assistant, placed near the pelvis of the patient, supports the ham, or lower part of the thigh, so that the whole leg is sufficiently raised to permit the different turns of the bandage to be freely passed around it. If we are deficient in assistants, it is necessary that the heel of the patient should be supported upon the knee of the surgeon, on the edge of a chair, or some other insulated prop. These precautions being taken, we throw the free head of the bandage upon one of the malleoli, the external malleolus if it is the right limb, on the internal, on the contrary, if it is the left, on the supposition, meanwhile, that the surgeon uses his right hand better than his left. Arrested upon this point by the left hand, the bandage is passed by its free surface upon the dorsum, the inner edge and sole of the foot, and brought to the root of the little toe. We then make a first turn; then a second, which covers two-thirds of the first; then a third and fourth, following the same rules, till we approach the instep. There the bandage is carried back by the inner side, and passed by the outer side around the lower part of the leg, on a level with, or a little above the ankles, so that the turns upon the foot resemble the figure of 8 in their connection with those of the leg.

Here difficulties present, which practice alone enables us to surmount. The malleoli and the heel form three projections, separated by unequal depressions. If the roller bandage is to be purely a containing one, we can proceed without any real inconvenience; but however little may be the compression it exercises, these parts are to be covered by it uniformly; the best mode, then, is to employ a glutinous bandage, (*bande collée*)—(Vid. supra.) In this case we always unroll the bandage perpendicularly to the surfaces; and the reverses (*renversés*) that we are obliged to make to change its direction having no longer a tendency to slip, we are thus not compelled to leave any vacant space, but cover every point of the entire region without difficulty.

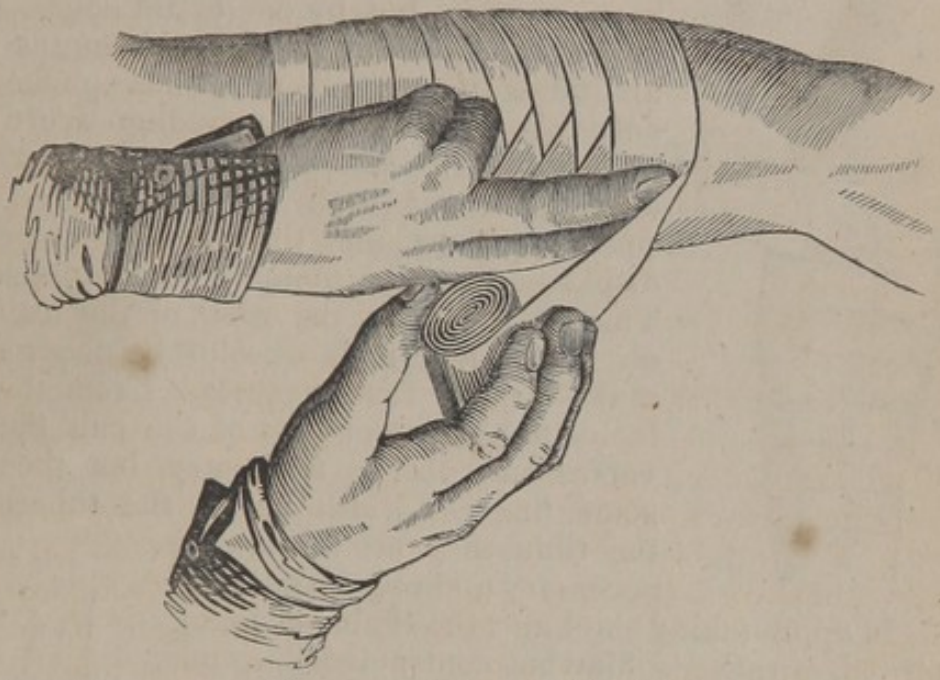
Supposing that we do not wish to have recourse to the linen saturated with glue, we must fasten the bandage, in proportion as we unroll it, to the turns over which it laps, and that by using pins at each circular turn where we wish to change the direction.

There is also here a difficulty of which young surgeons should be advised; it is, that the instep, from the metatarsus to the base of the malleoli, represents a sort of neck, which necessarily requires a great number of turns, (*doloires*,) and which, being the point of departure to a great number of compressing radii, seems to accumulate upon it a more considerable share of pressure than any other part in the neighborhood. Hence it is there that patients chiefly feel the pain; that phlyctænæ, sores, (*escarres*,) and gan-

grene form, if the bandage has not been properly applied. It is necessary, therefore, to be careful that we press as little as possible on this spot, and to endeavor not to concentrate upon it the different turns of the bandage that are to envelop the heel. It is a point of practice on which I cannot too much insist, so often has it happened to me to see it neglected by pupils, even by those who have been the best instructed.

Reverses, (*renversés.*) Before arriving at the instep, and especially in order to continue the bandage in the direction of the leg, we are obliged to make reverses, (Fig. 82.) In the act of bandaging,

(Fig. 82.)



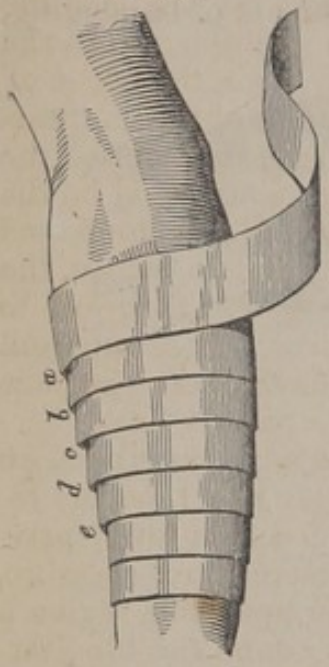
they give the name of *renversés* to a fold which makes the upper edge of the bandage become the lower, and its outer surface, the inner one. To render them as little inconvenient as possible, these reverses should be abrupt, that the oblique edge they make may not be much longer than the width of the bandage ; otherwise, it would represent a species of cord, which would wound the parts by rendering the compression unequal. To make these folds, whether from above downward, or from below upward, according to the place where we apply them, the surgeon fixes the last point of the bandage that has been unrolled, to the surface of the limb, while with the other hand, which has not separated the cylinder but to very little extent from the bandage, he turns it suddenly upon itself, without drawing upon it, and as if to cross its two edges. That being done, he continues to unrol it, until he comes back to the same point, following the rules above indicated, so as to repeat the same manipulations a certain number of times, if the form of the limb requires it.

These reverses are everywhere indispensable where the parts contract in the form of a cone. In fact, whether it be at the foot, leg, or fore-arm, the parts enlarging, from the inferior extremity towards the upper portion, render it necessary, in order to bear per-

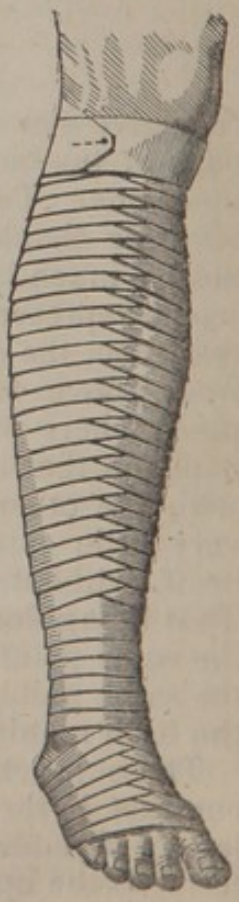
pendicularly on all the points of their surface, that the turns of the bandage should be made to stretch out in a spiral manner. To obtain, then, a regular roller bandage, it is necessary, in these regions, that the upper turn, which otherwise would fly off in a diagonal direction, should be brought back by a fold, made as quickly as possible, to the inferior turn, which latter is to remain in a circular position, if we desire that it should be in part lapped over by the other.

Puckers, (*godets.*) The pupil who, in a case like this, fails in making reverses, produces what are called puckers, (*des godets*—Fig. 83 ;) that is to say the bandage, applied circularly, does not then bear or press but by one of its edges, while the other edge flares out, and remains open, and tends to be displaced. These puckers not only take away from the bandage every thing that it might possess of elegance, but they also cause the limb to be strictured from space to space, and the dressing to become displaced from the moment of its application. Thus, to arrive at the roots of the little toes on the instep, it is absolutely necessary to make three or four reverses. From the malleolus to the lower part of the calf these reverses may not be necessary, but thence to some fingers' width below the tubercle of the tibia they are absolutely necessary and require extreme care. In approaching the knee, the limb, becoming cylindrical, or rather somewhat contracted, does not exact the same precautions. To give some elegance to this arrangement, we endeavor to place the reverses on the same line, on the anterior surface of the limb, for example, from the small toes to the knee ; there results from this a crossed appearance, which gives the bandage some resemblance to the ancient buskin, (*cothurne*—Fig. 84,) or to the stalk of an ear of wheat.

(Fig. 83.)



(Fig. 84.)



Nevertheless, we must guard against making unequal pressure on any part, merely for the purpose of giving greater regularity to the dressing. As the cylindrical or conical form of the part is not the same in every individual, it would be manifestly injurious to wish to submit the application of the roller bandage to rules too precise. The law which ought, above all other things, to govern the surgeon in such a case is, that the plane of the bandage should always press perpendicularly upon the skin ; add to this, that the compression should everywhere be equal; that there may be no void between the turns of the bandage ; that these turns lap over

each other in the manner of tiles or slates upon a roof; and you then have, for every intelligent person, the key to a roller bandage.

Padding, (*remplissage.*) The roller bandage, when used also for compression, often requires that paddings should be associated with it.

The leg. If it is the foot, we place, first, on the sole, at the inner part and middle; secondly, on the dorsum, upon the outer part and in front, pliant compresses, pieces of lint, cotton, tow, (*l'étoupe,*) or agaric; the same precaution is necessary between the heel and the ankles, and on the sides of the tendo-Achillis. Without this, the compression, in fact, would bear almost entirely upon the edges of the foot, and would soon fatigue all the articulations of the metatarsus, at the same time that it would favor the engorgement of the tissues directly beneath. In the tibio-tarsal region, it would be the heel, malleoli, and tendons of the ankles, that would be compressed precisely in that part where the compression is useless, whilst the intermediate portions, the only ones which we generally desire to make pressure upon, would remain perfectly free. It is apparent how the tendo-Achillis would be pressed towards the posterior face of the tibia, if we did not take the precaution to pad its sides.

I will add, that with the roller bandage, as with all others, an equal amount of pressure produces infinitely less effect, on the regions abundantly supplied with flesh, than on those that are deprived of it; therefore it is well, when we wish to have exact pressure, to increase its force about the calf, and to place upon this region a large compress folded four to six times, while around the tibio-tarsal articulation the compression should be much more moderate.

Fore-arm. What I have said of the roller bandage, in regard to the leg, is precisely applicable to the fore-arm, except that the hand, being well covered with flesh on both its sides, does not, therefore, involve as many difficulties as the foot, and has no tibial crest, like the leg, endangering too severe a pressure upon the teguments in a right line.

In conclusion, when we wish the roller bandage to remain in its place for a certain length of time, it is often necessary to fasten the looser turns of it by a few stitches or pins; but if this fastening should be a matter of much importance, nothing could be compared in this respect to a solution of dextrine, or Flanders glue, with which the bandage should have been previously saturated.

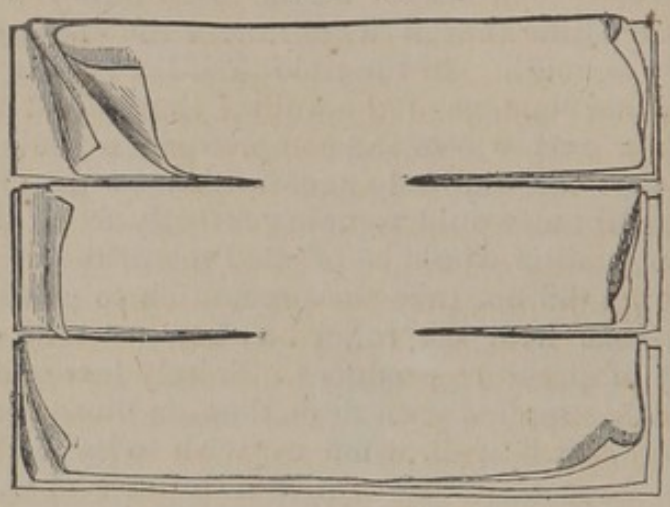
The roller bandage is of such general use, and yields so many advantages when it is well made, that I cannot too much urge upon pupils to practise themselves in it. Let those who have it not in their power to practise upon it in hospitals, get a manikin, or, what is as well, procure some bandages, and among themselves, on their own limbs, familiarize themselves to the use of it, so that they may comprehend and overcome all its difficulties. Being the only dressing for a great number of severe diseases, and associating itself to almost all other bandages, and to a great variety of dressings, it rarely fails to make a part of even those that are the most trivial.

§ V.—*Tail Bandages,* (*Bandages à Bandelettes.*)

Tail bandages are of two kinds—one composed of tails of greater or less width and number, and which are fastened by the middle; the other formed of narrower tails, simply imbricated or lapping over each other. To the first kind belong the different sorts of cleft compresses, and especially the bandage with eighteen tails, and that of Pott; the second comprises, at the present day, scarcely any other but the bandage of Scultetus.

A.—*Bandages with eighteen tails,* (Fig. 85.)

(Fig. 85.)



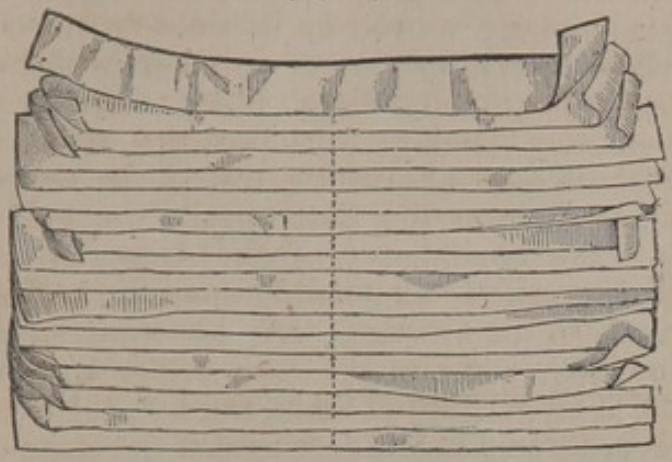
Though frequently employed formerly, the bandage with eighteen tails is now almost totally forgotten; it is composed of three pieces of linen nearly square, and laid over each other; they are afterwards slit on each side into three portions—a middle, a lower, and an upper one: we have thus nine compresses, each with two tails, consequently, in all eighteen tails. With this division of three whole pieces of linen we may envelop the leg in a uniform manner, without making either puckers or perceptible folds, because the lower tails slightly cover over the middle tails when they are brought forward, and the same with the upper tails when we bring them round from the lower part of the calf to the crest of the tibia; but this bandage has this disadvantage, that we cannot remove it but as a whole, and of presenting ends of compresses that are too wide. The bandages that have been substituted for it are manifestly better.

B. 2.d *Bandage with the tails united,* (*Bandage à bandelettes reunies.*)

Desiring to unite the security of the eighteen-tailed bandage to the regularity of the bandage with separate bandelettes, some surgeons have devised a dressing composed of wide bandages of three to four fingers' width, and sufficiently long to make a turn and a half around the limb. These bandelettes, previously arranged upon a drap fanon so as to lap over one another to two-thirds of

their width, should be sewed together along the whole median line on the back of the bandage, (Fig. 86.) We obtain thus, when it is

(Fig. 86.)



applied, a species of roller bandages, whose parts, fastened behind, cannot in any manner be displaced, and which, being sufficiently narrow, do not oblige us to make any fold or pucker capable of irritating the parts. This bandage, nevertheless, has not come into general use; from the union of its portions behind, preventing us from changing the bandelettes separately, the bandage with separate bandelettes, or that of Scultetus, is generally preferred.

C. *Bandage of Scultetus.*—Next to the roller bandage, the dressing of Scultetus is the one most employed in surgery, when we are healing wounds of the limbs; that of Pott, or the preceding, differs from it only in the stitches which fasten the different pieces behind. It is made, therefore, like the bandage of Pott, with a variable number of tails. These bandages being designed to make a turn and a half upon the part, will necessarily vary also in their length and breadth, according to the size of the limb. If it is the thigh, we give them a breadth of four fingers, and a length of twenty to thirty inches; for the leg, they ought to have at least six inches in length, and only three fingers breadth. We take care also to make them a little shorter opposite the narrow parts of the limb. All these tails (*bandelettes*) being prepared, we place them on the drap fanon, or on a napkin spread out. We commence by the upper

(Fig. 87.)

one, and the others are afterwards arranged from above downward, so that they may lap over each other two-thirds, (Fig. 87.)

Most generally it is useful to place on this dressing some long compresses, half as wide as the bandelettes of Scultetus, and which are the first that are raised around the wounded part.

To apply this bandage, we roll up its sides on two splints, which connect the whole into a species of cylinder, which are easily removed without displacing any thing. If we are treating a fracture, we first surround this bandage with the ties which are thought necessary. The diseased limb being raised, the surgeon slips the whole underneath, loosens the ties, unrolls the splints, and then spreads out all the bandelettes of the dressing. After having lowered the part as exactly as possible upon the middle of the bandage, he proceeds to the dressing. An assistant supports the foot by the heel and the roots of the toes, while a second assistant fixes the knee. The perforated linen, the lint, the compresses, and the cataplasms, are immediately arranged, if the state of the wound requires it; nothing more is left to be done than to apply each bandelette of the bandage; an assistant, who should be in front, stretches the extremity of one of these bandelettes, in proportion as the surgeon draws on the other, and raises it. We must begin with the long compresses, and always at the lower part. We then come to the bandelettes of Scultetus. properly so called, beginning also with that from below. In fact, the pieces of linen of the whole bandage ought to be applied in an inverse order to that of their position on the drap fanon. Below, we cross them so that their ends reach the plantar surface of the foot. Upon the leg, on the contrary, it is necessary that each of their extremities should be pressed against the side of the tendo-Achillis, or upon the calf, between the teguments and the fanon. We continue thus to the last of the bandelettes, that is to say, up to the knee if it concerns the leg only, or to the hip if the thigh is to be included.

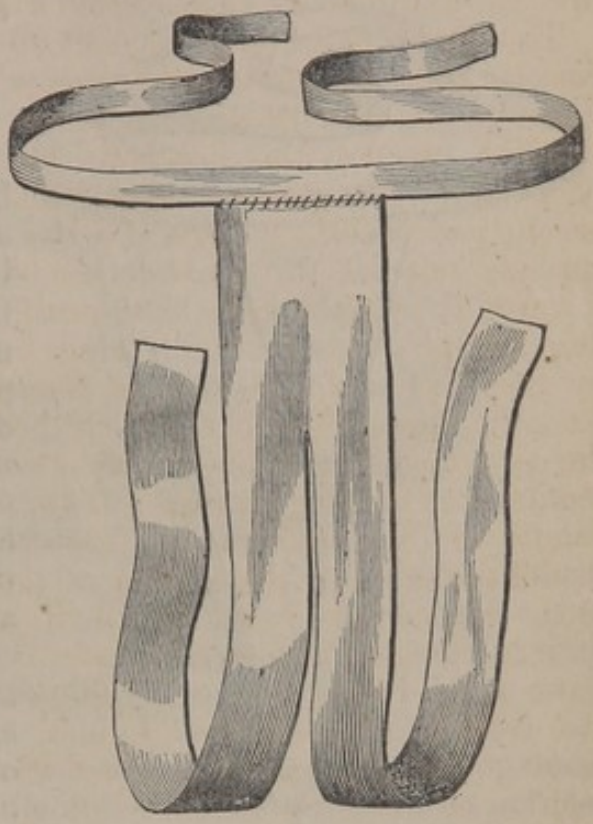
Composed of a multitude of pieces, the bandage of Scultetus accommodates itself to every variety of form and size of limbs. It has the very great advantage of enabling us to arrange the dressings without obliging us to disturb the part, whereas, in order to raise the part up to apply the roller bandage, we are forced to hold the limb in the air. Moreover, this bandage may be put together or taken apart in portions. Should some of its pieces become soiled, and require to be taken away, they are removed without disturbing any thing. By fastening, by means of a stitch or pin, a clean bandelette to the extremity of that which is soiled, we draw with the same movement the first into the place of the second. It is then the containing or compressing bandage *par excellence*, for all parts that require to be dressed frequently, and which it is important should be disturbed as little as possible.

§ VI.—*T Bandages.*

The T bandage is composed of two portions, one horizontal, the other vertical. The horizontal branch of the T, a portion of the bandage whose length ought to be in relation with the size of the

part to be embraced, is nearly always arranged in the same manner. The vertical branch of this bandage presents, on the contrary, many varieties. Ordinarily single, it may be double up to its root, or only to within some inches from the horizontal branch, (Fig. 88.) Formerly, surgeons used also a T, with three or four vertical branches; but, at the present time, we no longer use those complicated bandages. In short, it is a bandage which is made by sewing, or simply fastening by pins, one or two ends of bandage upon the middle of another portion of bandage. The T bandages are never employed now, but for diseases of the anus, perinæum, and genital organs. We shall see, however, that they are useful also for other regions.

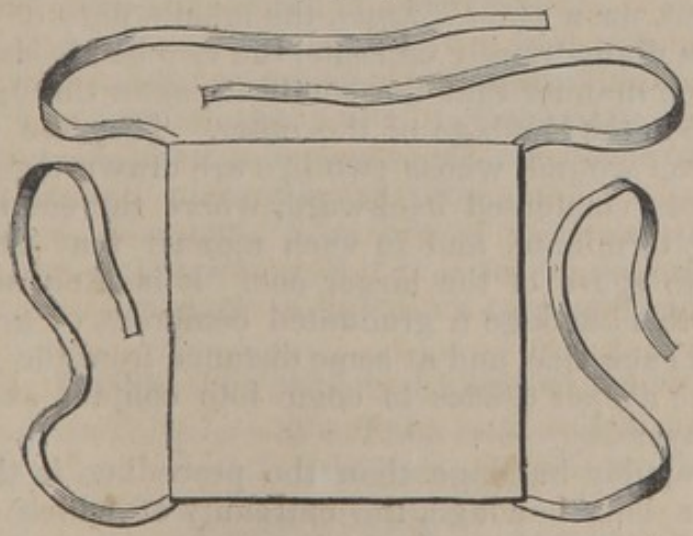
(Fig 88.)



§ VII.—*Square and Triangular Bandages.*

A piece of linen, of medium strength, cut into a square shape, and having a riband at each one of its angles, constitutes the square bandage, (Fig. 89.) This bandage, which may be suitable

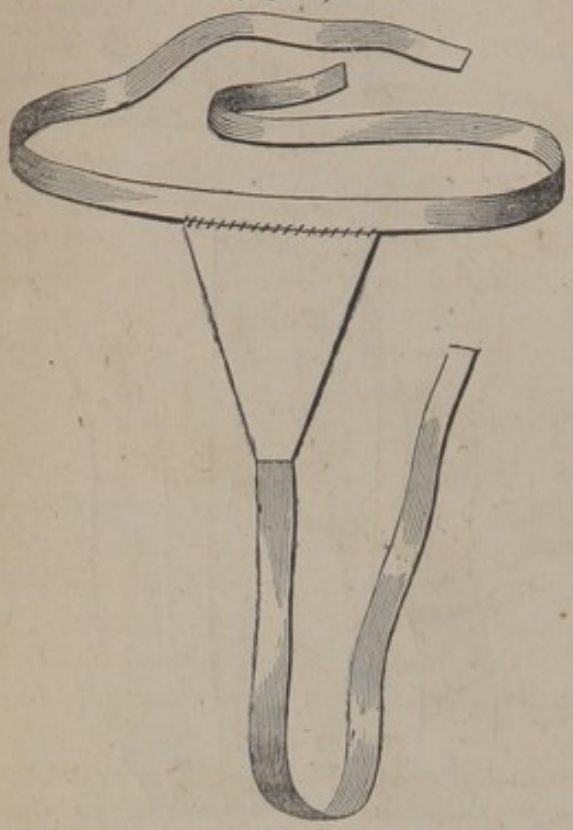
(Fig. 89.)



for certain diseases of the breast, hip, upper part of the thigh, and sides of the chest, is so simple that it has no need of being described.

It is the same with the triangular bandage, (Fig. 90,) which we employ on the same regions, and sometimes on the scrotum.

(Fig. 90.)



§ VIII.—*Uniting Bandages.*

Since adhesive plasters have been modified and improved so as to be made applicable to the greater number of wounds, the uniting bandages have almost entirely disappeared from practice. With some strips of diachylon and the simple containing bandage, we fulfil, in fact, the greatest part of the indications that gave rise to these different sorts of bandages.

It is, however, necessary to know some of them: 1. Because adhesive strips cannot be borne on the skin of some persons; and 2. Because the approximation of the lips of certain wounds is, in reality, better effected by a bandage than by plasters.

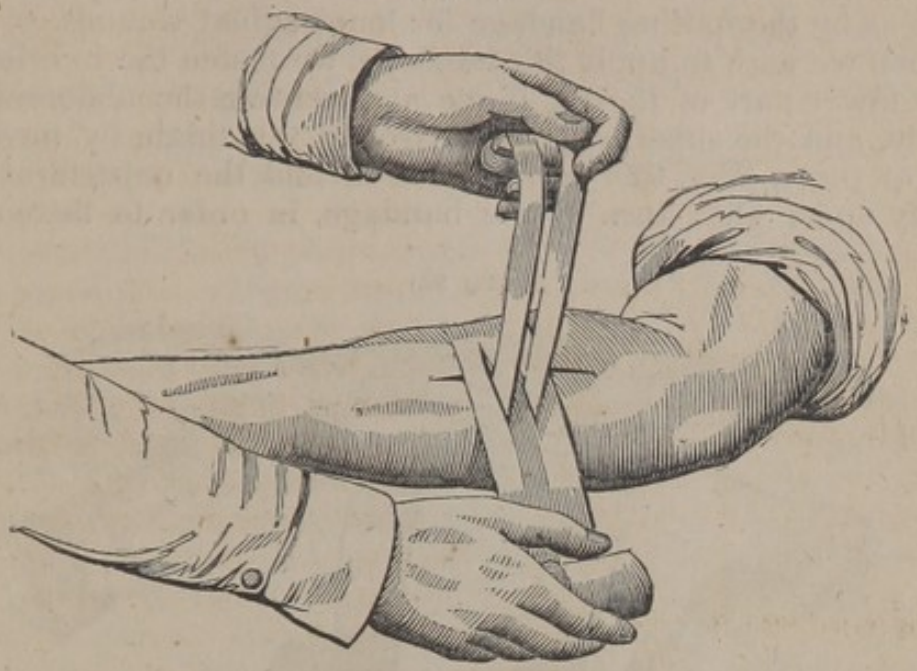
A. *The long uniting Bandage for wounds.*

To unite a wound, whether of the limbs or trunk, in a direction parallel to the great axis of the body, we have need only of a bandage; excepting that it is necessary that this bandage should be rolled into two unequal cylinders. In arriving at the sides of the wound, after having placed, for a *point d'appui*, the middle part of the bandage on the region diametrically opposite, the two heads should be conducted in such manner that the smallest passes through a slit previously made in the bandage of the other. They are thus crossed in front of the wound, whose two lips are drawn together. They are afterwards conducted backward, where the small head must be made to terminate, and in such manner that there are still some turns to spare of the larger one. It is often, also, useful to place under this bandage a graduated compress, of greater or less thickness, on each side, and at some distance from the wound. We thus force the deeper tissues to come into contact as well as the superficial layers.

A more regular bandage than the preceding, is that which is made with a long bandage, the extremity of which is converted into two strips, (Fig. 91,) and which present, at a variable distance from each other, two kinds of long openings. We make a small head with the divided extremity of the bandage, and a large one with the other portion. The measurements ought to be so made,

that while the middle of the bandage is supported on the point opposite to the wound, the openings and the root of the strips may

(Fig. 91.)



be found united together on reaching near the wound. Passing through each other, and properly crossed, the two portions of the bandage are then drawn upon, unrolled, and fastened, as in the preceding case.

With this arrangement, the strips fill up exactly the holes prepared beforehand, and the whole makes in reality but one piece, which draws in an equal manner, and in an opposite direction, upon the parts that we wish to keep in contact. It is to this, then, that we must have recourse when we wish to undertake the immediate union of a wound of some length, in those cases where adhesive plasters do not seem applicable or sufficient.

When the wound is narrow, or where it is of no consequence to effect a perfectly exact coaptation of its lips, we may make use of a more simple uniting bandage ; that is, of one somewhat narrower, and rolled like the other into two heads, and whose two portions are obliquely crossed without being slit, or without crossing upon the front part of the wound. This form of bandages is useful when we are treating parts, for example, of small dimensions, as the fingers, where we make use of bandages extremely narrow.

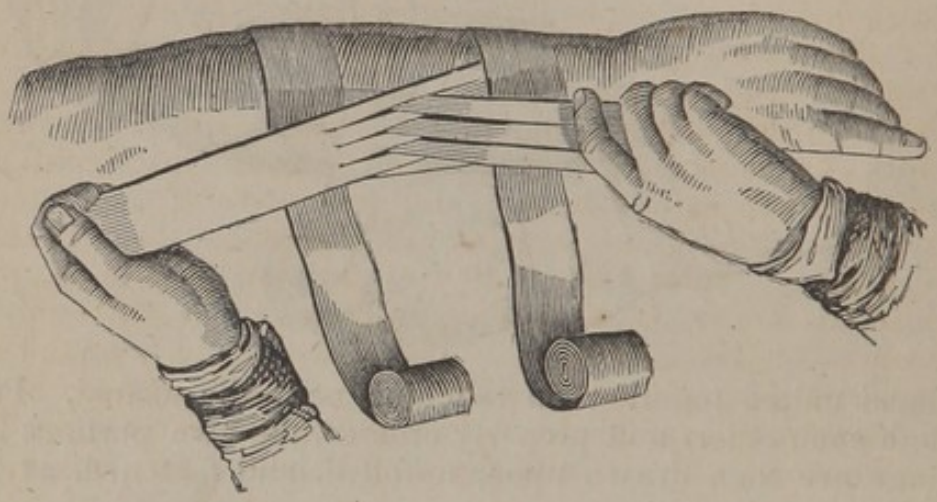
B. *Uniting Bandages for transverse wounds.*

To approximate the edges of a transverse wound, we must draw upon it in directions parallel to the axis of the body. The bandages then necessary not being enabled to act in a circular direction, we are obliged to employ special pieces, that are fastened by means of a roller bandage. Thus, we have an upper piece represented by the extremity of a bandage of greater or less length and width ; in the portion of this bandage which is to rest on the wound, we make

long slits or openings; we then have a second piece of linen, of nearly the same dimensions, and whose upper extremity is to be divided into two or three strips. In joining and crossing the divided parts of the two pieces of bandage, we obtain nearly the same figure as by the uniting bandage for longitudinal wounds.

When we wish to apply this bandage, we fasten the inferior part to the lower part of the leg if we are treating the abdominal extremity, and the superior portion around the thigh, by means of circular turns, (Fig. 92,) taking care to fold the unperforated extremity under each turn of the bandage, in order to fasten it as

(Fig. 92.)



firmly as possible. When the roller bandage reaches both above and below to the neighborhood of the wound, the surgeon, having charged two assistants with the head of each bandage, passes the strips of the lower piece into the openings of the upper piece, slips the graduated compress underneath and across, draws upon these two pieces in an opposite direction, and applies to the wound the perforated linen, lint, or any other object he judges necessary; when all the parts of the dressing are properly crossed, and each one properly applied in its place, he continues to unroll the upper bandage from above downward, until it is entirely exhausted. He does the same with the lower bandage, which enables him thus to complete the roller bandage, by enveloping what may remain uncovered of the uniting slips. This bandage might be replaced by two bandages in T, with two to three or four vertical branches. But then it would be necessary also to use a bandage of great length, in order to establish a roller bandage from the extremity of the limb to its upper part; it would, also, have the inconvenience of too strongly pressing upon the parts at the root of each T. The uniting bandage for transverse wounds is still employed by some for fractures of the patella and of the os calcis, and for rupture of the tendo-Achillis; but in those cases it should be replaced by something more simple and full as efficacious. On the arm and thigh we add to its solidity by fastening the superior portion with one or two turns of the spica bandage on the upper part of the limb.

Article II.—Special Bandages, or such as are adapted to those regions of the body in which they are required.

The form of the different parts of the body, obliging us to vary its bandages and portions of dressings, makes it proper that we should examine special bandages successively from the head to the foot.

§ I.—*Bandages for the Cranium.*

The ancients had become so practised in the application of bandages, and had so diversified their forms, that for the head alone Galen describes, an upper divided bandage, one cut in front, another general bandage, also divided, a covercle cut in eight divisions, the covercle with three heads, and three other varieties of covercle, two rhombs, a half-rhomb, the scapha, with many varieties, the thais of Perigenes, the anonymous thais, the discrimen, the tie of Glaucius, the royal bandage, different sorts of chevestres, the hare without ears, the upper joint, the helmet, &c., &c. These bandages, of which Vidus Vidius (*De Chirurg.*, lib. quat. in fol., pp. 46–72; lib. tert. Venet., 1611) has carefully given us the figures, are at the present day abandoned. There is scarcely a wound of the cranium that cannot be conveniently dressed with the aid of a kerchief, (*couvre-chef,*) a bandeau, triangular handkerchief, a T bandage, a bandage with six tails, the sling bandage, the packer's knot, and the capeline.

Even among these last there are many that are generally dispensed with in practice. The great kerchief, (*le grand couvre-chef,*) for example, which is formed with a napkin folded double, but in such manner that one of its edges extends some fingers' breadth beyond the other, and two heads of which are tied under the chin, while the other two are carried upwards towards the occiput, is no longer thought indispensable. The head-dress which country women sometimes wear, to protect them from the cold or sun, would give a tolerably correct idea of it. The head-dress, called *serre-tête*, would equally well replace it.

A. The bandage with *six heads*, (Fig. 93,) or the *poor man's* bandage of Galen, is more worthy of preservation. It is, in some respects, like one of the bandages with eighteen tails. The middle part is placed on the vertex of the head; the two middle heads are then brought down and fixed under the chin, after which we bring forward horizontally the two posterior heads, and carry backward its two anterior heads. We have, in this way, a bandage sufficiently simple and firm, and which allows of our making a certain degree of pressure on almost every part of the head.

B. The *sling bandage*, (*la fronde*—Fig. 94,) of the head, differs from the preceding by only one piece less. It may serve, for example, for dressing blisters on the neck, provided two of its heads may be easily fastened on the forepart of the forehead, while the two others circularly embrace the nape. We perceive how this sling

bandage, when placed on the anterior portion of the cranium, might readily take the place of the great couvre-chef bandage, and also of the bandage with six heads.

C. *The T bandage*, single, double, or triple, often formerly employed in the treatment of wounds of the cranium, is almost totally

(Fig. 93.)

(Fig. 94.)

rejected at present. So also with the *discrimen*, the *figured*, (*figuré*,) and the *knotted*, (*noué*,) bandages.

D. *The packer's knot*, (*nœud d'emballeur.*) When bleeding by the temporal artery was much practised formerly, they had recourse, in order to stop the hemorrhage, to a sort of compression, which was rendered exceedingly solid by forming, upon graduated compresses, different crossings called the packer's knot, (*nœud d'emballeur.*) For that purpose, it was necessary to have a bandage of five yards in length, about an inch in width, and rolled up in two heads. The middle of the bandage was placed on the sound temple, in order to bring its two heads, the one in front, the other to the occiput, opposite the point of compression. Here they were crossed in order to change hands, making each perform a half turn, and bringing them back on the sound temple by conducting one to the vertex of the head, and the other under the chin. Crossing them then, as before, they were brought horizontally back to the wounded temple to be crossed again, and so on till the two heads were exhausted.

This bandage, which could be of no use at present, had also the inconvenience of making painful pressure by its knots, and of becoming readily loosened, in consequence of the little security of its vertical turns.

E. *Capeline.* The head bandage most in vogue is that which is

still known under the name of capeline, (Fig. 95.) To make it, the surgeon placed on the forehead the middle part of a bandage of ten yards length, rolled into two heads. On reaching the nape, the heads change hands; after having made a reverse with the smallest, it is brought to the forehead, following the median line; it is fastened there by a circular turn with the other head; it is then carried to the back part of the head, following a line a little upon one side; again fastened behind, then brought forward upon the other side, and so on in succession till the whole cranium is covered with it, this head of the bandage is exhausted in bandelettes, having the appearance of the ribs upon a melon, whose terminations, in fact, are concealed by means of the circular turns of the larger head of the bandage.

(Fig. 95.)

The capeline, which we shall meet with again in speaking of bandages for the clavicle, shoulder, and thigh, is a bandage of great regularity, and of extreme elegance; but one which is deranged with great facility, difficult to make compression with on the vault of the cranium, and by its lower folds and numerous circular turns is, to a considerable degree, oppressive to the forehead, occiput, and temples; moreover, we can substitute for it, without any sort of inconvenience, the most simple bandages, and it could only arise from affectation, that a preference, in any case, should still be awarded to it at the present day.

F. *The handkerchief.* All bandages that were formerly used for the head have, at the present day, finally yielded to the triangular handkerchief, (*mouchoir.*) Applied by its base, either upon the forehead, or under the occiput, this bandage, the point of which is fixed in an opposite position by bringing it up from under the edges which are to make the circular turn of the head, has the immense advantage of being everywhere accessible, of being capable of application by every one, of possessing great security, and of permitting moderate compression, whether by one of its turns only, or over the whole surface of the cranium, if we take the precaution of drawing in an equal or unequal manner upon the point or lateral edges of the triangle, after its base is properly fixed.

For some cases, a simple bandeau might also replace the handkerchief bandage—in all cases where the uniting bandage on the cranium is not indispensable. The triangular handkerchief may take the place of all the others. If we really required bandages for any wounds of this region, it would be rather one of the forms of

the chevestre, than of the capeline, or bandages with six or four heads, that it would be most proper to use.

§ II.—*Bandages for the Face.*

There are four regions of the face, the nose, eyes, lips, and chin, for which particular bandages have been contrived.

A.—*Bandages for the Eyes.*

The frequency and number of the diseases to which the eye is subject, and the great number of operations that we are obliged to perform on this organ, sufficiently explain the number and variety of bandages which surgeons have contrived for it. It is nevertheless true, that all the dressings required by diseases of the eye or eyelids may be reduced down to four or five—the handkerchief, the bandeau, the eye bandage, (*l'œil,*) single or double, the monocle, (*le monocle,*) and the T bandage.

(Fig. 96.)

I. *Handkerchief and bandeau,* (Fig. 96.) When we wish only to attach gently upon the forepart of the orbit some pieces of linen, or lint, the handkerchief, in form of a triangle, applied in the way we have mentioned in speaking of bandages for the head, is generally quite sufficient. It is evident, that by lowering the base of this triangle to the point of the nose, the two eyes must be completely covered by it.

The handkerchief, covering, as it does, at the same time, the whole head, and pressing too much on the bridge of the nose, is advantageously replaced by the *bandeau.* We give the name of bandeau to a piece of linen, which is a long compress of five to six fingers' width, and sufficiently long to make a turn round the head, to be fastened behind with pins. This bandeau differs in no respect from the handkerchief, except that it sends off no point from the forehead towards the nape. To render it more useful, it is well to make a T-shaped hole in it near the middle and close to its edge. For that purpose we fold it double, and, with the scissors, cut its fold to the extent of about an inch through, and at the distance of about half an inch above its lower edge. Another incision, perpendicular to the first, and which is to represent the vertical branch of the T, is also made, from below upwards, upon the upper edge of the horizontal incision. This cleft, which is to receive the nose, when once in its place, prevents the bandage from either rising up towards the forehead or descending towards the mouth, and allows of its being applied much better upon the surface of the eye-lid. We

should, therefore, prefer it in most cases. Also, in arranging either the handkerchief or bandeau obliquely or diagonally, in place of applying it circularly about the head, we convert it into a kind of monocle in place of using a bandage for the two eyes.

These bandages, however, which are almost the only ones that are used at present, are not suitable, if the object is to make direct pressure, and with a certain degree of force, upon some points of the contour of the orbit, rather than upon others. It is in such cases that the monocle, or the bandage called the eye bandage, single or double, might still be of some utility.

II. *Monocle.* To make the monocle, we apply the free extremity of a bandage, two fingers wide and four to five yards long, upon the angle of the jaw. This extremity of the bandage should hang down to the extent of three quarters of a yard in a direction towards the chest; we then carry the rolled head of the bandage upon the cheek, the internal angle of the eye, the parietal bone of the opposite side, and to the nape, that we may circularly surround the base of the cranium. Brought back to the nape, this rolled head is passed under the jaw, in order to fasten the pendent head, which we then immediately raise to the forehead, where another circular turn fastens it, while it allows us to bring it under the jaw and fix it there by another turn, that we may bring it up for the last time upon the forehead, where it is to be finally attached by some additional circular turns. We have, thus, four oblique bandelettes imbricated upon the front part of the orbit—bandelettes which, firmly fixed on the forehead and under the jaw, cannot in any manner slip; so that, after the bandeau, the monocle is, in fact, the most secure of all the bandages of the eye; only it has the disadvantage of impeding the movements of the lower jaw, and of making a greater degree of pressure on the forehead and supra-hyoidean region than on the forepart of the orbit.

III. We may advantageously substitute for it the single or double *eye bandage.* To make the single eye, the bandage, having passed round the base of the cranium, is brought back upon the angle of the jaw, and conducted thence towards the upper part of the nose; then upon the parietal of the opposite side, and again on the nape. After having thus made three or four diagonal circulars, which must lap over each other half their width, as in the roller bandage, we let out the rest of the bandage by horizontal circular turns around the head.

IV. If we wish to make the *double* eye, we proceed in the same way, with this difference, that we pass the diagonal circulars upon the right and left eye alternately, and in such a manner that the whole represent an X on the forehead and occiput; that is, an X, or sort of cross, (*croisé,*) which is encompassed besides by a certain number of horizontal circulars.

V. *The new eye,* (*œil nouveau.*) The single or double eye, such as I have just described it, is very liable to be displaced. Its diagonals scarcely ever fail to ride up by their lower portion towards the ear, or to slide either upward or downward in their parietal por-

tion. We may, however, make it sufficiently secure, by modifying it in the following manner; that is to say, by fixing the free head of the bandage near the ear, so as to leave a portion of it hanging down like the monocle. The rolled head of the bandage is then passed under the jaw, and to the nape, and passing under the ear upon the opposite side, and going circularly around the base of the cranium, and afterwards brought from the nape to the angle of the jaw upon the outer surface of the free head, then repassed diagonally upon the internal angle of the eye and to the opposite parietal bone, is afterwards carried back to the nape, then to the angle of the jaw, to the front of the eye and on the parietal bone, and in this manner successively for three or four times. By this means we obtain a *single eye*, which may easily be made immoveable, by bringing back the free head of the bandage, in the form of a bridle, upon the outer surface of the turns of the ear, under the jaw, and in such manner as to make a vertical circular, which is fastened by means of a pin upon the fold or root of the bridle. If we wished to have a double eye, the two free portions of the bandage should be brought down towards each other, and tied together, by a knot under the chin.

These three varieties of bandages for the eyes, however, are rarely demanded. To make a moderate degree of pressure on the forepart of the orbit, it would be much better still to use circulars from the upper part of the forehead to a level with the cheek bones, taking care to protect the bridge of the nose by padding, rather than to attempt the monocle, or the other bandages which I have described.

The T bandage which some surgeons, David, for example, formerly applied in place of the monocle, merits in reality the disuse into which it has fallen.

B. *Bandages for the Nose.*

The principal bandages for the nose still in vogue, at the commencement of this century, were, to judge of them by Thillaye's book, (*Traité des Bandages*, etc., 2d edition, Paris, 1809,) the double T, the hawk, (*épervier*,) the drapeau, the sling, (*fronde*,) the releveur, the twisted nose, (*le nez tortu*,) and the fossa (*fosse*) of Amintas.

I. The *double* T deserves to be retained; its vertical branches, each from eight to twelve lines in breadth, should be separated near an inch apart at their root. We begin by placing its transverse branch upon the upper lip; we then raise its two vertical heads, first upon the sides, then to the upper part of the nose, where we cross them to carry them to the nape by passing obliquely over the parietal bones. The two heads of the horizontal branch, which are made to fasten them there, enable us to raise them again, and then return to the forehead, to fasten them there again, and to be completed by one or two circular turns.

II. *Epervier*, or *Drapeau*. With the T bandage we easily dress wounds on the sides or upper part of the nose; but for wounds of the point of the nose, (*lobule*,) it is better to have recourse to the

épervier, which is nothing else than a kind of purse, the two lateral ribands of which are passed from before backward under the occiput, to fasten the upper riband of the bandage (*drapeau*) at this point, and to be brought back to the forehead. We have thus a small sack, more or less exactly fitted to the nose, which enables us to apply upon this organ all the portions of dressing we may have occasion for.

III. The *sling* (*fronde*) of the nose should have only an inch width, and be provided with a hole in its middle to hold the point, (*lobule.*) Its two lower heads are raised up, and carried above the ears towards the occiput, while the upper heads are brought down towards the nape. This small bandage does not close the nares like the preceding, but it has the disadvantage of being less secure, and of tending to flatten the nose. No person, at the present time, attaches any further importance to the *releveur* of the nose, or to the twisted nose bandage, nor the fossa of Amintas, nor to the seventeen varieties of bandages figured in the book of Vidus Vidius. With the aid of the double T, that of the épervier, whose lower part may also be easily perforated near the nares, and with the *bandeau* perforated at the point of the nose, we have enough to satisfy all the wants of practice. At the present day, moreover, when the adhesive plasters are attainable by all surgeons, we rarely feel the necessity of bandages for the nose,

C. *Bandages for the Lips and Chin.*

Diseases of the lips scarcely require any other than the uniting bandage; but as this bandage, which comprises the three kinds above described, will be referred to again, under hare-lip, I will only remark here, that we often associate pelotes with it, to compress and push forward the anterior part of the cheeks.

(Fig. 97.)

In some cases, however, we use the sling for diseases upon the contour of the mouth. This sling should be slit, in fact, or notched, on a level with the mouth, and cut out in a crescent under the nose. Its two inferior heads are carried obliquely under the ears to the projection of the occiput, where they are crossed, and then brought forward and united on the forehead. The superior heads, also passed under the ears, may be fixed upon the nape, or crossed at this point, and afterwards brought to the forehead.

Wounds in the interior of the mouth scarcely ever requiring dressings, present, on that account, no occasion for the employment of bandages.

Wounds of the tongue only, have claimed some attention under this point of view, and the small purse (*bourse*) of Pibrac, (Fig. 97,)

which, enclosing the apex of the tongue, has at its base two silver threads, which are turned under the chin, and to which ribands are attached, which should go to the nape and return on the forehead, is the only dressing we can in such cases require.

Bandages for the Chin. It was in some measure for the chin that the sling was contrived; so also is it the only bandage used at present for wounds of soft parts of this region. Sometimes perforated in its middle portion, at other times entire, the sling for the chin ought to have about four fingers' width. Its two inferior heads are raised up in front of the ears, to be crossed at the vertex of the cranium, and afterwards brought down to the temples. Its upper heads, on the contrary, are passed horizontally under the ears to the nape; crossed on this point, they are then brought to the forehead, where they are crossed again, to be returned to the nape, and there fastened.

D. *The Mask.*

When it is necessary to cover many parts of the face at the same time, we use, under the name of *mask*, (*masque*,) a piece of linen shaped to the face, cleft into a T, or perforated opposite the eyes, nose, and mouth, and having attached to it four ribands, two above and two below, for the purpose of fixing it around the head.

E. *Bandages for the region of the Ear.*

Wounds of the ear, or the parotid region, are dressed with the aid of the écusson, the T bandage, the oblique, the sling, or the chevestre.

I. *The Ecusson.* A piece of linen, sufficiently large to cover either the expanded portion of the ear (*pavillon*) only, or both the pavillon and mastoid region, and to which three ribands are attached, behind, above, and below, constitutes the écusson for the ear. This bandage, which is fastened by a vertical circular turn by means of the upper and lower ribands, and by a horizontal circular turn by means of the posterior riband, conveniently holds the lint, or other portions of dressing that we wish to apply, either upon the irregularities of the pavillon of the ear, or between the pavillon and the mastoid process, or even in the parotid fossa.

II. *T Bandage.* When we wish to leave the ear free, and the disease is in front of the pavillon or the mastoid region, or if we have to dress a blister, for example, the T bandage is preferable to the écusson. We fix the horizontal branch of it around the base of the cranium; then bring down its vertical branch either behind or in front of the ear, according to the seat of the wound, in order to pass it under the jaw in the form of a bridle, and thence to fasten it to the horizontal circular on the opposite side. This bandage, though without contradiction the most simple that could be applied to the ear, is, nevertheless, but little employed; this is because it does not always answer, and that we can substitute for it, without inconvenience, temporary bandages, or, what is as well, a simple cravat to be fastened on the top of the head.

III. *Oblique Bandage for the Ear.* If the dressing of the auricular region requires some degree of security and many turns of the bandage, the oblique bandage is indicated, which is made as follows: a bandage, five yards long, is first fastened circularly around the base of the cranium, then brought from the nape under the ear and jaw; it is then carried up perpendicularly in front of the ear upon the sound side, to be brought down upon the diseased ear, and to return under the jaw; then around the cranium on the sound side, to return obliquely from the occiput to the affected ear; then under the jaw, and vertically to the top of the head, to make a new vertical circular; then another horizontal circular, and so on, successively, three or four times.

The oblique bandage of the ear, which we should not restrict ourselves to making with too much precision in one mode rather than another, is decidedly preferable to all the preceding, and may be, in almost every case, substituted for them.

IV. *Chevestres.* Of the seven chevestres represented in figures 16, 17, 18, 19, 20, 21, and 22, of Vidus Vidius, there remain but three in modern practice: the simple chevestre, the double with one rolled head, and the double with two rolled heads.

These bandages, whose object is to support the pieces of dressing that may be required for fractures or luxations of the lower jaw, do not differ sufficiently from the oblique bandage for the ear to require that they should be any longer separated from it, at least if we take care to simplify them, as I shall presently point out.

a. *The simple Chevestre,* (Fig. 98,) requires a bandage of three fingers' width and five yards long. Two compresses, cut in the manner of a sling, are first applied upon the chin and under the jaw. The bandage, being fixed by a circular turn around the cranium, is carried obliquely behind the ear and the angle of the jaw on the sound side; then under the jaw and in front of the ear on the diseased side, to the top of the head, behind the sound ear, under the angle of the jaw, and so on, in succession, so as to make three vertical circulars open in front. We then pass the bandage circularly around the upper part of the neck, then on the front part of the chin, so as to fasten the sling compresses, after which we make another vertical circular, terminating with a horizontal circular, with which the bandage is permanently fastened.

(Fig. 98.)

b. *The double Chevestre* requires a bandage eight yards long. We apply it first like the preceding one, and are then careful to pass it obliquely and vertically, alternately to the posterior part and

front of each ear, and as many times to the right as to the left. The circulars designed to envelop the chin being terminated, we make, as with the simple chevestre, one or two vertical circulars, and terminate it by one or two horizontal circulars.

To obtain a double chevestre as regular as possible, it would be much better to make use of a bandage with two rolled heads. We place the middle of this bandage on the forepart of the forehead, then cross the two portions of it upon the nape; we then bring them out under the ear on each side to cross them under the jaw, and to pass them vertically between the ear and the orbit up to the top of the head; there we cross them again, to carry them back to the nape, change hands with the heads, bring them under the ear, cross them, repass them to the vertex as at first, and thus recommence a third vertical circular. We proceed afterwards to form the circulars of the neck and chin, and then to make two more vertical circulars, in order to terminate in like manner with one or two horizontal circulars.

These bandages, often employed formerly for fractures and complete luxation of the jaw, are scarcely ever used at this day in such cases; but something similar is still frequently found useful for certain wounds or diseases of the parotid, masseter, temporal, auricular, and mastoid regions.

c. *Chevestre of the Author.* Without restricting myself, then, to the exact representation of one form more than another of the bandage which is used, I believe the following will answer for all the wants of practice, and render useless the oblique bandage, the écusson, the T bandage of the ear, and the different sorts of chevestres, of which, in fact, it is only a more simple modification. I fix the bandage by a circular upon the base of the cranium; I afterwards pass it from the nape under the ear and under the jaw, either upon the sound or diseased side—it is generally a matter of no consequence which; I then carry it upward, as with the chevestre, towards the temple on the sound side, in order to pass it directly over the vertex to the temple of the diseased side; I thus multiply its vertical circulars, inclining them sometimes in one direction, sometimes in another, so that they soon cover the whole of the dressing. Those which I pass upon the forepart of the chin are made to cross each other upon the nape; when it is necessary to place some under the jaw, I cause them to pass in a spiral line around the vertex of the head, in order to bring them back to the nape, and afterwards to make more vertical circulars; I finally terminate with one or two horizontal circulars.

It is evident that the bandage may be applied in this manner a little more behind or before, on one or on both sides of the head and face, and that nothing is more easy than to space out, (*espacer*,) or to gather together the turns of the bandage a little more on one point, or a little less on another, according to particular indications. I will add, that in making this bandage glutinous, we may form a dressing, as simple as it is solid, for all kinds of fracture of the lower jaw, and that, with this modification, nothing is so easy as to

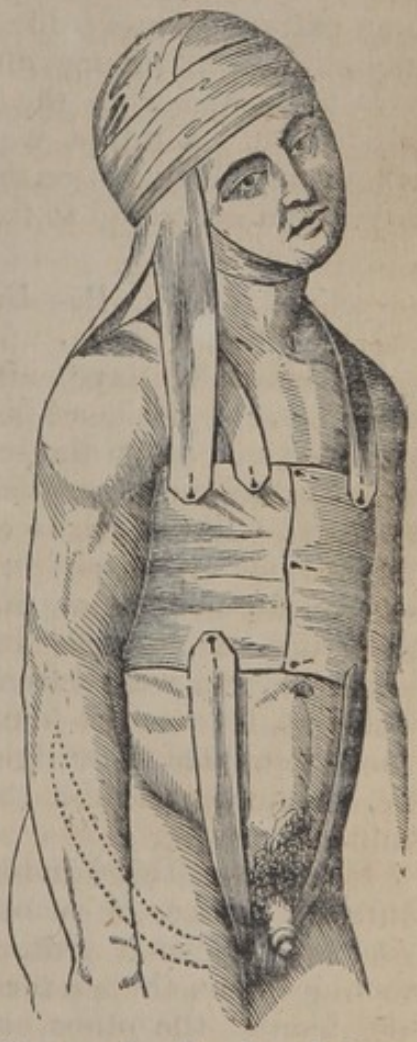
establish a permanent compression on whatever part we desire in the regions above mentioned. It is the only one that I have retained of all those that Galen speaks of, and of those that have been proposed since.

§ III.—*Bandages for the Neck.*

The region of the neck generally renders the dressing of its diseases somewhat difficult, at least as respects wounds, operations, and deformities. For inflammations, tumors, and other diseases, which require only containing bandages, the neck accommodates itself very well to the circular bandage, or that in the form of a cravat. It is in this manner we dress a seton, blister, moxa, or cautery, which we occasionally find it necessary to apply to the nape. But in order to unite a transverse wound, or to keep open the lips of a wound of that kind, situated upon some part of the circumference of the neck, we occasionally feel the want of certain bandages of a particular description.

A.—*Uniting and Dividing Bandage*, (Fig. 99.)

(Fig. 99.)



Longitudinal wounds on the neck require only adhesive plasters of diachylon, or the circular bandage. Transverse wounds, where we do not wish to recur to the suture, but prefer to approximate their edges, require a bandage which should keep the head inclined to the side of the wound.

The most convenient uniting bandage one can employ in such a case is the following: We fix securely upon the head of the patient a cotton cap, or a serre-tête, kept in place by a chin-cloth, (*mentonnière;*) we afterwards fasten upon this cap, by means of a sufficient number of circular turns, a bandelette slit in two, to some distance from its fixed point, and from which the two halves are left hanging down upon the diseased side. The wound being properly dressed, we depress the head of the patient by drawing upon the two bandelettes, which act upon it like a double hook; then we attach them upon a body bandage which surrounds the chest, and which latter has been made secure above by a scapulary, and below by bandages under the thighs.

If it concerns the anterior region of the neck, the bandelette should have its fixed point upon the occiput; and its two branches coming out in front, and brought down to the external orbitar an-

gles, should be made to descend to a level with the mammæ, where they are to be fastened to the body bandage. For a wound of the opposite region, it is upon the forehead that we must fix the root of the bandelette, and behind and between the shoulders that we should attach its branches to the body bandage. A wound of the lateral region would require to have this kind of dressing fixed upon the temple of the sound side, and to attach its two branches on the body bandage, the one before, the other behind the shoulder of the wounded side.

It has always appeared to me, that this bandage could also replace the dividing bandage for the neck. It is evident, in fact, if it was required to keep apart the lips of any wound in this region, that it would be sufficient to draw the branches of the bandelette backward when the wound is in front, and forward when it is behind, &c., &c. This indication might possibly be presented in some cases of wounds of the larynx or trachea, or after the destruction of certain bridles and accidental cicatrices. Nevertheless, we must not deceive ourselves by supposing that this bandage can be made to keep in place for any length of time, or that the patients will endure it without inconvenience or fatigue. Supported upon a column extremely moveable, the head almost always finds means, by inclining itself in one direction or another, or by turning on its axis, to escape from the torsions made by the dividing or uniting bandelette. All that we can say is, that it is less fatiguing, and wholly as efficacious, as the extremely complicated bandages which have been contrived to fulfil the same indications.

B.—*Redressers of the Head.*

Winslow, Thillaye, and some others, proposed bandages for straightening the head in cases of contortion of the neck. At the present time, when the section of the retracted muscles or tendons is performed with surprising facility, bandages proper for righting the head will not fail to come again into much use. As I do not wish to occupy myself in this place with the different apparatus known under the name of machines, I will confine myself to saying, that, with a simple bandage fixed around the head by some circular turns, and passed from the inclined side to the forepart of the forehead, then to the temple of the opposite side, then to the nape, we are enabled to straighten, with a considerable degree of force. the cervical region of the spine, while we elevate the face and chin.

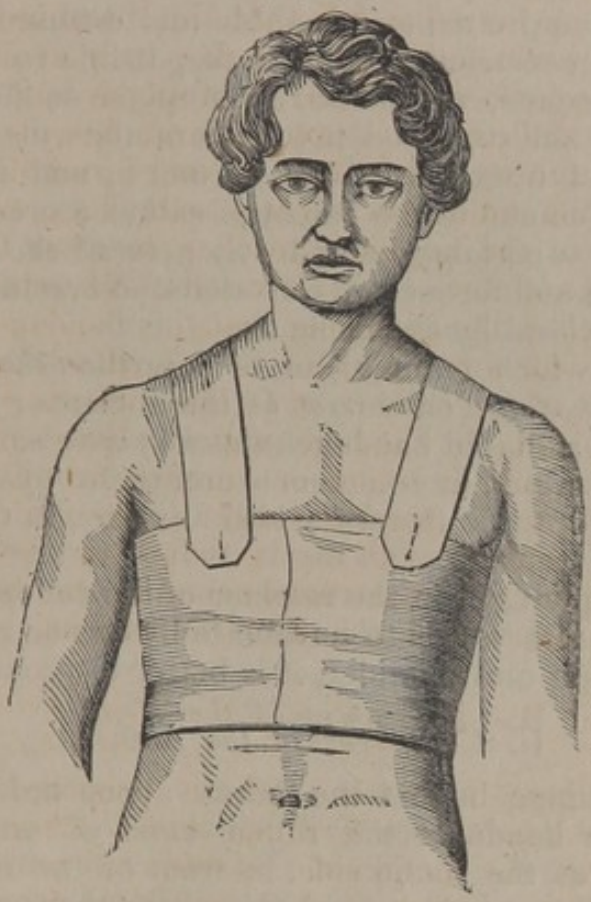
The end of this bandage may afterwards be fixed upon a body bandage under the arm-pit, or the bandage passed over the arm-pit itself, properly protected, to be afterwards brought above the shoulder upon the posterior part of the neck, then in front, under and behind the other arm-pit, then again around the head and under the arm-pit behind the shoulder of the inclined side; if these bandages be interlaid with pieces of pasteboard saturated with dextrine, they become extremely solid.

The bandages used after opening the jugular vein, and after bronchotomy, will be described in the chapter on those operations.

§ IV.—*Bandages for the Thorax.*

A. *Body bandages*, (*bandages de corps.*) The chest, properly so called, rarely requires any other than this bandage, (Fig. 100.) It is the only one employed as a containing bandage in the treatment

(Fig. 100.)



of wounds. Fractures of the ribs, and all diseases that require the employment of any topical application, or any portions of dressing, equally well adapt themselves to this bandage. It is made with a napkin folded thrice, or, if we wish to have it prepared beforehand, by sewing, in the form of a napkin thus folded, two folds of linen, of sufficient width and length, upon their free edges. This bandage is applied circularly. We should take care to tighten it a little more below than above, in order that it may be displaced as little as possible, and that it may not pucker into a cord from movements of the chest or arms; we fasten it on its upper edge by a scapulary, and on its lower by sub-crural bandages, [*i.e.*, under the thighs.] The *scapulary*, formerly, was a piece of linen slit so as to let the head pass through, and attached, on the anterior and posterior parts of the chest, to the body bandage. At the present time, we replace this bandage by the end of a bandage which is doubled, the fold of which is fixed, between the shoulders, to the body bandage, and its two heads brought, in the manner of suspenders, upon each side of

the neck, to be attached in front, either separately or together, upon the circular bandage. It is even better, when it is desirable that the patient should be as little moved as possible, to attach this accessory piece to the body bandage before passing the latter around the chest; so also, in renewing the dressing, we may confine ourselves to detaching these suspenders and the bandage in front only, without taking them entirely off.

B. *Quadriga for the Thorax.*

If we should require a more equable and diffused pressure, and a more uniform constriction than it is possible to procure by the aid of a body bandage, we should, in the place of the bandages designed by Butet for supposed luxations of the ribs, and by David for luxations and fractures of the vertebræ, and fracture of the sternum, have recourse to the bandage called the *quadriga* of the ribs. In short, we no longer employ at present the quadriga with two heads, nor the different sorts of stellated bandages (*étoilés*) of Kiastres, &c., as used by the ancients.

The bandage which I am about to describe differs, also, essentially from the *quadriga* or *chariot* of the ancients; composed of a kind of posterior stellated bandage (*d'étoilé postérieur*) and thoracic circulars, it resembles, in some measure, the *cataphrast* of Galen. A long bandage of three fingers' width answers, in this respect, for every purpose.

In place of applying it in the manner of the roller bandage, from below upwards, afterwards to terminate by one or two figures of 8 around the arm-pit and shoulder, it is better to proceed as follows:

C. *Cataphrast of the Author.*

We leave hanging behind the thorax about half a yard of the free end of the bandage, the rolled head of which is passed to the shoulder of the sound side, in front of the chest, under the arm-pit of the diseased side, and back of the thorax, so as to make circulars which, in passing over the free head of the bandage, should, while they lap over each other to two-thirds their width, extend upwards to the hollow of the arm-pit in the manner of a roller bandage. We afterwards surround the arm-pits with a posterior figure of 8, to terminate upon the chest by a circular, either from below upwards, or from above downwards. We then raise the reserved head of the bandage to the shoulder opposite to that which first received it, in the manner of suspenders, to fix it in front upon the lower circulars, (Fig. 101.) We thus prevent the separation of the turns of the bandage, and give great solidity to the whole dressing.

D. *Bandages for the Mammæ.*

Subject to numerous diseases, and frequently requiring serious operations, the mammary region has suggested the contrivance of a great number of bandages, which may, however, be replaced, in most cases, by the body bandage, or by the preceding *quadriga.*

(Fig. 101.)

I. *Square Bandage for the Breast*, (Fig. 102.) There are two special bandages which are occasionally used for diseases of the mam-

(Fig. 102.)

mary gland—one the square bandage, which is a piece of linen six to ten inches in diameter, having a riband or a band at each one of its angles; in order to fasten this bandage, we pass its two lat-

eral ribands, the one above and the other under the arm-pit of the affected side, to tie them behind with those of the sound side, which should also pass, one above and the other under the shoulder.

In place of the square bandage, we may use a triangular one, whose horizontal part should be fixed around the chest, while its vertical should be made to join the other behind the diseased side, in the manner of suspenders. A double T bandage, with large branches, would fulfil the same indication, but with less regularity.

II. The *suspensory* bandage for the mamma is also made with a square piece of linen, from which we cut off a triangle, in order to sew the two edges of the division, and thus speedily form a kind of purse with a large opening to enclose the mamma. The angles of this suspensory, being also supplied with straps, are then applied and fastened like the square bandage. But these bandages, though suitable for supporting a simple dressing, are not sufficient when we wish to make pressure, or undertake the approximation or separation of the lips of a wound.

III. *Uniting and compressing bandage for the mammary region.* Wounds of the mammary region may be united by means of adhesive plaster, or simple uniting bandages, like those for any other region. If, in addition, the approximation of their edges should be clearly indicated, it would be sufficient, in order to effect this object without difficulty, to make some regular turns of the cataphrast in their neighborhood, and to arrange at a certain distance graduated compresses.

To suspend the mamma by means of a bandage, we may do as I have described in speaking of the quadriga, except that some turns of the bandage ought then to be passed in a diagonal direction from the lower part of the diseased breast over the shoulder of the opposite side. If these diagonals were only on the diseased side, we should have only a single suspender; in applying them on the two sides, we would have the double suspender. Some circular turns, placed first above, then below the breasts, secure the turns of the suspensory. The head of the bandage, which has been left free behind, being brought in front in the manner of suspenders, forms, altogether, one of the most simple and secure dressings.

The compressory bandage for the mamma does not materially differ from the preceding; for whether we do or do not apply at first pieces of agaric or gateaux of lint upon the organ to be compressed, there is, if the mamma be large, not the less necessity of diagonals, the same as in the suspensory, and also of a greater or less number of circulars, as with the roller bandage, and of an extremity of the bandage to serve as a suspender to restrain the whole.

The *compression* of the mamma might also, in certain cases, be effected by *means of strips of adhesive plaster* applied circularly, and from before behind, about the chest, when the gland is, as it were, flattened (*plaquée*) on the thorax, or we may apply the strips circularly around the breast itself, and from its base to the nipple, when the organ is extremely globular, pendent, and easy to be separated from the thorax; with this exception, that we rarely find that the

conformation of the parts allows us to give to this dressing all the firmness which it requires.

We see, then, that, in adding a posterior and an anterior figure of 8, a single or double turn of the spica, and one or two diagonals, the roller bandage of the chest is converted at pleasure into a quadriga, a cataphrast, a figure of 8, a star, (*étoilé*,) or a spica; so that it may, in reality, answer for all the dressings of the mammary, axillary, sternal, dorsal, and supra-clavicular regions.

§ V.—*Bandages for the Abdomen.*

Whether we desire to make pressure upon the abdomen, to dress or unite its wounds, or to make any dressing whatever upon this region, it is always possible to effect this object by the aid of the body bandage, the roller, the cincture, corsets, or uniting bandages.

I. The *body bandage* (*bandage de corps*) itself is more frequently employed than all the others put together, for the purpose of supporting the portions of the dressing around the belly; only that we have to give it a little more width for this region than for the chest, and are more frequently obliged, also, to secure it by bandages under the thighs, (*sous cuisses.*) This bandage is adapted, at the same time, to diseases of the epigastric, umbilical, and hypogastric regions, and to the sides and loins.

II. *The roller bandage.* It would not be necessary to substitute the roller for the body bandage, except where it should appear requisite to make a uniform pressure, or pressure on distinct and numerous points, in the different regions upon the anterior part of the abdomen.

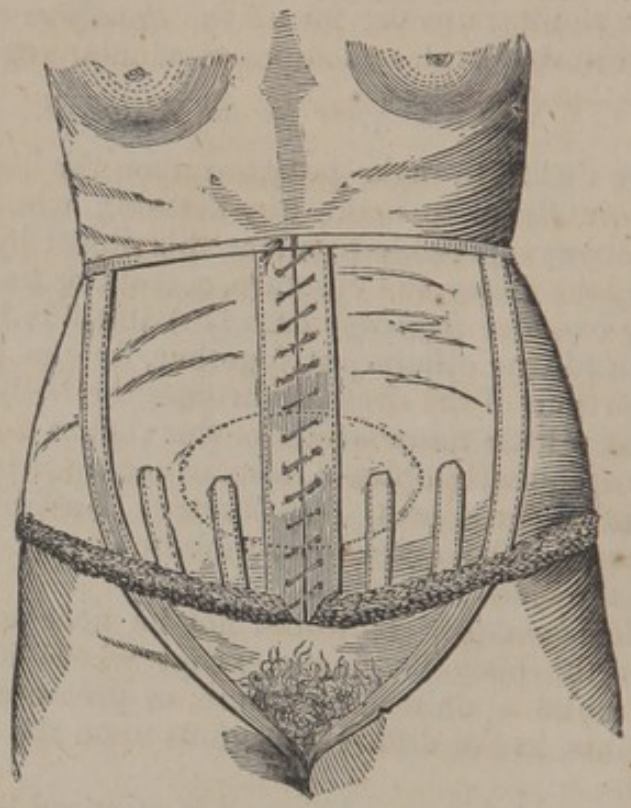
III. *Cincture and Corsets.* When it is required to make upon the abdomen a uniform, unchanging, and permanent pressure, the cincture or the corset sometimes replaces the body or roller bandage. The cincture, which, in fact, is nothing but a stuffed body bandage, somewhat narrow, and ordinarily supplied with leather straps, or other elastic materials, is peculiarly adapted to support the different kinds of ventral or abdominal hernias.

Corsets may be very useful for dropsical patients, and for certain females who suffer in the hypogastric region. For this purpose, Monro devised a kind of bandage which enveloped the whole belly, and which was laced behind like a corset, and the object of which was to compress the abdomen in the operation of paracentesis, to prevent the too sudden relaxation of the digestive organs. Now generally no longer used in such cases, Monro's corset might, nevertheless, be exceedingly well adapted for producing compression of the belly to promote absorption (*à titre de résolutif*) in ascitic patients.

IV. *Suspensory, or Cincture of the Hypogastrium.* Women who have had many children, and those who have the uterus inclined forward, with a very large pelvis, often experience uneasiness, drawing-down pains, and weight, in the lumbar region, kidneys, iliac fossæ, groins, and hypogastrium, sufferings for the relief of which they are often subjected to all kinds of useless treatment,

but which generally yield to the use of a suspensory to the hypogastrium, (Fig. 103.) But this suspensory may be the ordinary corset, provided, in place of being widened below, it bends inward (*se recourbera*) in the direction of the pubis, so that, when applied, it

(Fig. 103.)



moderately presses upon the lower region of the abdomen from below upwards and from before behind, instead of pressing from above downward, as it usually does. The busk of this corset would, moreover, answer, better than any other bandage, to secure a pelote or graduated compresses upon a fistulous opening, or some tumor, that would require to be compressed upon the median line; an artificial anus, for example, (of which I have had an instance,) and that without occasioning any uneasiness.

In general, women put their corsets on over their chemises; if it is necessary that the bandage should press directly on the skin, it is better to have one made especially. In this case, I use a sort of belly-band, (Fig. 103,) shaped to the hypogastric region, furnished with or without stuffed pelotes, and which are fastened about the trunk on the side of the loins, or in front, and then below, by the aid of bandages under the thighs, (*sous-cuisses.*)

In truth, the suspensory of the hypogastrium should be used much more frequently than it is; it is the means of preventing miscarriage in a great number of pregnant women. Many indispositions, attributed to the condition of the womb or intestines, would be made to disappear entirely, purely by its mechanical action, and without any medical treatment.

V. *Uniting bandage.* In no part do wounds that we wish to unite

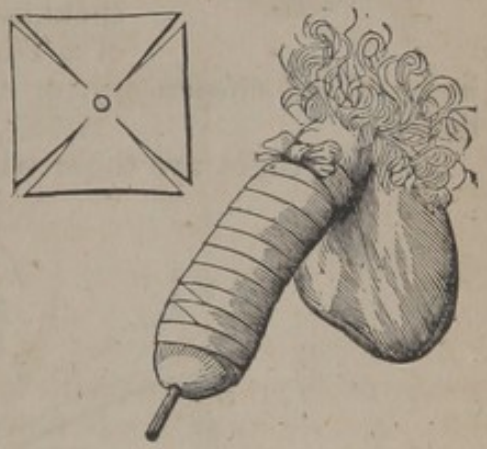
immediately, more imperiously require the suture than in the abdomen. Supposing that this means should not be applicable, we should, at least, have the resource of adhesive plasters. If, however, we preferred making trial of uniting bandages, we have only to recall what I have said of them above, to understand how, by giving them a breadth proportionate to the extent of the wound or region, and having care to fix them by a scapulary above, and subcrural bandages (*sous-cuisses*) below, we possess all that is necessary to know on this subject.

§ VI.—*Bandages for the Genital Organs.*

The diseases of the genital organs have suggested but a very small number of bandages, to wit: Some for the penis, others for the scrotum.

I. *Bandage for the Penis*, (Fig. 104.)

(Fig. 104.)



Whether we wish to dress a wound, or an ulcer of the penis, or to compress this organ, the Maltese cross, or the roller bandage, with or without lint, are generally quite sufficient. Sometimes the Maltese cross is merely perforated opposite the urethra; at other times it is provided with a hole, which allows it to embrace the glans penis, and to push back the prepuce. A narrow bandage serves to fasten it by its circulars, and to cover the whole extent of the penis with a roller bandage, which should terminate at the pubis, either by a knot by means of the bifurcated extremity of the bandage, or by the aid of a pin, or, better yet, by attaching it to a suspensory.

B. *Bandage for fixing the Catheter in the Urethra.*

When it is desirable to leave a catheter in the urethra, or bladder, it is indispensable to retain it there by means of bandages; it is a precaution that pupils rarely know how to carry into effect in a proper manner; which, however, it is very useful not to neglect. We possess for this purpose a great number of peculiar processes: the best of all consists in fastening, near the handle of the catheter, by means of a double knot, and by their middle portion, two cords of cotton wick (*cordons de coton à mèche*) about thirty inches long; the two branches of each of these cords are then taken, pair by pair, and brought two of them forward and two behind, or, what is as well, two of them to the right and two to the left, to a level with the base of the glans penis, (*de la racine du gland.*) We then connect the two branches of one side with each other to form a noose, (*anse,*) then the two heads of this noose are exhausted in cir-

culars upon the teguments behind the glans, and fastened by a bow-knot, (*rosette ;*) the same is done with the two cords on the opposite side. We thus obtain four rays, united by their apex near the handle of the catheter, and fastened on the penis by their base, (Fig. 105.)

(Fig. 105.)

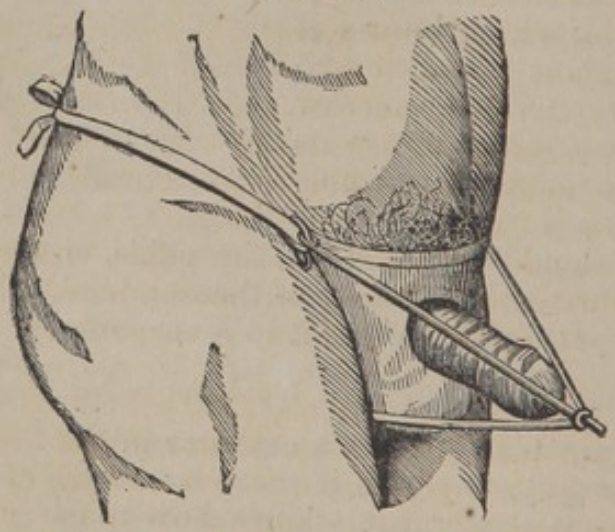
To give greater firmness to this little apparatus, and to render it less inconvenient to the patient, we may previously include the penis in a small double compress, as we may also fasten the four heads by some circulars of adhesive plaster.

Those who recommended fastening the catheter by two cords under the prepuce, and around the corona glandis, made use of linen ribands ; but it is a practice too objectionable to be retained.

Many surgeons, fearing pressure on the penis, fix the four cords, of which I have been speaking, to the cincture of a suspensory, or of a T bandage, (Fig. 106,) above, and to the body of the suspensory, or to the sub-crural bandages of the T below.

Finally, there are those who begin by fixing to the root of the

(Fig. 106.)



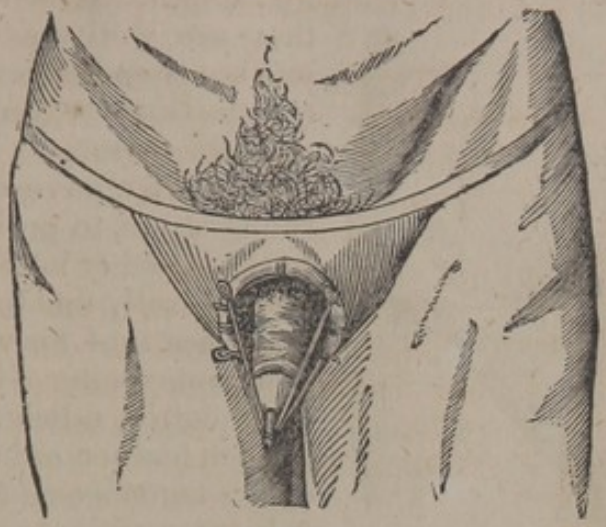
penis, on the front part of a suspensory or T bandage, a ring slightly wadded ; it is to this ring, (Fig. 107,) which remains fixed in this position, that the four cords of which I have just been speaking are attached.

The process which I have first described is unquestionably the most convenient of all. When properly applied, it causes, in most patients, no inconvenience ; if, however, the state of the penis, or some other special reason, should deter us from using it, the wadded ring could be most advantageously substituted for it.

When it is requisite to fasten a catheter in the bladder of a female, we can only do this conveniently by attaching the four cords

that are fastened near its handle, to the cincture and sub-crural branches of the T bandage.

(Fig. 107.)



§ VII.—*Bandages for the Scrotum.*

Bandages are used to support the scrotum or testicles, even where there are no wounds of these parts. They are also used as a means of compressing them, and for dressing their wounds.

A. *Suspensory.*

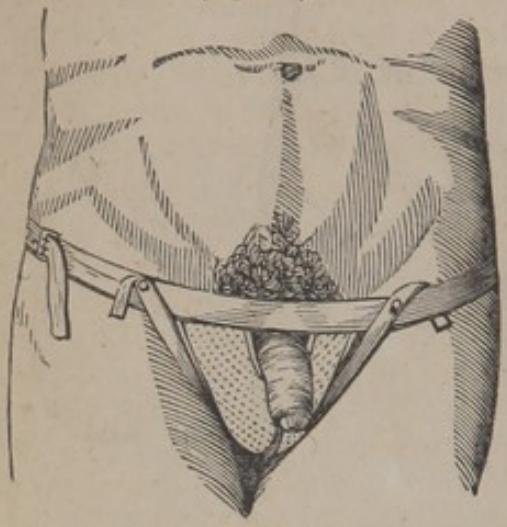
We give the name of suspensory of the scrotum to a kind of bag, designed to sustain gently all the parts of the dressing we may have occasion for in the treatment of diseases of the testicles, or of its envelopes. This purse, which should vary in size or depth, according as it is to enclose a greater or less number of objects, is composed of a piece of linen fastened above to a bandage of sufficient length to go twice around the pelvis. Below, the suspensory has two cords called sub-crural, (*sous-cuisses ;*) near its upper part it has an opening through which the penis is to pass. To apply it, we first neatly adjust all the dressing ; then, by means of the cincture, we fasten it around the body ; the two sub-crural branches are then passed into the sub-ischiatic groove, then on the side of the great trochanter, and fastened by a bow-knot, or by the aid of buttons, to the cincture of the bandage near the hip.

This manner of applying the suspensory has, in a great number of cases, the inconvenience of pressing or crowding the scrotum towards the anus, or against the upper part of the thighs. I have also been in the habit, as practised also by other surgeons, when there is nothing to be done but merely to support the scrotum, and there is no particular indication to the contrary, to bring the sub-crural bandages forward along the groins, (Fig. 108,) in place of making them pass behind. In this manner the testicles are kept gently suspended, and free from all traction or painful compression.

When the dressing is for wounds, the arrangement of the suspensory is difficult. In that case, in fact, it is convenient to give to it

sometimes the form of a triangular or square piece of linen slightly hollowed out, while at other times it must represent a sort of child's bonnet, or a purse, of greater or less depth. It is rare, also, that they are well made in hospitals, and we often find ourselves obliged to substitute extemporary bandages for them.

(Fig. 108.)



When we have only to support the scrotum, to prevent its becoming fatigued or involved in disease, we generally find in the shops suspensories that answer sufficiently well, some being of hemp cloth, linen, or cotton, others of caoutchouc, or even leather, or in form of a bagnet or truncheon, (*de tricot.*) The only inconvenience of these suspensories, is that of their presenting a harder border than the rest of the dressing, and which often irritates the parts in the manner of a cord.

We sometimes replace the suspensory by a long compress, which embraces the scrotum under its middle part, and which is fastened by its extremities to a cincture around the hypogastrium. A more convenient mode still, consists in folding a pocket handkerchief into a triangle, the base of which rests on the root of the scrotum, while the extremities are brought in front of the groins, to be attached to the cincture of the hypogastrium, and the apex of the purse raised in front, to be fastened at the median line on the same cincture. But these substitutes are in reality neither as secure or convenient as an ordinary suspensory which has been properly made.

B. When we have to dress wounds of the scrotum, after the removal of the testicle, we may find it useful to employ the T bandage. We may also use, equally well, the triangular bandage in place of the suspensory; if we have to make unequal pressure on various points of the scrotum, we may have recourse to a kind of *quadriga* for the pelvis. In the two first, we pass the horizontal portion of the bandage around the lower part of the trunk; we then depress the vertical branch of the T, or the triangle of linen, on the diseased side of the region, in order to encircle the upper part of the thigh with it, and thus fasten it to the cincture on the side of the body.

Certain engorgements of the testicle, blennorrhagic orchitis among others, are advantageously treated by compression. But to make exact pressure on the testicle, nothing is more commodious than adhesive plasters made with diachylon. Depressing the swollen part with one hand, as if to detach it from the ring, the surgeon surrounds it with adhesive strips of the width of the thumb, so that all the parts of the tumor may be covered or enveloped as by a sac, the opening or apex of which should be arranged with care around the root of the cord, (Fig. 109.)

[A *scrotum bandage*, which I contrived while physician to the *Seamen's Retreat*, (New York,) where the class of patients and diseases were such as to require great attention to this part of surgery, and in which I found this apparatus of eminent service in completely supporting this part in an isolated manner, giving great relief, and neither pressing on or wedging between the thighs, nor drawing back painfully, as in the ordinary clumsy suspensory, was the following, (Figs. A and B,) which I would recommend to general use:

(Fig. 109.)

(Fig. A.)

(Fig. B.)

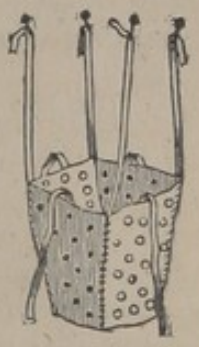


Fig. A represents the suspensory as applied, being a bag of brown holland, (hemp tissue,) of four trapezoidal pieces, tapering downward, and firmly sewed, with the seams outside, as seen in Fig. B.* There may be six or eight strips of narrow bandage,

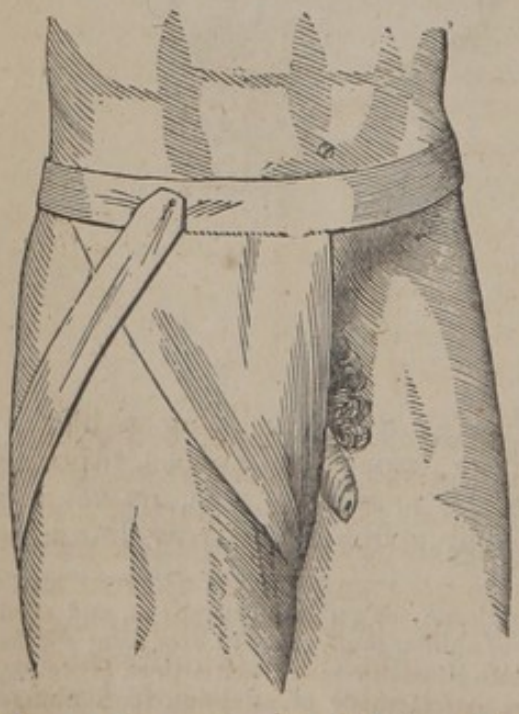
* Brown holland is mentioned as a cheap tissue for public institutions, and easily attainable everywhere. When made of that or similar stuff, (always excepting cotton,) large eylet-holes, in rows, should be worked into it, each one at least a third of an inch in diameter, to admit of ventilation. A more perfect mode of attaining ventilation, as preferred by Dr. Mott, would be to make a netted bag of flax, hemp, or silk cord, as being far cooler, and equally well calculated to answer the object.

about an inch wide, attached at pleasure to the corners and sides. Each one of the two coming from the middle portion of the upper edge of the two lateral sides of the bag, is to pass backward under and around the thigh, to be fastened to the cincture around the waist, farther back than the others, which latter four or six, according to the number the bag has, are all to be fastened on the broad girdle of brown holland in front, in the space on the belly between the hips, the patients shifting the same as they would the *rigging* of a ship, (and which the sailors at the Retreat Hospital above mentioned did with great expertness,) until each bandage was arranged to suit their feelings, in such manner that they all drew with an easy and consentaneous force upon the bag, which latter, with the contained testicles, is thereby raised gently upward and forward, or to one or the other side, at pleasure, and, at the same time, kept in a firm and steady position, especially by the two straps going backward, which, to use a nautical phrase, might be called the *back-stays*. The great superiority of this suspensory over all others was effectually established by me at the Seamen's Retreat, as it has been in private practice since. The size of the bag must be proportioned to the dimensions of the scrotum and testicles, whether the latter are diseased or not. It is of eminent use and comfort to patients with hydrocele, varicocele, and especially scirrhous and hydatid testicles, which, by their weight and size, are so distressing upon the cord. The floor of the bag may be made so as to be slightly concave within.—*T.*]

§ VIII.—*Bandages for diseases of the Anus and Perinæum.*

The T bandage is almost the only one in use at the present time for dressing affections of the anus and perinæum. It is almost always the double T that we require. As it is from the lumbar region that we set out with the vertical branch, it is necessary to give to this portion, which should be from four to six fingers wide, a length in its undivided portion of from six to ten inches, in order that the two branches may not be separated from each other except in the neighborhood of the anus. We apply it first around the trunk. It is advisable, in fact, to fasten it in this manner before commencing with the dressing. The wound being dressed, we bring the T down upon the portions of the dressing; we then cross the branches on the perinæum, so as to bring that on the right between the scrotum

(Fig. 110.)



and the left thigh, and that of the left between the scrotum and the right thigh, in order to fasten them by a knot or by pins to the cincture above the groins.

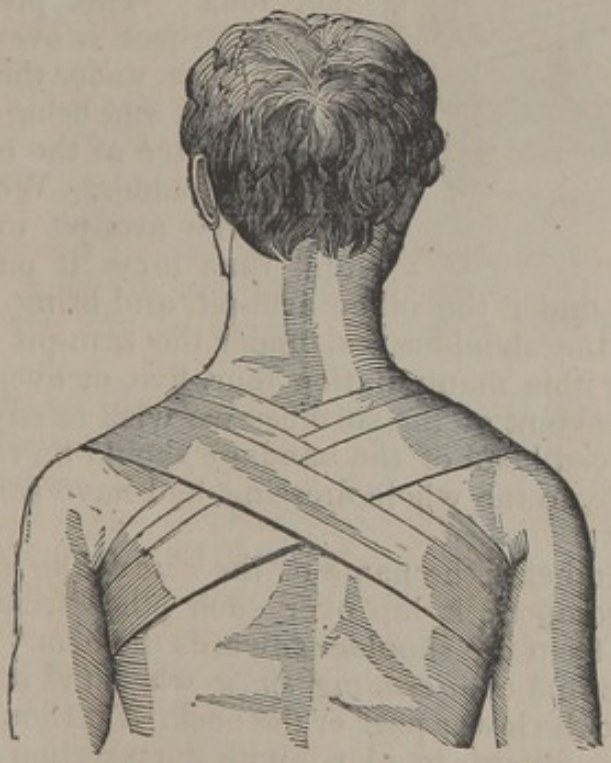
The *triangular bandage*, which was used formerly for certain wounds in the neighborhood of the anus, and which is in frequent use at present for diseases of the *inguinal* region, (Fig. 110,) is in fact the same as that of which I have spoken in pointing out the bandages for the mammary region. It is, therefore, unnecessary to recur to it here.

§ IX.—*Bandages for the upper part of the limbs.*

The upper part of the arm is subject to so many diseases, that it has given rise to the suggestion of a number of bandages. Among these, however, there are scarcely any other than the figure of 8, the different varieties of the spica, the stellated, (*étoilé*,) and the capeline, which it can become necessary for us to be acquainted with at the present day.

A. The bandage, called *Figure of* 8, was formerly employed in the treatment of fractures of the clavicle, (Fig. 111.) We place

(Fig. 111.)



under each arm-pit a long compress, whose ends are crossed on the apex of each shoulder. We then, by means of a bandage of three fingers' width, make an 8, which surrounds the upper part of each arm, and crosses between the shoulders, to be repeated thus three or four times, while an assistant, having his knee fixed against the dorsal portion of the spine, forcibly draws the two shoulders back. In order that the turns of the figure of 8, thus made, might rest secure, some surgeons placed under their point of crossing a long compress, or a strip of bandage, the extremities of which were

turned back upon the median line. This bandage irritates, and is altogether useless.

B. *Spica*, (Fig. 112.) The bandage known under the name of Ear of Wheat, (*épi*,) or Spica, is a kind of figure of 8 with unequal turns, which are applied on the upper part of the arm, the apex of the thorax, and on the upper part of the thigh and pelvis, also on the root of the thumb. On the arm and thigh the bandage requires to be from five to ten yards in length, and at least three fingers' width. To render it secure, and to prevent its displacement, I am in the habit of making it thus: I pass the free head of the bandage aroud the arm-pit or thigh of the diseased side, either from before backward, or from behind forward, and then continue it in an opposite direction, so as to leave a portion of it hanging down about two feet long. This precaution being taken, we pass it over either surface of the chest, under the arm-pit of the sound side, and bring it back by the other surface of the chest to the diseased shoulder. We then pass it under the arm-pit to make a turn, and thus cross it on the shoulder, carry it back under the other arm-pit, and bring it in the same manner upon the shoulder and under the arm-pit of the diseased side, repeating this manipulation four, five, or even six times, according to the extent of the surfaces we wish to cover. It is then that the reserved head of the bandage should be raised up, in the form of a bridle, to the whole dressing, as I have said in describing the cataphrast.

(Fig. 112.)

This bandage bears the name of the *descending spica*, when the turns which compose it lap over each other from above downwards, that is, from the shoulder towards the arm. It takes, on the contrary, the name of *ascending spica* when the turns go upward from the arm to the lower part of the neck. If it should be necessary to prolong it downwards to a level with the insertion of the deltoid, it would be much better to make some circular turns upon the humeral portion of the shoulder, than to give it the form of spica in its whole extent.

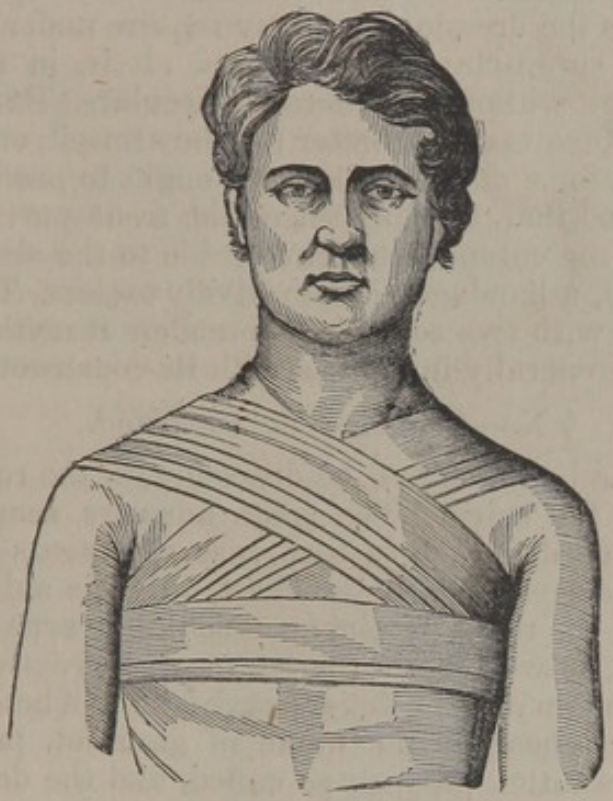
Finally, to make the spica in the groin, it suffices to apply to the pelvis and upper part of the thigh what I have said of the chest and shoulders.

The spica which I have described is the simple spica. If it was required to have it double, we may understand, without the necessity of a particular description, that it would be necessary to make

on each side what I have said of one of them. The roller bandage with two rolled heads, which was formerly employed for this purpose, is wholly useless; surgeons of the present day are, for the most part, satisfied with the bandage with one head for the different kinds of spica they may have occasion for.

C. *The Stellated*, (*étoilé*—Fig. 113.) The stellated bandage is a sort of figure of 8, crossed in front of the chest, and associated with

(Fig. 113.)



some turns of spica. Thillaye describes three varieties of it—the *single stellated*, the *double stellated*, and the stellated with a bandage of two rolled heads.

To make the first, we place the free end of the bandage under one of the arm-pits—that of the right, for example—then pass it in front of the chest and left clavicle, behind the shoulder, and under the arm-pit of the same side, to return in front upon the clavicle, behind the shoulder, and under the arm-pit of the right side, so as to complete the 8; after having repeated this crossing two or three times, we carry it in front of the arm-pit, on the clavicle, and behind the corresponding shoulder, in order to reach the posterior part of the opposite arm-pit, as in the spica. We at length terminate by repeating the figure of 8 and spica turns, till the bandage is exhausted, unless we should prefer unrolling it circularly around the chest.

This bandage, which advantageously replaces the quadriga and the spica, has the inconvenience of being very easily displaced. Embracing the upper part of the arm in front, it slips with the least movement, and readily becomes detached, in the manner of the sleeves of a dress that opens behind.

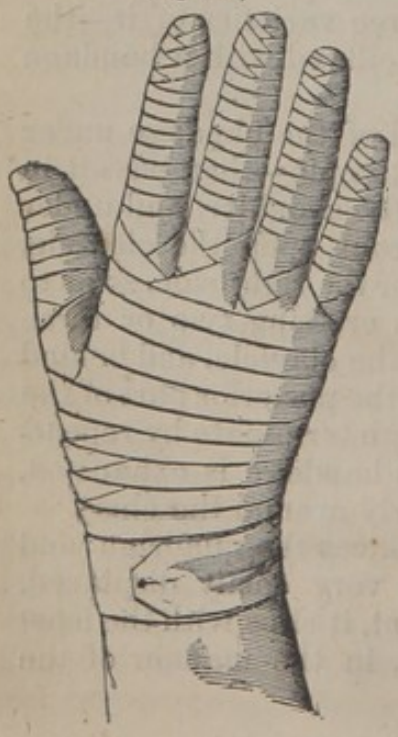
The double stellated is composed of anterior and posterior figures of 8, whose scapular crossing is not unlike a double spica. We make it with a long bandage, proceeding first as above. After having made one or two figures of 8 in front, and carried them in the rear, the bandage serves to make an equal number of figures of 8 behind. In continuing thus, we soon have three or four turns of the 8 crossed on the top of the sternum, on the posterior part of the thorax, and on the clavicular portion of each shoulder.

This bandage, which is much more solid than the preceding, conveniently retains the dressings we may require under the two arm-pits, or on the supra-clavicular regions. It is, in fact, only the quadriga bandage without the thoracic circulars. But it is evident that the single spica is much better for one arm-pit, or one shoulder only; also, that, for a double lesion, we ought to prefer the double spica to this; and that, for diseases of the front part of the chest, or for the back, the cataphrast is preferable to the stellated. It is, in fact, therefore, a bandage comparatively useless. The making it with a bandage with two rolled heads renders it neither better nor more solid, and generally interferes with its construction.

§ X.—*Bandages for the Hand.*

Diseases of the hand may all be dressed with the roller bandage, the circular, or the spica. The spica answers scarcely for any thing but the thumb, which in that case represents the shoulder, while the wrist corresponds to the chest. By the aid of this bandage, the thumb, the thenar eminence and metacarpal bone, which corresponds to it, as well as the wrist, may be dressed without the hand participating in it. The fingers have a kind of bandage adapted only to them, and bearing the name of gauntlet, presenting two varieties: the gauntlet, properly so called, and the demi-gauntlet.

(Fig. 114.)



A. *The Gauntlet*, (*gantelet*,) (Fig. 114.)

The object of the gauntlet is to surround each finger with a kind of roller bandage. It is always useful when we wish to make a certain degree of pressure, preventive or curative, on each of the fingers separately. A mode of doing this, which I have found very convenient, is as follows: take a bandage of about an inch or one finger's width, and eight or ten yards long; fix it securely by two circulars on the wrist; then bring it diagonally on the back of the hand to the root of the little finger; then wind it around this finger to its free extremity; then make turns which lap over each other two-thirds, in proceeding from the nail to the metacarpus; return to make a circular about the wrist, then by the dorsum of the metacarpus, to do on the ring finger

what has been done on the little finger; proceed a second time to the wrist; bring the bandage to the middle finger, which is to be surrounded like the preceding; return a second time to the wrist, to surround also the forefinger. There is then nothing more to do but to pass some transverse circulars upon the metacarpus, and to finish by fixing the bandage upon the wrist.

(Fig. 115.)

B. The half-gauntlet (Fig. 115) differs from the preceding, in being limited to one turn of the bandage upon the root of each finger, and fastened by the like number of circulars upon the wrist. It is a sort of multiple of the spica, sometimes dorsal, at other times palmar, but scarcely ever used at present.

C. *The Scarf*, (*écharpe*—Fig. 116.)

(Fig. 116.)

Almost all diseases of the upper extremity require the bandage commonly known under the name of the scarf. Formerly there

was a large and a smaller scarf, the medium scarf and the grand scarf of J. L. Petit.

The ordinary scarf is made with a triangular piece of linen, generally with a napkin, or pocket-handkerchief, folded from one angle to the other. The forearm is placed in the middle of this piece, so that the point of the triangle is directed towards the elbow. Its two extremities are raised up, one in front, the other behind, as it were to form a loup (*anse*) at the root of the neck; the extremity of the triangle passing from below upward, and from before backward, under the healthy armpit, in order to return to rejoin the anterior extremity in front of the shoulder of the diseased side, would make a diagonal, as in the preceding bandage. After having fastened the two ends of the scarf by a knot or a pin, the middle portion of it is spread out under the forearm; we afterwards raise up the point in front or behind, to fasten it upon that portion of the triangle which is situated in that part.

The scarf, which in fact is nothing but a suspensory of the forearm, and which the diagonals of the preceding bandage could in a case of necessity replace, may be arranged in a great many other ways. Thus, in place of being turned in the direction of the hand, its base may be carried backward; and in place of mounting to the neck, it may be attached to the forepart of the vest or coat; it is thus we obtain the different kinds of scarfs which I have noticed above. Provided that it supports, in an equal manner, the elbow and the whole length of the forearm, and permits the parts to be easily withdrawn from, or replaced in it, it is all that we can expect of it; the rest is only a matter of taste.

§ XI.—*Bandages for the Lower Extremities.*

The different bandages which the diseases of the abdominal extremities may require, are the roller, the circular, the bandage of eighteen heads, and that of Scultetus. The stirrup (*étrier*) will be described in speaking of bleeding in the foot. The uniting bandages for longitudinal and transverse wounds, have no special arrangement for these parts. The figure of 8, the kiastre, and the bandage of Ravatan, like all other kinds of bandages devised for fractures of the patella, have no claim to our attention at present; so that the lower extremity has, in fact, no special bandage.

§ XII.—*Bandages for Fractures.*

It is in treatises upon surgical *pathology*, that we can properly discuss in detail the different kinds of dressings designed for the treatment of fractures; but as the bandage necessary for these descriptions of disease is, owing to the new improvements, nearly everywhere the same, I propose to speak a few words of it in this place. Thus, in every case it is the bandage of Scultetus, the body, clavicular, or roller bandage. Wherever we desire compression, and do not wish to remove the dressing frequently, the bandage must be previously saturated in a solution of dextrine. To do this,

we pour, little by little, into a large vessel, one portion, a tumbler full, for example, of dextrine in powder, then a portion of water to dilute the powder. When we have carefully diluted the dextrine, breaking it up by means of the fingers and by trituration, we pour into the mixture, gradually, a third of brandy or alcohol; the unrolled bandage is then dipped into this liquid. When it is saturated with it, and we are ready to make use of it, we roll it up as we do a wet bandage, without rolling it too tightly. If it is the bandage of Scultetus, we should saturate it after it is in its position with the same mixture. It is in this solution, also, that we must dip the graduated compresses, or the pieces of pasteboard, if it should be found advisable to make use of them.

A. *Fractures of the Hand.*

I. *Fractures of the fingers.* In the case of the fingers, after having properly reduced the portions of the phalanges, we surround the part with a piece of fine linen, then with turns (*plan*) of the roller bandage which has been saturated with dextrine; a graduated compress, or a long, narrow strip of pasteboard, is then placed on the palmar and dorsal surfaces, from one extremity to the other of the fractured finger. We then apply over this a second or third series of turns of the roller bandage, after which we conduct the bandage to the back of the hand, to make two circular turns there, and then proceed to form it into a collar around the root of the finger. Left exposed to the air, the bandage thus arranged dries and acquires the hardness of wood in twenty-four hours. Thus it is protected from all displacement, and has no necessity of being renewed before the consolidation is completed.

II. For the *metacarpus*, whether it concerns one or more of its bones, we proceed nearly in the same manner: a dry piece of linen being applied on the part, is immediately attached there by one or two turns of the bandage. The surgeon proceeds then to the reduction, if he has not effected it before, and applies immediately upon the back of the metacarpus a square piece of linen folded upon a piece of pasteboard saturated with dextrine, (*carton mouillé*,) then a similar square, or one a little thicker, on the palm of the hand, which latter must be fastened by some additional turns of the bandage. After having surrounded the wrist with turns, the bandage is brought back to the root of the finger, which corresponds to the fractured bone as in the gauntlet. It remains then to place the graduated compresses upon the palmar and dorsal surfaces of the finger and of the metacarpal bone. One or two series of turns of the roller bandage, which should envelop the whole length of the finger, then the whole hand, and also the wrist, complete the dressing. The important point here, is to make pressure in a very gentle manner upon the edge of the hand near the root of the fingers, and to avoid all strangulation at the wrist.

B. *Fractures of the Forearm.*

I. *Fracture of the lower extremity of the radius.* Having restored to the wrist its natural direction, the surgeon applies upon the linen

which is to go next to the skin, a portion of roller bandage, from the root of the fingers to the elbow; over that he places the two graduated compresses, the anterior and the posterior, folded upon pasteboard which has been saturated with dextrine, (*doublées de carton mouillé,*) down to the corresponding surfaces of the hand; a second and then a third series of roller bandage, from the elbow to the root of the fingers, and from the root of the fingers to the elbow, terminate the bandage. The solidity of this bandage, and its desiccation being effected by degrees only, allows of the inferior portion of the forearm, during the first days of its application, being gradually adjusted, and with as much exactitude as we could wish.

II. *Fractures in the body of the limb.* The coaptation being made, and the limb surrounded with linen, it is enveloped in one series of turns of the roller bandage. The graduated compresses, with the pasteboard, are applied before and behind upon this layer of turns, (*plan de bandage;*) a second layer of turns of bandage is brought from above, from the elbow to the wrist; the bandage is then passed once or twice around the metacarpus, between the thumb and the root of the fore-finger, and then terminated by a third series of turns with the roller. For greater security, if we were treating an intractable subject, or a fracture very high up, it would be well to prolong the layers of bandage, the limb being flexed, to some inches above the elbow; because, when it has become dry, the humero-cubital articulation is by this means rendered altogether immoveable.

III. *Fractures of the olecranon.* No bandage hitherto proposed, can with certainty prevent the separation of the fragments of the bone in a fracture of the olecranon; unless this separation exceed an inch, it causes very little inconvenience. The best thing to do in such a case, is to keep the limb in a very moderate state of extension, and completely immoveable, for about a month. We obtain this result in the most perfect manner possible by means of a bandage saturated with dextrine; nothing then prevents our depressing the fragment of the olecranon by placing above it a transverse graduated compress, then some oblique turns (*arcs*) of the bandage, provided we take care to make but little pressure, and to place over the whole, in a uniform manner, the roller bandage, with two large pieces of pasteboard saturated with dextrine, extending from the root of the fingers to the neighborhood of the shoulder.

C. *Fractures of the Humerus.*

For the humerus, properly so called, there is no need of graduated compresses; the simple roller bandage, attached above by some turns of the spica, with two pieces of pasteboard, suffices, without any other precaution, for all the fractures of the body of this bone. If it is its lower extremity, we must place a graduated compress in front on the bend of the elbow, and another behind upon the olecranon. One of the assistants making extension by drawing upon

the hand, the other counter-extension and coaptation by pushing the olecranon forward with his thumbs, and drawing the lower fragment backward with his fingers, enable the surgeon to apply the saturated bandage in the form of a roller with three layers, (*à triple plan,*) with the saturated pasteboards, and to multiply its circulars around the elbow; here, as at the wrist, we must take care to watch the desiccation of the bandage, and by making the proper degree of pressure upon the parts, gradually to restore them to their natural position.

I have already said that the fractures of the neck of the humerus, whether in an anatomical or surgical point of view, do very well with the bandage for the clavicle, described further on; I will add, that the roller bandage, accompanied with four or five turns of spica, provided with a thick piece of linen, or with any other material adapted to filling the cavity which separates the two principal walls (*parois*) of the axilla, is still more convenient, and ought generally to be preferred.

D. *Fractures and Luxations of the Clavicle.*

Of all the bandages contrived since the time of Hippocrates to the present day, to remedy fractures or luxations of the clavicle, scarcely any now remain but the bandage of Desault and the single scarf. The bandage of Petit, those of Duverney, Boyer, Boettcher, Brasdor, and Meslier, the sling (*fronde*) of Flamant, the ancient brassière of Ravaton, and a great number of others, in no way answering the end proposed, merit the oblivion into which they have fallen.

I. The *bandage of Desault* itself is scarcely any longer employed. The difficulty of applying it well, the necessity, so to speak, of replacing it every day, and the irritating pressure which results from it, upon the chest and brachial plexus, have caused it to be generally discarded; which is so much the less to be regretted, as it scarcely ever prevents the riding upward (*chevauchement*) of the fracture, and the deformity of the callus. This bandage, which seems to have taken its origin in the spica of Glaucius, delineated in figures 75, 76, and 77, of Vidus Vidius, deserves, therefore, no further mention.

The *scarf* that M. Mayor desires to have substituted for it, is not sufficiently solid, and permits too much motion to the limb, to have any other advantage than that of supporting the elbow and forearm, and of leaving the cure of the injury to nature.

II. *Bandage of the author*, (Fig. 117.) There is no doubt that a simple scarf is much more valuable than the bandages and different machines extolled of late. It causes infinitely less fatigue, while it accomplishes full as regular a union. But I have contrived a bandage, by means of a simple band, which is adapted both to sterno-clavicular luxations, for which I had at first designed it, and also to acromio-clavicular luxations, fractures of the clavicle, acromion, and scapula, and even to fractures of the neck of the humerus. For this purpose we procure a bandage of eight to ten yards in length. The head of this bandage is first applied under the

armpit of the sound side, or behind, as with the cataphrast; it is then passed diagonally upon the back and shoulder to the clavicle, upon the side affected. The hand of the patient is then placed

(Fig. 117.)

upon the acromion of the sound shoulder, as if embracing this last. The elbow thus raised is brought in front of the point of the sternum, and the affected shoulder is pushed upward, backward, and outward, by the action of the humerus, which, taking its *point d'appui* on the side of the chest, acts like a lever of the first kind, or by a swing-like motion, (*mouvement de bascule.*) While an assistant keeps the parts in place, the surgeon brings down the bandage upon the anterior surface of the arm, then outside and under the elbow, to bring it upward and forward under the sound armpit. He repeats this three or four times, in order to have that number of diagonal turns, which obliquely traverse the wounded clavicle, the upper part of the chest, and the middle portion of the arm. In place of bringing back the bandage to the affected shoulder, it is afterwards passed horizontally upon the posterior surface of the thorax, and brought back upon the external surface of the arm, elbow, or forearm, in the form of circulars, which are repeated until the hand which is on the sound shoulder and the stump of the affected one alone remain uncovered. We finish by one or two more diagonals, and by a similar number of horizontal circulars.

Another bandage, well saturated with dextrine, and applied exactly in the same manner over the first, makes a kind of immoveable sac, in which the elbow rests without effort, and without having the power to move itself either backwards, outwards, or forwards. I have already employed it a great number of times, and it has appeared to me so simple, and of such easy application, that I do not hesitate to offer it as preferable to all those that have been hitherto proposed. It is unnecessary to add, that some paddings and thick compresses may be placed under it in the supra-clavicular region, sometimes nearer the sternum, at other times nearer the acromion, according as it seems proper to make pressure on one point rather than another. It is well, also, in order to avoid excoriations of the skin, to place a piece of linen folded double between the chest and arm; and it will be also necessary to adjust a kind of wedge into the arm-pit, of half the thickness of that of Desault, if it is a case of fracture of the neck of the humerus.

E. *Fractures of the Ribs and Sternum.*

All fractures of the ribs and sternum may be dressed with the body bandage, (*le bandage de corps,*) or equally well with three layers of the roller bandage, or, better still, with the cataphrast saturated with dextrine. The first answers when the fracture is simple, and without displacement; the second or third will be preferred in other cases, because it enables us to increase or diminish at pleasure the pressure on this or that point, and, consequently, to force back, during the desiccation, and in such direction as we may desire, the projections that we wish to flatten down.

F. *Fractures of the Lower Extremity.*

All the fractures of the abdominal extremity, like those of the thoracic, may be treated by the bandage of Scultetus, or the roller bandage, saturated with the desiccatory glue; on which account, I have, for the last three years, discarded all extensor and containing splints, and the dressings of Desault, Boyer, &c., &c., in the treatment of fractures of the leg and thigh.

I. *Fractures of the Foot.* For the foot we proceed as with the hand; that is to say, a dry piece of linen is first applied upon the skin; the reduction being well effected, the anterior external depression of the dorsal region, and the posterior internal hollow of the sole of the foot, are adjusted with graduated compresses and pieces of pasteboard; and the whole is afterwards covered with two or three layers (*plans*) of the roller bandage, with which we surround both the lower part of the leg and the malleolar regions.

II. *Fractures of the Leg.* In complete fractures of the leg, one assistant, seated at the foot of the bed, grasps the heel with one hand, and the digital extremity of the foot with the other, in order to make the extension; a second assistant, having his back turned towards the face of the patient, grasps the lower part of the thigh, and the posterior surface of the ham, to make the counter-extension: the two together, thus holding the leg slightly raised up, ena-

ble the surgeon to effect the coaptation; to surround the limb with dry linen—then with a layer of roller bandage reaching from the toes to above the knee; to apply a long graduated compress on the anterior inter-osseous fossa, and another on each side of the tendo-Achillis, and behind the malleoli; or to substitute three pieces of pasteboard for these compresses—one behind and one on each side—to descend again with a layer of turns upon these compresses, or pasteboards, and to pass another layer of them upwards to the knee. This being accomplished, we may, in order to have a more rapid desiccation, suspend the leg upon loops of bandage, (*anses de bande,*) or by straps fixed to the circles of the hoop which is to support the bed-coverings. If the direction of the parts should not seem correct, we must carefully look to it, and adjust it, in proportion as the bandage hardens and dries.

III. *Fractures of the Tibia.* Fractures of the tibia being scarcely ever accompanied with displacement in the direction of the length of the bone, are still more easy to dress than complete fractures of the leg. We proceed in the same manner as I have just described, except that, in most cases, we may dispense with the anterior and external, and even with the internal, graduated compresses.

IV. *Fractures of the Fibula.* There are three principal kinds of fractures of the fibula: those of the three upper fourths of the bone, those of the external malleolus, and the fractures opposite to the tendo-Achillis. The first and second require only the simple roller bandage, with the bandage saturated with dextrine. Those of the third kind, or the supra-malleolar fractures, and which interest surgeons the most, require that the foot should be forcibly raised up and directed inward by the assistant, who makes the extension, that the hollows (*gouttières*) of the tendo-Achillis, that is, the malleolar, as well as those of the anterior inter-osseous fossa, should be well adjusted with graduated compresses, and that the pieces of pasteboard should accompany the rest of the bandage; they require that we should, from time to time, take care to adjust the inclination of the foot inward and forwards, until the desiccation of the dressing is completed. We thus procure, without any effort or fatigue on the part of the patient, all the advantages of Dupuytren's dressing, united to those of the bandage of Scultetus, and the ordinary splints and compressing bandage.

V. *Fractures of the Patella.* Like those of the olecranon, the fractures of the patella are scarcely ever united by immediate contact; like them, also, they allow the limb to resume its functions when they are not followed by a separation of more than an inch. I have even seen fractures of the patella accompanied with a separation of two or three inches, and which had not prevented the functions of the leg from being re-established. If, on the other hand, we consider that all bandages, without exception, and all the methods adopted for this injury, lead to a great number of inconveniences, we should be allowed, as I conceive, to subject it to the application of a bandage which causes no fatigue, which permits the patient to take considerable exercise, and procures a definitive result as

satisfactory, at least, as any of the others. This bandage we have, and it is no other than the roller bandage saturated with dextrine, and provided behind with a piece of pasteboard, which may go from the upper part of the thigh to the heel. The only precaution to be taken in employing it consists in this, viz.: To hold the two fragments of the patella as closely approximated as possible; to apply to their unfractured (adherent) margin graduated compresses placed crosswise; to draw them towards each other by means of turns of bandage passed obliquely under the ham; to prolong the roller bandage to the upper part of the thigh, and to re-descend to the foot.

VI. *Fractures of the Thigh.* The thigh, when it is fractured in the body of the femur, accommodates itself still better than the leg to the roller bandage saturated with dextrine. The fractures in the neighborhood of the trochanter do, also, exceedingly well with it. So also do those of the lower part, provided we take care to place graduated compresses in the hollow of the ham. In all cases, it is requisite that the bandage should be prolonged as high as possible in the direction of the hip, and that it should be carried many times around the pelvis, in the form of spica, upon the upper part of the limb. To increase its solidity still more, we must not forget to place two large splints of pasteboard, one before and the other behind, between the great trochanter, or the ischium, and the knee, or, what is as well, one on the inside and the other on the outside, extending up to the iliac fossa. If the necessity of holding the limb raised during the application of the roller bandage should disquiet the surgeon, or seem to fatigue the patient too much, we might, without any difficulty, substitute for the roller bandage that of Scultetus.

VII. *Fractures of the neck of the Femur.* If it is true that intracapsular fractures of the neck of the femur cannot be consolidated, it is useless to subject patients who are afflicted with them to the employment of any fatiguing application. Thus I have, for a long time, been in the habit of permitting such patients to leave their bed and move about on crutches, after the tenth or fifteenth day of the accident. On the supposition, however, that there may be reason to hope for consolidation, a bandage, saturated with dextrine, (*bandage dextriné*,) when properly applied, in the form of spica, and associated with a roller bandage, which should extend from the foot to the ischium, would assuredly be better than the bandage of Desault, or that of Boyer, or than the half-flexion of Bell or Dupuytren; in fine, than the thousand modes which have been proposed, and which are still at this day proposed, with the intention of curing fractures of the neck of the femur without shortening the limb.

If, after all, it were necessary to keep the limb extended during the desiccation of the dextrine bandage, nothing would be more easy. A bandage, passed as a noose (*en anse*) above the heel and instep, serves to make the extension by fixing it to a cross-piece at the foot of the bed, while another bandage, passed under the thigh

and ischium, serves to make the counter-extension, by being fixed to a post at the head of the bed. As soon as the dressing is completely hardened, these accessories are useless, for the limb is no longer susceptible of any displacement, and the patient is at liberty to turn and move himself without danger.

G. Thus, then, have we all that concerns the bandaging (*déligation*) of fractures at the present time, if all practitioners would imitate what I have done at La Charité since the month of January, 1837. In every case, we perceive that the bandage saturated with dextrine answers the purpose. When we consider that, by this means, the patient is enabled to move and to turn himself in bed, even to raise himself up, and to walk with crutches from the third or fifth day, it may be asked if henceforward there will be any need of cushions, splints, fracture-boxes, (*gouttières,*) inclined planes, leathers, ties, and foot-boards, in the bandages designed for fractures.

[With every degree of deference due to so high an authority as M. Velpeau, the unqualified preference given by him to the *appareil amydonné*, or *dextriné*, as first adopted and lauded to so great an extent by M. Seutin, of Brussels, should, in the opinion of Dr. Mott, be taken with considerable allowance, or subjected to important exceptions. There is no question, ceteris paribus, of its superiority over all other modes in effecting and preserving perfect coaptation and immobility. But there is unquestionably, and lamentable experience proves it, great danger in its *immediate application*. For its unyielding nature under such circumstances must, in every instance, aggravate the consecutive local inflammation, or inflammatory reaction, (often violent,) which must necessarily, and should, by every sound curative principle in pathological and therapeutic surgery, take place as a consequence to the injury, and an essential remedial process for the accomplishment of consolidation. The memorable and recent instance of Prof. Dubovitsky, of St. Petersburg, Russia, wherein this *appareil amydonné* was immediately applied, and the devastating effects of which Dr. M. was himself an eye-witness to at Paris, has been descanted upon at length, as also all the objections to Seutin's mode, in Dr. M.'s recent book of "Travels in Europe and the East." This case, if no other existed on record, would demonstrate the danger of the immediate application of this method of treatment of fractures. Among the dreaded results which the inelastic character of the dressing produces upon the inflamed parts, and which may be developed insidiously to the most mischievous and alarming extent under this masked battery, and be thus concealed from the possibility of inspection by the surgeon, are great augmentation of pain, heat, and every other symptom and consequence of inflammation, from the inability of the parts to have free distension; and thence follow quickly ulcerations, abscesses, sloughing, gangrene, and sphacelation, or, should the vitality of the parts survive, permanent and incurable thickening and contraction of the tendons, aponeuroses, and fasciæ, and hypertrophy of the bones and callus, and total destruction often of the use of the limb. After the reduction of the primary inflammation, there is no

doubt that the apparatus may often be eminently beneficial and decidedly indicated; but, until all preliminary inflammation is subdued or past, the open mode of dressing by the modern improved methods of jointed splint-boxes, with well-regulated means of extension and counter-extension, and especially the flexible cylinders of straw, as improved upon and sanctioned by the Baron Larrey, should be rigidly persisted in. We shall recur to this subject of the dextrine bandages under the head of Tenotomy.—*T.*]

CHAPTER IX.

PROVISIONAL DRESSING FOR FRACTURES.

For all the different portions of linen which I have hitherto spoken of—that is to say, for bandages, compresses, straps, &c.—a surgeon of Lausanne, M. Mathias Mayor, proposes to substitute simple pocket handkerchiefs. Square pieces of linen, pocket or neck handkerchiefs, folded in the form of a triangle, cravat, or in any other manner, are sufficient, says M. Mayor, for all our wants. These articles, which we have always at hand, have, moreover, the advantage of being afterwards restored to their uses, as portions of dress in the domestic economy. With them we have no need either of bandages, bands, (*liens,*) or compresses; all the dressings may be applied by the first person who comes. Without sharing in the repugnance which M. Mayor has to bandages and compresses, or concurring exactly in all the praise he bestows upon handkerchiefs and square pieces of linen, I ought to declare that we may, by means of these articles of dress, extemporaneously and without difficulty, make a much greater number of more simple, convenient, and even more solid bandages than with the ordinary kinds of bandage. I will add, that for all kinds of dressings, we may, in a case of necessity, in fact, substitute for the bandage the handkerchief, folded in different ways, as a provisionary dressing. If it were only then under this last point of view, the method of dressing by the surgeon of Lausanne deserves to come into general use, and to be better known. It so frequently happens in the army, in campaigns, and on the occasion of sudden accidents, that we are under the necessity of dressing the wounds immediately, without having at our command either bandages or compresses, that the surgeon will find himself fortunately situated, if he can have it in his power to borrow, either from the assistants, or from the patient himself, whatever can be made into a temporary dressing.

Article I.—Bandages for the Head.

We have already remarked, that the handkerchief, folded in triangle, was frequently employed for covering the dressings designed

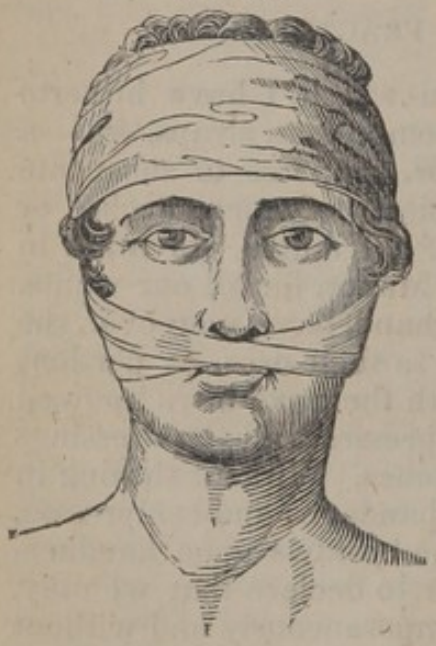
for wounds of the cranium ; it is, therefore, useless to recur to that at present.

Article II.—Bandages for the Face.

Having shown how, in lowering the base of the triangle, on one or both sides, or upon the eyes or nose, we obtain with the handkerchief a bandage preferable to the different bandages of the nose and orbitar region, I have only to call attention to the facility of applying the same processes to diseases of the temple and ear.

For *hare-lip*, or any other division of the upper lip, we obtain a uniting bandage by bringing from the occiput under the nose the two heads of a handkerchief, (Fig. 118,) the point of which has been fastened to the cap. These two portions are then crossed on the front part of the lip, and passed, one above or through the other by a button-hole, and to be then passed in the opposite direction towards the temples, where they are to be fastened with a pin. We may also place the middle portion of the handkerchief upon the forehead, and carry the two heads to the occiput, crossing them there, then bringing them back on the front part of the lip, and fastening them as in the preceding mode. In adopting this last mode, there is no use in placing a cap on the head, for the handkerchief, whose point is extended to the nape behind, answers that purpose sufficiently well.

(Fig. 118.)



Article III.—Sling (*Fronde*) for the Lower Jaw.

To cover the wounded portions of the cheeks, lower jaw, or even the lips—to take the place, in fact, of the sling or chin-cloth, (*mentonnière*)—we adjust the triangle towards the vertex, with its point turned forward. After having brought down and crossed its two branches under or before the chin, we carry and fix the extremities of this triangle towards the temporal regions. By placing the middle of the handkerchief, which is on the top of the head, a little farther forward, it is easy to bring down its two halves upon the parotid regions, cross them under the jaw, (Fig. 119,) and afterwards raise them towards the temple. In this case, we may place the middle part of the triangle on the auricular or on the parotid region itself, in order to fix its two extremities upon the opposite temple. But, the handkerchief, folded as a cravat, is manifestly much better fitted for diseases either of the cheek, ear, or parotid region, than the handkerchief in the shape of a triangle. Applied by its middle portion under the jaw, the cravat intended for this

use is afterwards raised, either directly upward, or obliquely backward, and carried towards the vertex of the head, where it is fastened, either by a knot or by the aid of pins.

(Fig. 119.)

Article IV.—Bandages for the Neck.

The ordinary dressings for the neck are made by a neck handkerchief, (*mouchoir en cravate ;*) this has been the practice for ages.

(Fig. 120.)

If this kind of lesions require a certain degree of solidity in the width of the bandage, nothing is more easy than to adjust, after

the manner of M. Mayor, a thin piece of pasteboard or of coarse paper between the folds of the handkerchief.

The uniting, dividing, and straightening (*redresseurs*) bandages, for the neck, are made by means of a handkerchief, the middle part of which is placed on the vertex, (Fig. 120,) if it is necessary to incline the head forward; on the forehead (Fig. 121) in the contrary

(Fig. 121.)

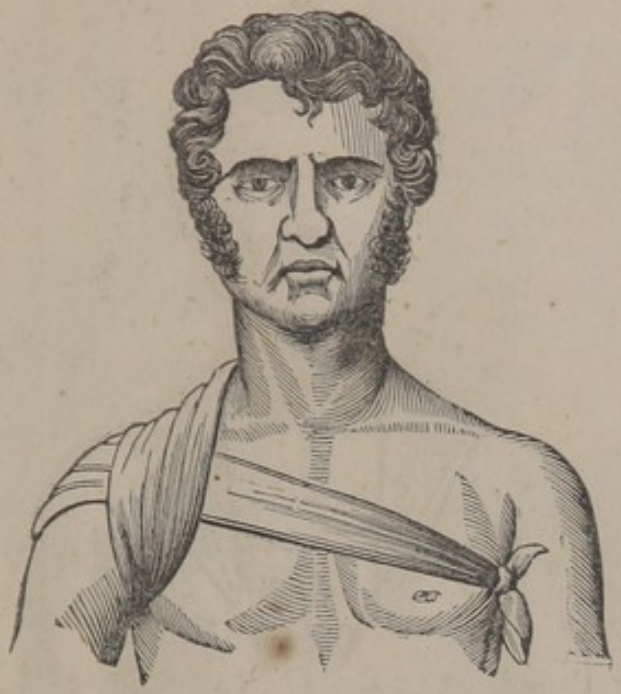
case; and on one of the parietal regions, when we wish to incline the head towards one of the shoulders. We afterwards bring down the extremities of the handkerchief to attach them, before or behind, upon a body bandage, or, on the side to a sub-axillary cravat, of which we shall speak presently.

Article V.—Bandages for the Arm-pit.

The diseases of the arm-pit (or axilla) may be easily dressed by the aid of a handkerchief, folded cravat fashion. We place the middle of the cravat under the hollow of the arm-pit itself, in order afterwards to cross its two halves upon the corresponding supra-clavicular region. We then conduct one of these in front, the other behind, to beneath the sound arm-pit, where they are fastened, (Fig. 122.) If the handkerchief should be too short, we lengthen it by means of pieces of ribands, or, what is as well, by placing under the sound arm-pit a second cravat, which we should then tie to the first on the shoulder of the diseased side. We may also, with the same facility, make a figure of 8 with these two sub-axillary cravats; each one represents a species of ring around the upper part

of the limb, and nothing is more easy than to unite their ends behind, and fasten them between the two shoulders. With the same ease, we could, if we had a very long handkerchief, arrange it first

(Fig. 192.)



in the manner of a scarf, as worn by women, making its two halves pass from before backward under the arm-pits, then fixing them afterwards to the middle of the scarf between the shoulders.

Article VI.—Bandages for the Thorax and Abdomen.

The *cravat* could also serve to surround the chest or belly, and take the place of the body bandage. But, as it is almost always as easy to procure a napkin as a cravat, I am of opinion that the body bandage will, for the most part, render the substitute M. Mayor speaks of, useless.

The handkerchief has the advantage of being capable of containing the portions of the dressing for all the regions of the thorax or abdomen.

To the chest we fasten it below, in the manner of a cincture; we then raise up its point, to which having attached a riband, we conduct it, in the manner of suspenders, above the shoulder, attaching it to the cincture of the handkerchief. This forms a *triangular bandage*, which may be applied to the right or left, in front or behind, according to the indication, and in such manner as not to be disturbed either by the neck or shoulders.

If we were treating the abdomen, and especially its lower part, we should arrange matters so, that the base of the bandage should be turned upward, and that its point, furnished with a riband, could serve the purpose of a sub-crural bandage below.

We obtain a *scapulary* by means of a cravat, one portion of which

embraces the lower part of the neck, and the other the anterior or posterior part of a thoracic cincture, (Fig. 123.)

I have mentioned above how the handkerchief, or cravat, might

(Fig. 123.)

replace the suspensory of the scrotum. I will add, that the dressings of the anus and perineum may be very well made with the aid of a cravat, which is fastened behind and before to another cravat.

Article VII.—Bandages for the Pelvis.

For diseases of the hip, or breech, it is sufficient to fasten a cravat around the pelvis, then to attach the base of a triangle-folded handkerchief about the upper part (*la racine*) of the thigh. The point of this handkerchief, raised and fixed to the pelvic cincture, (Fig. 124,) enables us to cover all the portions of the dressing which we wish to support, either in front of the groin, opposite the great trochanter, or on the breech. If we are treating ulcers, wounds, (*plaies,*) or injuries, (*blessures,*) of the region of the sacrum, the triangle, fixed by its base around the pelvis, and brought back by its point between the thighs, (Fig. 125,) and up to the pubis, would fulfil every indication.

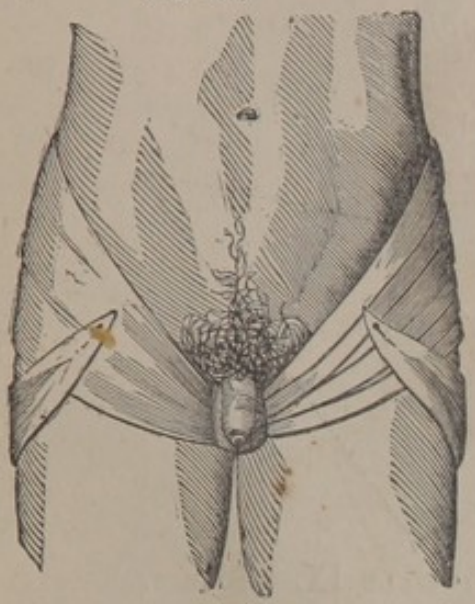
Article VIII.—Bandages for Amputations.

After amputations of the limbs, we have often occasion for bandages that are purely containing, and of dressings that will

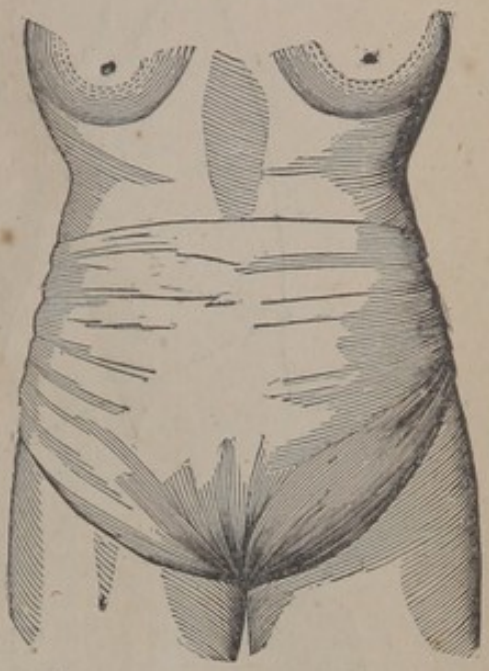
prevent any motion of the stump. The handkerchief, folded as a triangle, may serve for this double indication.

If it is an amputation of the arm, for example, we pass a cravat

(Fig. 124.)



(Fig. 125.)



from the armpit of the sound side, to the supra-clavicular region of the diseased side, where it is fastened. The base of the handkerchief, afterwards applied below the wound, is to be fixed by a knot on the sound shoulder, while we raise up and attach its point to the cravat on the affected side.

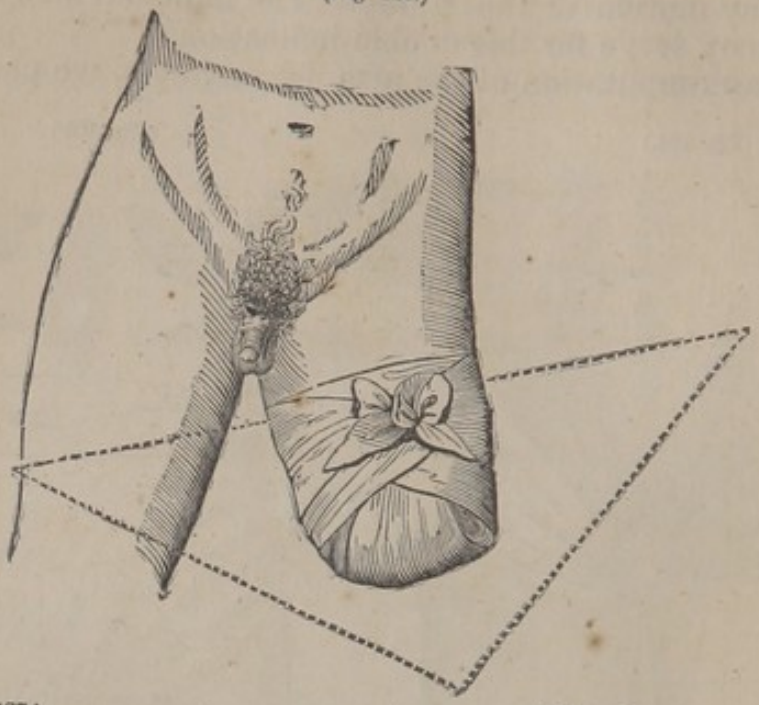
For the amputation of the thigh, the handkerchief, arranged in the manner described for the abdomen, and properly adjusted, would very well answer for the principal indication.

For an amputation upon the body of the limbs, (*dans la continuité des membres*,) at the middle of the thigh, for example, we should embrace the stump, at some inches above the wound, with the triangular handkerchief. The other portions of the dressing being applied, there would be nothing to do, but to raise from behind forward, and from below upward, the point of the handkerchief, (Fig. 126,) in order to attach it to the circle formed by the base of the bandage.

Adjusted in this manner, the bandage for amputations is extremely simple. As it requires only to detach and lower the point of it to uncover the wound, the dressings may be renewed without causing the least movement to the stump.

What I have just said of amputation of the thigh, is applicable to amputations of the leg and foot, the arm and forearm. I will only add, that the handkerchief thus arranged, is only to be preferred when used as a purely containing bandage, or for treating stumps that are exceedingly painful, or keeping in their place simple gâteaux of lint, or different kinds of cataplasms. Everywhere else, in fact, the bandage exposes to less risk of strangulation, and allows of more regularity in the distribution of the dressing.

(Fig. 126.)

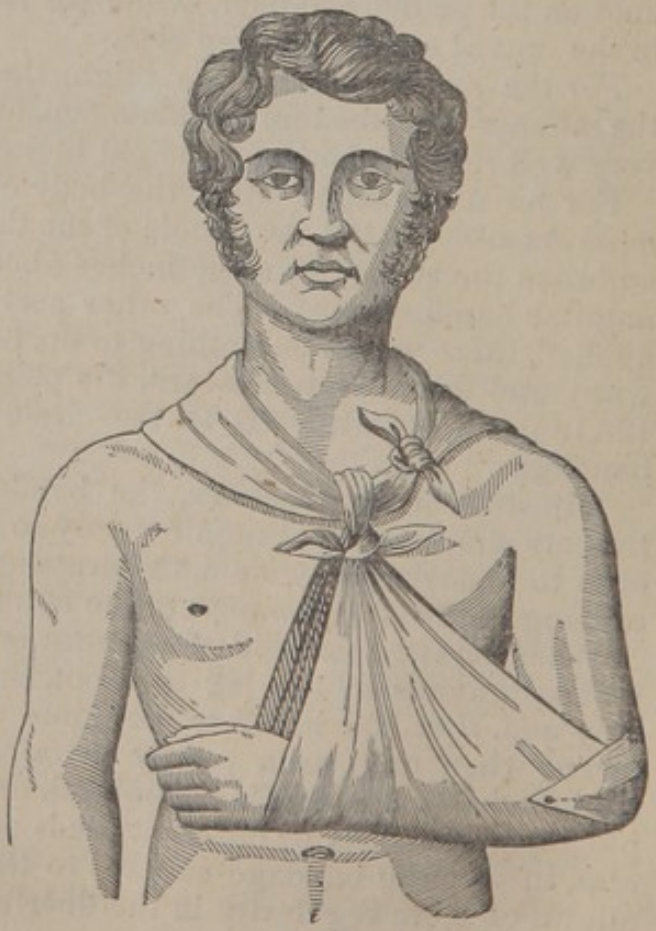


(Fig. 127.)

Article IX.—Scarfs.

The different kinds of scarfs, whether of the leg, (Fig. 127,) or for the forearm, (Fig. 128,) may be replaced by a cravat

(Fig. 128.)



and a handkerchief, in form of a triangle. Embracing in this manner the nape, the cravat ought to be tied upon the side or front part of the chest. It thus represents a ring, to which are fastened the two extremities of the triangle that embraces the elbow or the knee.

It is also easy to understand how cataplasms, sinapisms, and blisters, may be supported upon different regions of the limbs by means of handkerchiefs and cravats. It is the mode instinctively followed by the world generally, and which M. Mayor has taken as the point of departure for his whole system of bandaging, (*déligation.*)

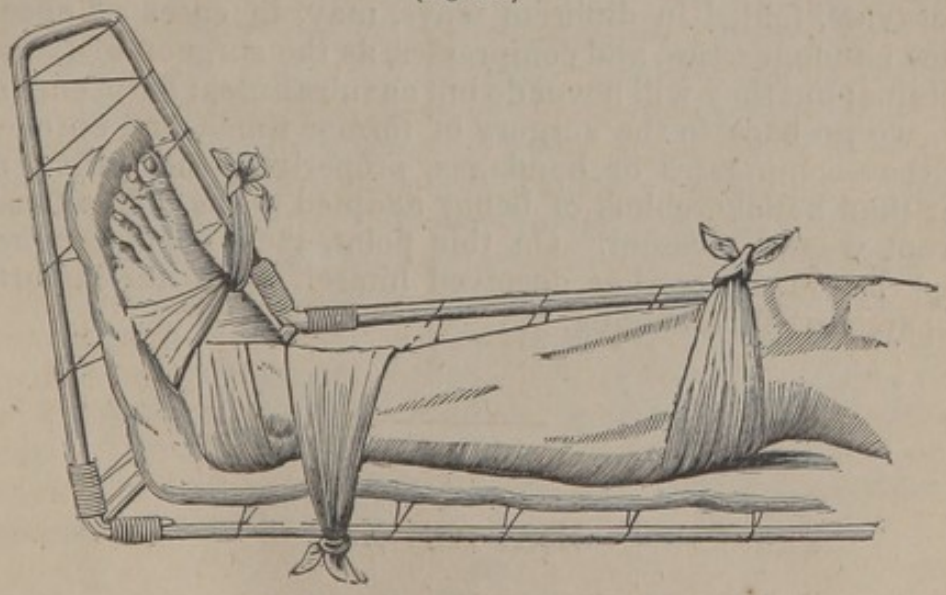
Article X.—Uniting Bandages.

What I have said of the handkerchief, as a uniting bandage in hare-lip, or wounds of the upper lip, shows also that we could, in a case of necessity, convert the handkerchief or the cravat into a uniting bandage, both for longitudinal and transverse wounds.

Article XI.—Bandages for Fractures.

It is evident, also, that by the aid of handkerchiefs, folded in triangles, oblongs, cravats, or cords, we may make almost all the dressings required for fractures. It is thus that three or four handkerchiefs, (Fig. 129,) in the form of cravats, may take the place of

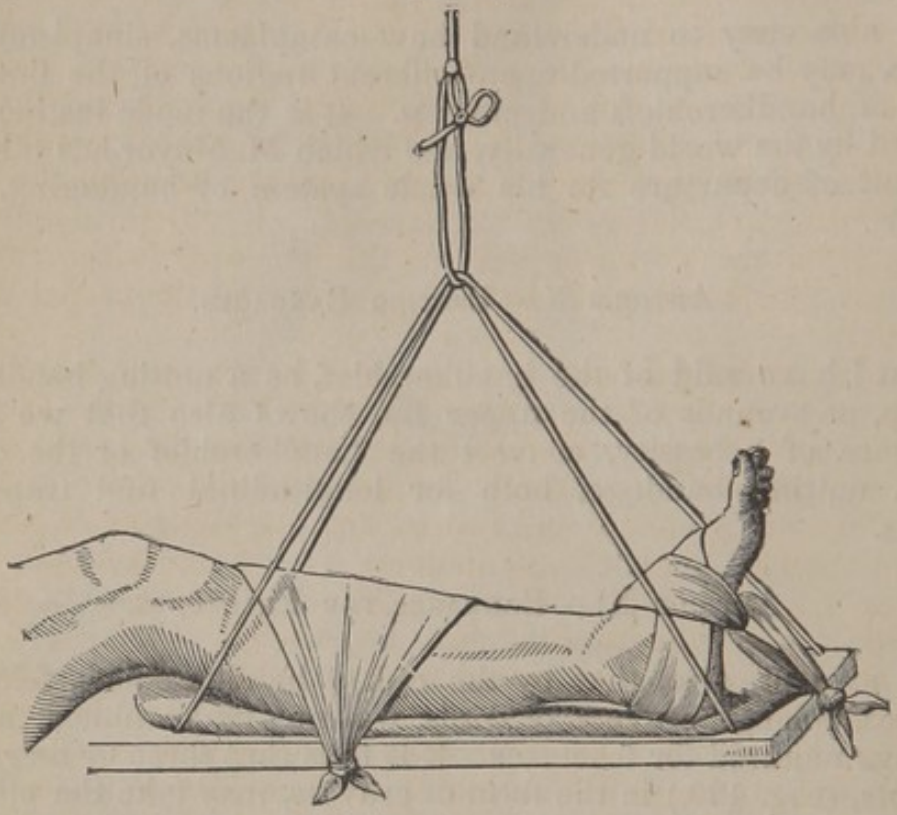
(Fig. 129.)



a bandage with eighteen heads, the bandage with bandelettes, [vide *supra*,] or that of Scultetus. In multiplying them still more, we would obtain a part of the results procured by the roller bandage; and we can easily perceive in what manner, when placed around splints and bundles of straw, (*des paillassons*,) they might advantageously replace the different sorts of cords. However, this

part of the popular mode of dressing by M. Mayor, (Fig. 130,) would lose much of its value if the mode of dressing which I have adopted in the treatment of fractures came into general use.

(Fig. 130.)



In conclusion, then, the square pieces of linen, the handkerchiefs, and cravats, folded in different ways, may, in cases of necessity, replace bandages, ties, and compresses, as the surgeon of Lausanne maintains; but they will never do but as substitutes; for in employing them, we go back to the surgery of former times, and no one can deny that compresses or bandages, properly applied, allow much better than handkerchiefs of being adapted to the indications that different wounds present. On this point, then, I feel constrained to say, that M. Mayor has deceived himself about the importance of his system of bandaging.

CHAPTER X.

HERNIA BANDAGES.

Hernia requires particular bandages, known under the name of trusses, (*brayers.*) These bandages having become the patrimony of certain surgeons or manufacturers, I am not allowed to treat of them at length: I will remark only, that the ordinary truss is formed of an elastic cincture, a sort of steel spring, well padded, (*rembour-*

rée,) which terminates on one side in a leather piece, and on the other by a pelote, sometimes circular, and at other times oblong, and occasionally triangular. To apply this bandage, we pass it around the pelvis, then carefully adjust its pelote in the fold of the groin, on the opening of the crural canal, or above the pubis, so as to cover the track of the inguinal canal, according to the nature of the hernia, taking care, however, to avoid the scrotum and spermatic cord. The leather is then brought forward and fastened upon the external surface of the pelote, by means of small hooks. The bandage then represents a cincture passing between the crests of the ilium and the great trochanters. A subcrural bandage, brought from the posterior part of this cincture to the external surface of the pelote, gives to the apparatus all the proper degree of solidity.

If it is an umbilical hernia, we proceed in the same manner, except that the cincture passes upon the sides between the false ribs and the bones of the pelvis. Moreover, whether the pelote of such bandages is filled with astringent substances, like those of M. Jalade-Lafont, or is elastic and full of air, like those of M. Cresson, or simply padded with elastic materials, as in the ordinary truss, we must always expect irritation, fatiguing compression, excoriations, and displacements, difficult to be avoided.

The best that I am acquainted with to the present time, are the bandages of M. Fournier. For inguinal hernia, the trusses of this surgeon, which, as has been recommended by MM. A. Cooper and A. Thompson, and which I have also demonstrated to be necessary, press upon the whole track of the inguinal canal, in place of simply closing its anterior opening, have an especial efficacy. Keeping the two principal walls of the passage in contact, they retain the viscera in the belly; by the somewhat forcible pressure they exercise, they present, moreover, a chance of the radical cure of the hernia. I have seen some of those made by M. Fournier for umbilical hernia, which had an extremely large plate, (*plaque*,) furnished behind with a long thick crest, projecting more than an inch. Applied upon the hernial aperture, this crest reverses the two portions inwardly, and soon destroys the tendency of the organs to protrude into it. It has always happened that patients who had derived no advantage from other kinds of bandages have always found themselves perfectly well accommodated with that of which I speak. The umbilical bandages, also, generally have need of a wide cincture. To keep them steady, they also require sub-crural bandages and a scapulary.

CHAPTER XI.

VARIOUS KINDS OF DRESSINGS.

Besides the pieces of linen, bandages, and different objects we have hitherto mentioned, we sometimes use medicinal substances, under the character of dressing. Among the topical applications, the management of which it is the usual practice to assign to the pupils of the hospital, are to be found cerates, cataplasms, pomades, unguents, balsams, salves, different liquids, fomentations, the douche, (*les douches*,) fumigations, liniments, &c.

Article I.—Dressing with Cerate.

Of the different topical applications which the ancients used in the treatment of surgical diseases, scarcely any remain in practice except cerate and some of the unguents.

The cerate most in use is a composition of oil and white wax, if we desire to have that of Galen, and of yellow wax, if we wish to have the ordinary cerate. With this cerate we make Goulard's ointment, by the addition of the extract of lead; an anodyne cerate, by the admixture of laudanum; the sulphur ointment, by uniting with it sulphur and a small quantity of the essence of lemon; mercurial ointment, by mixing with it the Neapolitan ointment; and the ointment of belladonna, by associating with it a small quantity of the extract of this plant.

Cerate is used in various ways. It is almost the only ointment that should be used in simple dressings.

When we have under treatment ulcers, wounds, or any kind of solutions of continuity whatever, we mean by *simple dressing*, the methodical application of the following articles: 1st. A perforated piece of linen, (*linge criblé*,), or fringed bandelette, (*bandelette découpée*,) or a gâteau of lint besmeared with cerate, is first placed upon the diseased part, or upon its circumference, according to the rules established above, (see linen spread with cerate;) 2d. One or several compresses are then applied over the lint; 3d. Then one of the bandages above described, for the purpose of securing the first articles in a proper manner.

The plumasseaux ought not to be spread over but with a very thin covering of cerate, and only when, as rarely happens at the present time, we are to apply them naked to the skin. The perforated linen itself ought not to have any of this cerate, except to prevent its adhering to the edges of the wound. It is the same with the fringed bandelettes. The cerate, in fact, is for no other purpose than to render easy the removal of the inner pieces of the coverings at each dressing.

The simple cerate may be used on plain pieces of linen, or by simple friction, when we wish to soften the skin, to cover excoriated

surfaces with it, or those regions that we are fearful of irritating, or parts enveloped with scabs, which require to be softened, or those places upon the body that we wish to shave. Fresh butter and oil could, in fact, in such cases, be substituted for it. But we must not fall into the error which pupils too often commit, that is, in applying the linen spread with cerate over the lint, unless specially directed, or that of covering the perforated linen with gâteaux spread with a thick layer of cerate, since the object in such cases is to clothe with a greasy substance that piece of linen or dressing only which is to be in immediate contact with the wound or its circumference.

The dressings with the Goulard, opiate, mercurial, sulphur, or belladonna ointment, are made after the same rules, when we are treating wounds, with this single difference, that the plumasseau placed next to the parts, is then preferable to the perforated linen. But these different ointments are most frequently employed as frictions. It is thus we treat certain affections of the skin, tumors, and inflamed regions.

Article II.—Dressings with Pomades.

The pomades used at present are but few in number. As topical applications, they differ so little from unguents and certain balsams, that they are scarcely to be distinguished. We employ them in the treatment of wounds in the same manner as cerate. But as it is for frictions they are most usually prescribed, the pupil ought to know that they are not always applied in the same manner, nor in the same quantity. The anti-ophthalmic pomades, for example, are employed in two very different modes. Some, whose object is directly to subdue certain kinds of ophthalmia, are applied to the ciliary or glandular part of the free edge of the eyelids, or even to the surface of the eye, according to the kind of ophthalmia, but never upon the skin in the neighborhood. It is in this manner that we apply, of the size of a small bean, (*lentille*,) the pomades of Janin, Desault, Lyon, Régent, Dupuytren, white precipitate, nitrate of silver, &c. The important point here is, that the pomade should reach the diseased surfaces, and not be retained by the scales and scabs, nor by the hairs on the edge of each eyelid.

If, on the contrary, we were using resolving or specific pomades, the mercurial, opiate, or belladonna, for example, we should take a quantity of the size of a pea or small nut, (*noisette*,) and rub it in—not upon the edge of the eyelids, but upon the skin of these parts, or, better still, upon the forehead or temple of the diseased side.

The *pomade of Autenreith*, which is composed of one to two gros* of tartar emetic to an ounce of lard, is used only in friction upon the epigastrium, or some other region, morning and evening, until it has produced an eruption which has much resemblance to that of the small pox.

[* A *gros* in French weight is four grammes, and a gramme is eighteen grains English weight, so that a gros is seventy-two grains English weight.—*T.*]

The pomades of *iodide of lead*, hydriodate of potash, hydriodate of mercury, white precipitate, and calomel, almost all of which contain half a gros to a gros of the substances in question to an ounce of lard, are also employed in frictions, principally in the treatment of certain eruptions and a great variety of tumors.

The mercurial pomade, which we sometimes spread upon the perforated linen, fringed bandelette, or plumasseaux of lint, is often, however, much more frequently employed in frictions, or as an unction. When, however, we desire its action to be purely indirect, we must prescribe it in the quantity of a scruple to two gros each time, repeat the application once a day, or even once only in two days, and spread it over a large extent of surface, rubbing the part for the space of from ten to twenty minutes. If the mercurial ointment, on the contrary, is employed as a topical application, it is not necessary to rub for so long a time; but it is advisable then to use larger quantities. It is thus in peritonitis I have applied two to three gros of it to the belly every two hours; and in acute inflammations of the cutaneous surface, or subjacent cellular tissue, we use, in the same manner, as much as two ounces in twenty-four hours. It is necessary that the patients subjected to the employment of this pomade, should be protected from exposure to cold, and that they should not carry on their persons pieces of jewellery, either of silver, gold, or any other metal, in contact with the skin.

To free the skin of these different pomades, simple washings are not sufficient; first, we have to dissolve the pomade with oil, or with a weak solution of soap and water. We must also bear in mind that the mercurial pomade has a strong tendency to the mouth, and easily causes salivation; that pieces of linen which have been touched by it easily turn black in ley, and that these spoil, in the same manner, all other linen with which they have been placed in contact; and that we ought, therefore, to throw into the fire, after having used them, every thing which may have been impregnated with this ointment.

The pomade of *iodide of lead*, which I have called *chrysochrome*, (color of gold,) from its beautiful yellow hue, and to conceal its nature from certain timid patients, is exposed also, in a certain degree, to the same inconveniences; so that, under this point of view, pomades with mercurial preparations, or preparations of lead, exact more caution than others.

The *balsam of Arceus*, or digestive ointment, whether simple or mixed with an equal part of cerate, is applied only to wounds. For that purpose, we spread a layer of it, of greater or less thickness, upon a plumasseau of lint. It is the same with the storax ointment.

The *white rhasis*, or camphorated ointment, is employed like the simple cerate, or the sulphur ointment.

The *basilican ointment* should be employed like the balsam of Arceus. It has the disadvantage, like this last, of adhering strongly to the parts, and of sticking unpleasantly to every thing it touches

The *canette*, or red ointment, should be employed like the cerate, or the white rhasis, if it has in reality any greater efficacy than those in general use in hospitals.

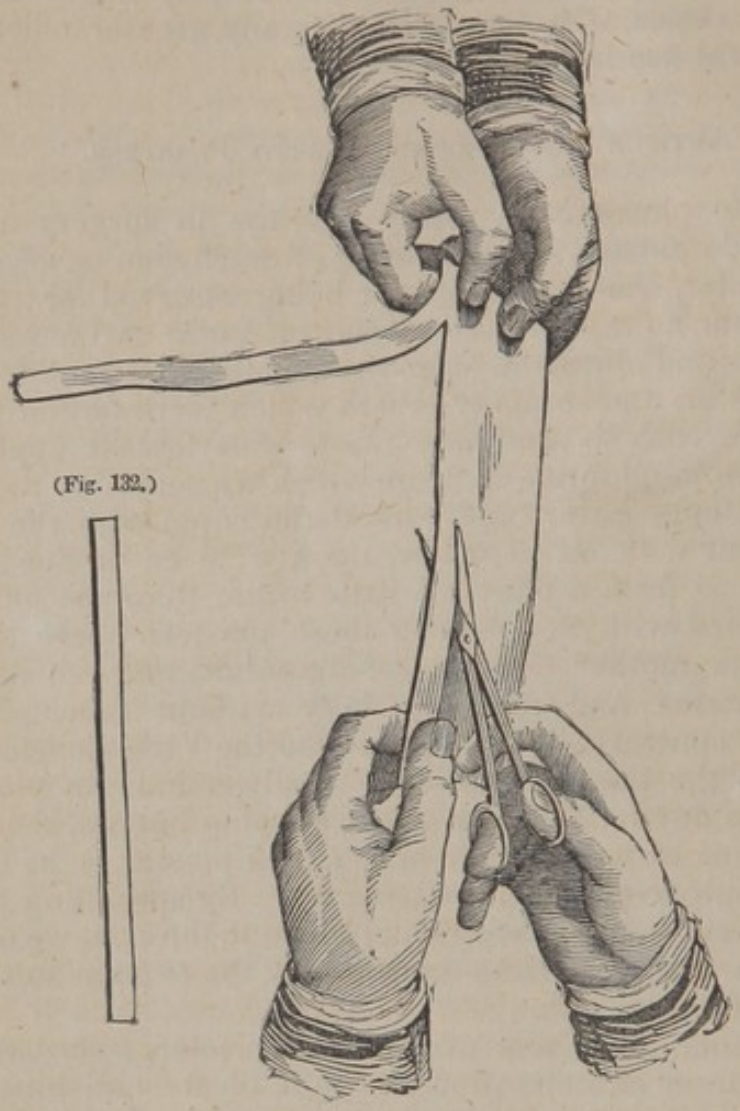
Article III.—Dressings with Plasters.

In regard to plasters, we rarely now use in surgery any other than the simple plaster, called plaster of diachylon, (*sparadrap*,) or the Vigo plaster, the blister plaster being reserved for particular cases. We hear no more of the plaster of André de Lacroix, of the mother plaster and ointment, (*emplâtre ou onguent de la mère*,) of the diapalme plaster, and so many others which were formerly in use. Also, when we wish to use these plasters as topical applications, we take a certain quantity of them, which we soften by the heat of the hands or tepid water, and spread the same with the thumbs, rendered pliant with oil or water, upon a piece of fine linen or leather, so as to form a plaster a little larger than the part which is to be covered with it. Among those plasters, there are some which, like the mother plaster, the diapalme, and the diachylon, may be separated and removed daily without much difficulty. Others, on the contrary, like the pitch and the Vigo plasters, adhere so strongly to the tissues, that they easily remain in place from eight to fifteen days. We also often envelop buboes, the testicle, and certain tumors, with a Vigo or hemlock plaster, so as to renew the dressing only every eight or ten days. By sprinkling the pitch plaster with tartar emetic before applying it to the skin, we obtain, at the expiration of four to eight days, nearly the same result as with the pomade of Autenrieth.

Plasters, under the name of diachylon plaster, (*sparadrap*,) are employed to dress cauterizations, certain ulcers and blisters, and for forming adhesive straps, (*bandelettes*.) In the first case, we cut out, every morning, pieces of different shapes, which are applied upon the diseased part after it has been properly cleaned. In the second, the strips are cut into different forms and lengths, according to the kind of dressing they are to compose.

The adhesive plasters (*bandelettes emplastiques*) which are used in dressings should be pliant, but firm and moderately adhesive. It is advisable to take off the free edges of each roll, as we do those of the seams of the linen, of which we wish to make compresses or bandages. To cut them rapidly and accurately, we seize with the left hand the free or unrolled head of the roll of plaster, while an assistant holds the roll itself apart, at a suitable distance. The scissors, passed quickly and on the line of the thread (*en droit fil*—Fig. 131) from the surgeon towards the assistant, will, by their mere pressure, and without the necessity of approximating the blades, divide the plaster into as many strips as we wish. These strips, (*bandelettes*,) which for the most part do not require to be heated, are employed in the character of a uniting or compressing bandage, (Fig. 132.)

(Fig. 131.)



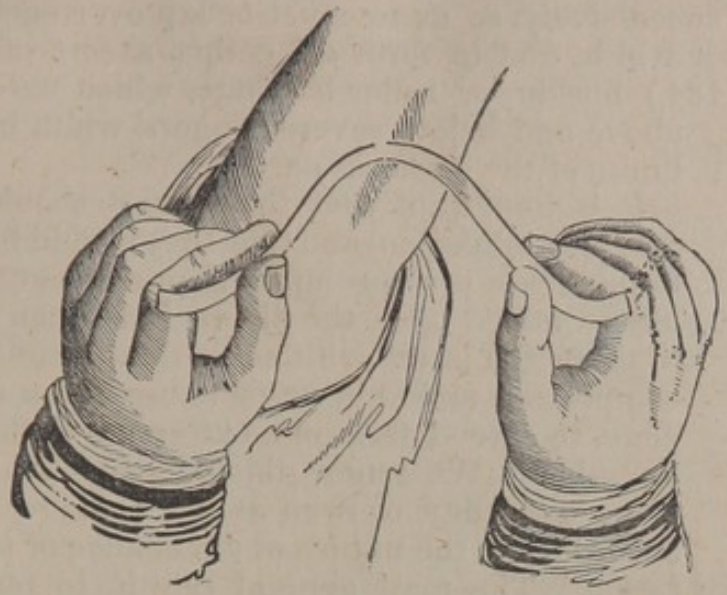
(Fig. 132.)

§ I.—*Adhesive Strips.*

To apply strips of adhesive plaster properly, it is necessary, after the lips of the wound are sufficiently approximated, to carry and attach one of their extremities to an opposite point, in order that the remaining portion may be placed directly across the wound; also, we must give them great length, and not slacken the ends before they have become closely adherent to the skin. Though it is the custom to commence with that which is to cross and unite the middle of the wound, there are, however, cases where we begin rather with that which is to be placed below or above it.

To remove the uniting strips, we begin by detaching their extremities; we afterwards separate them up to the edges of the wound, from which part they are to be removed last, and by a perpendicular traction, for fear of disturbing the union, which as yet has but little solidity, (Fig. 133.) This precaution would become useless if they had been employed to hold the lint, compresses, or other portion of the dressing in the character of a containing bandage.

(Fig. 133.)



§ II.—*English Court-Plaster, (taffetas.)*

In treating small and superficial wounds, and when we wish to dispense with all dressing, we prefer the English taffeta to the adhesive strips, (*bandelettes.*) This taffeta, which is a kind of tissue spread with gum, and capable of being preserved for a long time, is in the first place cut into convenient strips. After having moistened one of its surfaces with saliva, it is sufficient to apply and press it for some moments on the skin, and as it were astride and in front of the cuts, to enable it to attach itself immediately, and become quite firm. To take it off afterwards, it is requisite to moisten it again, until it is all softened. [See supra on Caoutchouc bandages, &c.]

§ III.—*Strips of Adhesive Plaster employed as a Topical or Compressing Bandage.*

A new mode of dressing has entered into surgical practice during the last thirty years. It consists in enveloping the parts that we wish to act upon (*modifier*) by means of superincumbent strips of adhesive plaster. This dressing, first proposed in England by Baynton for ulcers of the legs, is made in the following manner. We have strips of diachylon sufficiently long to make one and a half turns around the part we wish to envelop. These strips, which ought to have a width of from eight to ten lines, and to be cut from pliant, tenacious plaster of sufficient firmness, and little disposed to break or scale off, are applied according to certain rules, which it is useful not to lose sight of. If we are treating an ulcer, we commence by having it well cleansed; the first strip is then applied, by its middle portion, upon any point whatever of the circumference of the limb, at an inch or two below the ulcer. We then bring back the two halves to a point diametrically opposite, where they are crossed, and then prolonged to their terminal extremity, and always perpendicularly to the surface they are to cover. A second,

third, fourth, fifth, sixth, seventh, or even a greater number still, are thus applied successively, so as to cover or lap over each other to two-thirds their width, and to form altogether a sort of bracelet, gaiter, (Fig. 134,) buskin, or roller bandage, which extends, both above and below, several fingers' width beyond the limits of the diseased part.

(Fig. 134.)

It is important that these strips should not produce strangulation, and that they should be confined to moderate pressure upon the parts. Instead of being placed naked upon the ulcers, it is often advisable to cover the latter with some thin layers of lint, or compresses, and afterwards to use also a roller bandage, to extend from one extremity of the limb to the other. We renew this dressing every day, or every other day, or even at much longer intervals, according to the nature or abundance of the suppuration. The most general rule is, to renew them every three or four days only. To remove them, they are cut at the point opposite to the wound by means of blunt-pointed scissors, one of the blades of which is insinuated flatwise, and from below upward, between the adhesive bandage and the skin. If the scissors were brought from below downward, their point would encounter the edge of each strip, and might thus render the operation longer.

These strips are in no way intended to approximate the lips or sides of the ulcers; they act at the same time as a cleansing and compressing bandage; the ulcers beneath are cicatrized by the conversion of their cellulo-vascular surface into new tissue, and into cuticular pellicle, much more than by the approximation of their edges. After having removed them, we cleanse off by means of a dry linen the purulent or other matters remaining on the limb. If the skin should appear glossy, elastic, and pale; if the edges of the wound seem firm and of vermilion hue, and exhibit no trace of erythema or excoriation, the bandage will succeed; and it must be applied again. In the contrary case, that is, when erythema, excoriations, separations (*soulevements*) of the epidermis, itching, and an ichorous exudation, are seen under the strips, we should lay them aside at least for some days, and in the mean while substitute for them either simple dressings, or dressings with some kind of topical application. But we must not allow ourselves to be alarmed with the dark color which the suppuration then puts on; for it is the effect of the combination of certain ingredients in the plaster with some of the matters which escape from the diseased surface. We diminish the acridity of these exuding matters, and the tendency of the surfaces to become inflamed, by more frequently renewing the strips, and by washing, before we reapply them, all the surfaces of the wound with some emollient liquid, or a solution of lead-water.

This kind of dressing, which Baynton rarely applied, except to

varicose ulcers of the legs, is fully as efficacious, at least, in a great number of other lesions. Thus I have frequently employed it in chronic pains of the joints, (*arthropathies chroniques.*) In that case, I surround the knee, elbow, wrist, or even instep, with them, as if I was treating an ulcer, and then apply over them the proper paddings, and a moderately compressing bandage. I employ them in the same way in almost all kinds of wounds or ulcers that we cannot, or do not wish to, cicatrize by approximation of their edges. It is, for example, for ulcers denominated syphilitic, which are so frequently developed upon the limbs, the best dressing I am acquainted with, after those ulcers have been previously changed in character by cauterization with the nitrate of mercury, and that the patient has also undergone a suitable mercurial treatment. I have seen an infinite number of patients thus cured in fifteen or twenty days of numerous ulcers which had resisted all sorts of remedies for many years.

Every kind of simple wound, also, which continues for some weeks, and which, in our opinion, requires flat dressings, is generally cured better under a bracelet of adhesive strips than by any other dressing.

There are, also, no phagedenic ulcers, even those of a *cancerous aspect*, which do not often yield to these plasters with promptitude, when the ulcers have been previously cauterized with chemical substances of a certain degree of activity.

[Nothing, according to the judgment of Dr. Mott, can be more proper or true than these eulogiums and directions in regard to the justly celebrated mode of dressing by strips of adhesive plaster of diachylon, which, in the United States, have nearly superseded all other kinds of bandages whatever. The opinion of all practitioners of any experience in this country is in full accordance with these recommendations. At the Seamen's Retreat Hospital I have obtained rapid cures by these dressings, when nothing else had the least effect, especially of those extensive phagedenic, deep-seated, chancre-like ulcerations which are so apt to succeed to syphilitic buboes; and the cure is more certain in fresh young subjects than in old or broken down, worn out mercurio-syphilitic constitutions. These ragged-edged perforations, that go often from two to three inches' depth into the groin, are also far more conveniently reached and controlled, and their borders infinitely better approximated, by these strips than by any other mode. They should cross over each other from the belly down along through the hollow of the groin backward to the breech, and some of them down the thigh, forming altogether a stellated dressing, the centre of which is directly over the ulcer and at the point where the radii converge. They succeed when nothing else will. Also in old chronic mercurio-syphilitic ulcers on the limbs, if not too large; but in these latter, when extensive, and also in those terrific and destructive carcinomatous ulcers which make such havoc in their rapid and deep-seated devastations upon the face, nose, eyes, and now and then on the massive fleshy tissues of the upper part of the thigh and glutei muscles,

where I have seen them near a foot in length and near half a foot deep, where they had nearly quite destroyed the under part of one gluteus and parts of the muscles of the posterior part of the thigh below, a strong and constant application of chloride of lime, or linen cloths wet with it and often renewed during the day, together with tonic treatment internally, I have found to effect a cure that might almost by some be thought marvellous. Dr. Vaché, at the hospital at Bellevue, N. Y., and where among the poor these frightful cases, especially upon the face and in females, are not rare, effected perfect cures by similar constant pledgets of strong solution of sulphate of copper, and a drink of the decoction of the root of our indigenous yellow dock. Even some, in whom it may be said the whole side of the face had been carried away, extirpating with it the eye and half the nose and mouth, were entirely cured. In all cases of ulcers where the adhesive straps can be used, and the cicatrizations do not progress rapidly, we should use at each removal of the dressings a wash of strong chloride of lime mixed freely with rain-water till it has the appearance of diluted milk, as water dissolves too little to depend on the solution. This is cheap for hospitals, and, perhaps, has, in this state of mixture of its grains of powder with the water, and which grains afterwards settle upon the surface of the ulcer, and thus continue their slight escharotic action, more efficacy than the more elegant, and clear, and costly solution of chloride of soda in use in private practice. Good food, and especially the compound sirup of sarsaparilla as a constant drink, must not be neglected in the general treatment. Dr. Mott remarks, that the great benefit of adhesive plasters to old ulcers of the legs is, that they give tone to the limb by their mechanical compression, repress exuberant granulations, and thereby promote cicatrization, and especially diminish the size of the cicatrix, which is not effected by the ordinary modes of treating.—*T.*]

Burns. Wounds produced by bodies preternaturally charged with caloric, in fact burns, do also admirably well with these strips. For a burn of the first degree, an application of strips supported by a bandage slightly compressing, and which may be renewed from the fourth to the eighth day, is quite sufficient. If the burn is of the second degree, that is, with phlyctenæ and without phlegmonous tumefaction, I cause the separated cuticle to be removed, and cleanse off the exuded matters. The strips are then applied, and the cure generally takes place at the end of the second dressing, sometimes of the first, almost always of the third; so that, if it has not been effected by the fourth, this dressing must be abandoned. If there is engorgement and tendency to erysipelas, I commence by combating these symptoms, by means of emollient cataplasms or bleedings, and then apply the strips. If the burn is in the third degree, that is, with alteration or destruction of the surface of the cutis, we proceed as in the preceding case, and the cure is not the less certain; only it exacts from ten to twenty days. When the burn is yet deeper, when it involves the entire thickness of the dermoid tissue, the strips not being enabled to prevent the necessary destruction of

the parts by the elimination of the eschar, are of no use until after the removal of this latter, until, in fact, after the cleansing of the ulcer. In other respects, their application to burns is subject to the same rules as for the treatment of ulcers.

I have applied adhesive strips, also, in the treatment of phlegmon, of inflamed varicose tumors, and certain ganglionous tumors, (*tumeurs ganglionnaires*,) and I am satisfied that we may derive real advantages from them in these cases.

Scrofulous ulcers, whether of the neck or limbs, treated at first by nitrate of mercury, (*nitrate acide de mercure*,) to destroy their burrowings and loose edges, are generally cured better by the use of these strips of adhesive plaster, than by any other dressings. In fact, I have used this kind of dressing with remarkable success for different wounds, or ulcers of the chest and mammary region, whose cicatrization was tardy.

In speaking of bandages for the scrotum, I have mentioned what benefit we may expect to derive from adhesive plasters as a compressing application to the testicle.

Article IV.—Dressing with Cataplasms.

We give the name of cataplasms to the different sorts of paste, pulp, or pap, (*bouillie*,) with which diseased parts are sometimes covered. Cataplasms bear the name of emollients when they are made of flaxseed meal, the soft part of bread, or of the fecula or leaves of mucilaginous plants boiled in plain water, milk, or water of marsh-mallows. They are called astringents if there enters into their composition the powder or decoction of some kind of bark, as that of the oak, Peruvian bark, or gallnut, or the roots of bistorte, tormentilla, &c. They are called excitants when we combine with them ammonia, alcohol, an acid, or some antiscorbutic substance. Maturating cataplasms contain, more especially, leaves of the sorrel, boiled onions, basilican ointment, or honey.

In gangrene, or hospital gangrene, (*pourriture de l'hôpital*,) we sometimes add to emollient cataplasms the slices or juice of lemons. By boiling white soap and barley flour in water, we obtain a liquefying cataplasm. The pulp of certain roots, the carrot, for example, becomes a resolvent cataplasm when boiled in water. Grated, and in the crude state, it forms at the same time a refrigerant and dissolvent cataplasm, in the same way as the pulp of potato applied cold is a calming and resolving cataplasm for a burn. Irritating cataplasms are chiefly made with mustard flour: I shall recur to them in speaking of sinapisms. We obtain narcotic cataplasms by adding the decoction of poppies, nightshade, (*morelle*,) hemlock, (*cigue*,) henbane, (*jusquiame*,) belladonna, or some other preparation of these plants, to ordinary cataplasms. [A very valuable application of this kind, in our country, says Dr. Mott, is the fresh leaves of the stramonium mingled in a common bread and milk poultice, or of themselves after being dipped in hot water.—*T.*] But we may use these plants themselves, after having saturated and softened them by boiling water, and then placing them between two pieces

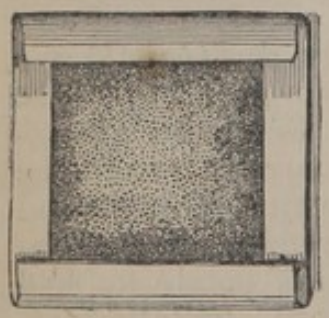
of linen upon the diseased part. It is in this way I often employ the pellitory (*la pariétaire*) upon the hypogastrium, in certain cases of retention of urine. In this manner, also, Mr. North informs me he has often employed the leaves of the tobacco, to assuage pains and certain inflammations complicated with spasm.

In respect to emollient cataplasms, unquestionably the most important of all, I am convinced that none can be compared to those of flaxseed meal; so that the crumb of bread, barley meal, and different feculas, ought not to be used but when that cannot be procured. Boiled and reduced to paste, the flaxseed meal possesses an unctuous, viscid, and soothing quality, which is not found in the others. This cataplasm, also, must not be either so liquid as to spread out into pap, nor so thick that it does not moisten the fingers. In general it is advisable to renew it often, especially in hot seasons, as it rapidly ferments, and then soon acquires irritating properties. Cataplasms are employed in two different ways—bare, or between two pieces of linen. [Dr. Mott always applies poultices bare, and he considers the practice of enclosing them between linen inefficient.—*T.*]

§ I.—*Cataplasms applied bare.*

To apply a cataplasm bare, we place a suitable quantity of the ingredient upon a compress, or a square or oblong piece of linen; after which we raise the edges of the linen upon the naked surface of the paste, which latter is then spread out uniformly by bringing back each edge of the linen towards its fold. We thus obtain a layer of cataplasm encased, as it were, in a compress, (Fig. 135.) It is the uncovered portion of this form of poultice that we place upon the diseased part. If it is intended for wounds, ulcers, or uneven surfaces, whose suppurations we wish to modify, (*modifier*,) it is advisable to cover it with a thin layer or with some flakes of lint, which will prevent the cataplasm from making deposites. In such cases, of course it would be ridiculous to place upon the surface of wounds the perforated linen, plumasseaux, or other dressings, spread with cerate. All such applications, being designed to prevent the linen from adhering to the wound, become perfectly useless under a cataplasm.

(Fig. 135.)



We may make an emollient cataplasm, thus prepared, resolving, by spreading upon its surface, immediately before applying it, a spoonful of extract of lead. In covering it with a spoonful of laudanum, we convert it into a narcotic cataplasm, and in the same way make a sinapism of it by sprinkling it with mustard flour.

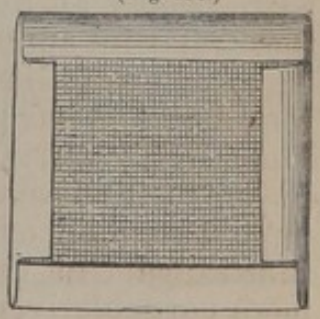
Once in place, the cataplasm should be kept there by means of a large compress, which extends on every side beyond its edges and prevents its running upon the neighboring linen. This compress, crossed and fastened by pins, is often sufficient when the patient can remain quiet. Otherwise we occasionally surround the com-

press itself, with the bandage of Scultetus, the roller bandage, or some of those already described.

§ II.—*Cataplasms between two pieces of Linen.*

When placed bare on the parts, the cataplasm has the disadvantage of escaping, or running out in a state of pap, beyond the limits to which we would wish to restrict it, making a dressing of a very unpleasant and uncleanly kind. On this account, many surgeons are in the habit of enclosing it between two pieces of linen; that is, they spread upon the surface of the paste laid upon the first compress another similar piece of linen, which is to be placed next to the diseased part. This is a modification upon which it is well to have correct notions. The cataplasm does not act only as many persons suppose, merely like compresses saturated with tepid water. Applied bare (or naked) on the skin, or on wounds, it places itself in contact with every indentation, furrow, or unevenness on the cutaneous surface. Its marrowy and pultaceous consistence enables it to adapt itself infinitely better than any kind of linen to the inequalities of the parts; so that, all other things being equal, the naked cataplasm is much better than that placed between two pieces of linen. Nevertheless, there are some regions, like those of the eyes, lips, and face in general, which scarcely permit the employment of the naked cataplasm. As, on the other hand, there are a great number of patients who would be exceedingly annoyed to see their linen or bed soiled by a cataplasm, and others on whose tractableness we cannot rely, we ought, in private practice at least, to know how to enclose a cataplasm between two pieces of linen. We proceed then in the following manner: The cataplasm is first arranged like the preceding; we then cover the surface with a square piece of *lawn*, *tulle*, or *gauze*, (Fig. 136,) or very open *muslin*. These tissues, representing a net-work with large spaces, suffice to restrain the oozings of the paste without in any manner interfering with its action upon the diseased surfaces. If we have neither tulle, lawn, gauze, nor muslin, we should at least make use of linen that is old, or as thin as possible.

(Fig. 136.)



§ III.—*Remarks on the use of Cataplasms.*

Temperature. Cataplasms should be applied hot; that is, at a temperature of from 25 to 30 degrees of Reaumur, [that is, about 90 to 100 of Fahrenheit.] Below this temperature they are chilly and cold, and become easily converted into revulsives, (*répercussifs*,) or resolvents, (*résolutifs*.) Above it, they are excitants, or even rubefacients.

Re-application. Simple cataplasms should be renewed every twelve hours at least, and applied in layers sufficiently thick to remain moist during this lapse of time. Kept on for longer periods,

they might dry and irritate the parts in the manner of hard irregular bodies. In applying a cataplasm, it is well to recollect, that by its weight it tends to run and spread upon descending surfaces; and that it is better, therefore, to apply it from the projecting points to the deep-seated parts, or from the anterior region to the posterior region of the diseased surface, than in the contrary direction.*

Removal. To remove them, it is generally quite sufficient to seize them by their longest border, and then gently and quickly to turn them back by making them roll, as it were, upon an axis to the opposite border. If the folds of linen on the poultice should be adherent in any place, we moisten them with tepid water before detaching them. When the cataplasm is too soft, or adheres to the cutaneous tissue rather than to the compress, we liberate the skin from it by drawing upon it gently with the border of the plaster which is first detached, or by the aid of a spatula. When we have no fear of wetting or softening the parts too much, or when there is to be any advantage gained by cleansing them carefully, we do not reapply the cataplasm until after having bathed them, or left them to soak some minutes in hot water.

Irritating action. Emollient cataplasms frequently occasion a grayish colored puffiness (*boursoufflement grisâtre*) of the ulcerated surfaces; but that does not, in general, prevent the cicatrization from going on: it is even remarkable, that an infinite number of wounds and ulcers cicatrize much better and more rapidly under the use of cataplasms of *flaxseed* meal, than by any other kind of treatment.

[On this subject of *poulticing wounds*, and especially ulcers, we beg leave to refer to a note we have made in the author's preliminary appendix of additional new matter at the commencement of this volume. We must venture to reiterate here our dissent from so respected an authority as Velpeau, and our entire distrust of these relaxant applications in all wounds or ulcers where the primitive acute inflammation has been subdued by proper active remedies, and has passed into that familiarly known atonic condition of the parts, in which, from immemorial time, and consecrated by universal usage, the stimulative or corroborative course, in topical as well as internal medicaments, has been adopted and substituted. In the worn-out constitutions of hospital patients, more particularly, do we see the pernicious results of obstinately protracted emollient poulticing, not only in retarding, but in vitiating the efforts of nature to produce healthy florid granulations. It does, certainly, for the moment, assuage the mere nervous irritation and pains; but in so much exactly as it is the reverse, for example, of the improved and more rational and effective modern modes of

* [This sentence seems at first rather obscure. It is thus—"Qu'il vaut mieux en conséquence le poser des parties saillantes vers les parties profondes, ou de la région antérieure vers la région postérieure du point malade, que dans le sens opposé"—that is, as we understand it, the poultice should be of such variant thickness that it should have a thicker layer of paste where it comes in contact with the deep-seated surfaces of the cavity, and, vice versa, should be proportionably thinner where it rests upon the projecting or prominent parts of the wound.—*T.*]

compressing adhesive plasters, does it increase the difficulties, by augmenting the sensibility and tenderness of the parts, and thus cause debility and retrograde action. Poultices can, under such circumstances, be only temporarily and occasionally applied upon accidental accessions of severe pain, interrupting the opposite and true mode of treatment. Gangrene is one of the frequent consequences of protracted poulticing, an event not uncommon in its application to blisters, burns, &c. Dr. Mott is fully of opinion that continued poulticing of wounds, after the inflammatory symptoms are reduced, greatly diminishes the vitality and tone of the part, retards or vitiates the granulations, and cannot be sustained in practice.—*T.*]

When these *cataplasms* have been a long time on, and *ferment* and become *rancid*, they irritate the skin and the wound, readily produce erysipelas, or at least very frequently cause a sort of *vesicular eruption*, which, though they oblige us to suspend this topical application, are no just cause for alarm.

Cataplasms of plants should generally be placed between two pieces of linen; those of potatoes, carrots, lilies, (*lis*,) onions, apples, &c., require, on the contrary, to be applied bare.

Cataplasms made with *honey*, yolks of eggs, and wine, should be applied in the same manner as those of flaxseed meal. Moreover, almost all special cataplasms should be renewed more frequently than the emollient. For this reason we ought to change, three, four, or five times a day, the opiate cataplasms, those of the pulp of fruits or of roots, the herbaceous, and almost all those of a medicated description.

Article V.—Dressings Saturated with Various Liquids.

Surgical diseases are sometimes dressed with applications saturated with liquids: it is thus, in order to rouse, (*animer*,) excite, and give tone to ulcerated surfaces, we impregnate with aromatic wine, decoction of bark, solution of sal-ammoniac, &c., the lint or pieces of linen with which we wish to cover them. So, also, we saturate with lead-water, brandy, camphorated spirits, or pure water, certain bandages by which we wish to aid resolution. In such cases, we sometimes impregnate the different portions of those bandages before applying, as is generally done, for example, in fractures; in other cases, on the contrary, the bandage is applied first, and afterwards saturated, when in its place.

But there is a mode of saturation in extensive use at present, and which I ought to notice in this place: I mean, dressing with wet compresses as the only application. It is a method which has been adopted, for a long period, by various surgeons in Germany and England, and which I myself have often made use of during the last ten years. In place of covering wounds with linen spread with cerate, or applying gâteaux of lint, compresses, and bandages, we simply place over them a folded compress, which we take care to keep constantly wet, and to change every twenty-four hours.

We dress in this way with advantage those wounds which we are fearful of becoming inflamed; also, the greater part of incipient superficial or sub-cutaneous inflammations. By saturating with cold water the compressing bandages, also, about inflammatory engorgements, we have a powerful resolvent remedy. I have used it with signal success in the treatment of certain fractures, phlegmonous erysipelas, burns, and of various wounds from contused or cutting instruments, the operation of cataract, many amputations, and a crowd of other operations; but if it is true that cold water, employed in this manner during the hot season, is an excellent topical application, it is also true, that in cold weather it is much better to have recourse to tepid water; so also is it true, that the water, whether cold or tepid, almost always wets some region that we would have wished to protect; that it exposes to chills, colds, rheumatisms, inflammations of the chest, and a great number of affections, often more serious than the disease itself. It is also proper to say, that, applied indifferently to all kinds of wounds, it may produce as much evil on the one hand as good on the other. By retarding the circulation, it favors gangrene of the contused or divided tissues; and by deranging the phenomena of inflammation, it frequently vitiates (*dénature*) the suppuration, and rarely admits of immediate adhesion of the lips of the wound. It is, in fine, a kind of dressing useful to be preserved, but not meriting all the eulogiums that have been lavished upon it since Schmucker, and which it has very recently received among ourselves.

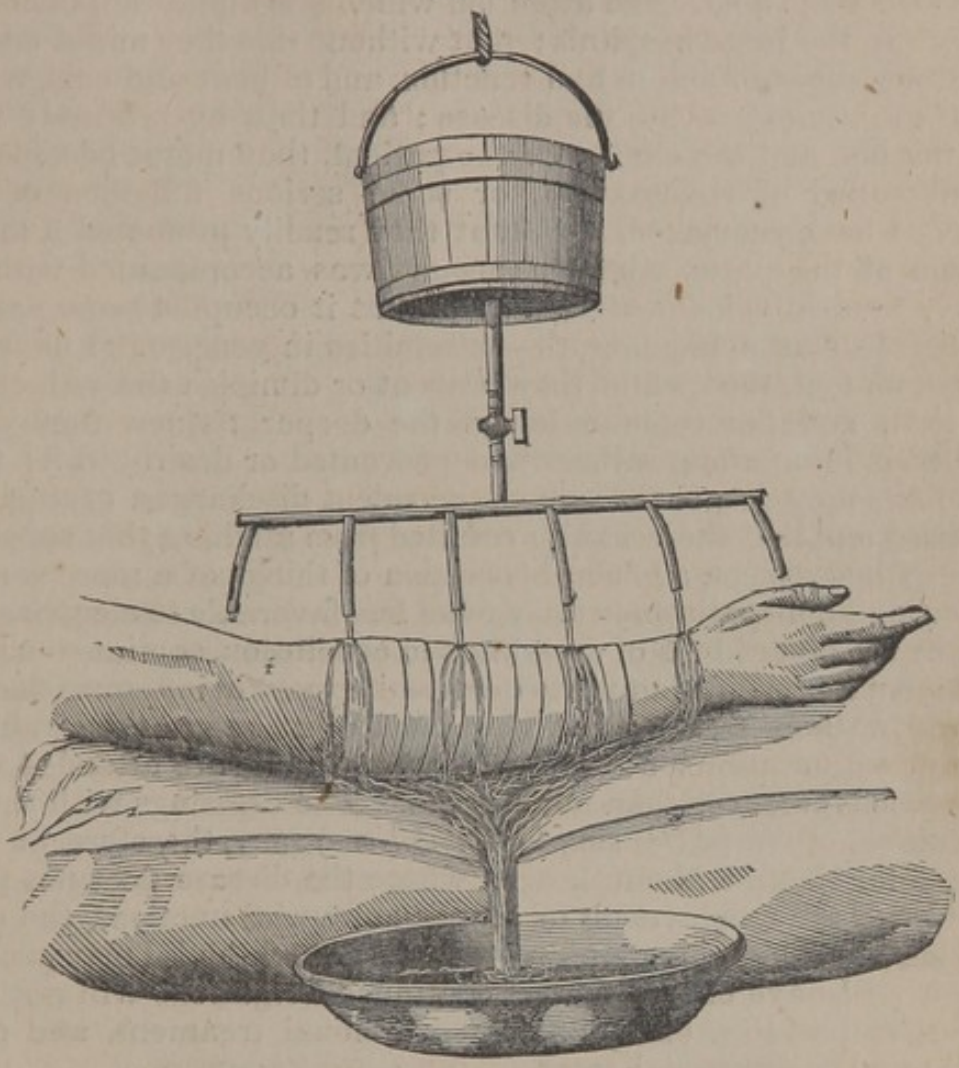
Article VI.—Irrigations.

To render the application of cold wet dressings more uniform and efficacious, *irrigations* have been proposed. The dressing then consists only of some pieces of linen spread over the diseased part, and of gentle currents of water falling incessantly upon the linen, or between the linen and the wound. We use, for that purpose, a vessel, or some sort of reservoir, such as a basin, pail, or small cask, which is suspended either to the bed, or some piece of furniture or fixture in the neighborhood, above the plane which supports the body. A spigot, ending in a certain number of tubes, either of gum elastic or tin, is fixed near the bottom of the vessel; the tube or tubes are prolonged to a level with the diseased part, so as to allow the water contained in the reservoir (Fig. 137) to fall upon it drop by drop, or in a minute stream. If the diseased part is very circumscribed, a single tube suffices. In the contrary case, we increase the number more or less, so as not to leave between them more than three to four inches, in order that the liquid may fall without interruption on the principal inflamed points.

To obtain from this treatment every possible advantage, it is necessary that the irrigation should be constantly kept up; that is to say, that it should not be interrupted and renewed at intervals; that it should be made sometimes drop by drop, and at other times in jets, according to the degree of cold we wish to produce; that

the temperature of the liquid should be sometimes under, sometimes above that of the atmosphere, according as we wish to subdue

(Fig. 137.)



or merely to moderate the inflammation. It is, therefore, an apparatus that we must watch with care, and not permit the reservoir to become entirely empty, and which requires, also, a sufficient degree of docility on the part of the patient.

The *continued irrigations* brought into vogue among us by Josse, of Amiens, (*Mélanges de Chir. Pratique*, etc., 1835,) often since employed under the direction of MM. Bérard, (*Arch. Gén. de Méd.*, 2e série, t. VII., p. 5, et 317,) Breschet, (*Roberty, Thèse*, No. 323, Paris, 1836,) Cloquet, and others, at Paris, (*Gaz. Méd. de Paris*, 1832, p. 576; *Bullet. de Thérap.*, 1834; *Jour. des Conn. Méd. et Chir.*, t. I. et II.; *Thèse de Paris*, 1835–1836,) have also been often made trial of by myself. Josse regards them as the sovereign cure for fractures, complicated luxations, simple and phlegmonous erysipelas, phlegmon, contused wounds, and for all sorts of general wounds that may be complicated with serious inflammation. M. Bérard, junior, and M. Bérard, sen., have extended these applications to many diseases of the articulations, and especially to certain kinds of white swellings, (*tu-*

meurs blanches.) For my own part, I have but little confidence in their efficacy. I have seen from the beginning, and I have often so stated in my lectures, that to make them really effective, the incessant irrigations exacted a care and attention which it is almost impossible to procure in the large hospitals; that without this they might endanger alternations of action and reaction, and of heat and cold, which might greatly aggravate the disease; and that, by profusely wetting the bed and the clothes of the patient, they might become the actual cause of rheumatism, or some serious affection of the chest. I have remarked, also, that they readily promoted a mortification of the parts, when the wound was accompanied with extensive separations, (*décollements,*) or that it occupied some part of the fingers or the hand, or the extremities in general. I have observed, in fact, that while they prevent or diminish the redness of the skin, and the tumefaction of the deeper tissues, they often masked inflammation, rather than prevented or destroyed it; that, therefore, they do not prevent the purulent discharges, (*fusées purulentes,*) and that there finally resulted from all this a thin suppuration of a bad aspect, a general condition of things of a more serious nature, and a disposition in the wound less favorable to cicatrization than by the other kinds of dressing. In conclusion, continued irrigations have not seemed to me to be useful, except in inflammations of the skin, or those that were sub-cutaneous, and before the establishment of suppuration; after this first period they are attended with more inconveniences than advantages. The dressings with simple saturations of water (*les simples imbibitions*) may, therefore, be substituted for them, without danger, where the disease does not seem to allow of the employment of strong mercurial unctions, the compressing bandage, or large temporary blisters. I think I may predict, from what I have observed, that continued irrigations will not long remain in practice, except as an occasional treament, and for a small number of special cases.

In short, it is a system of treatment whose origin goes back to an early period. I have seen in many treatises on popular medicine, I have learned in my youth from common people, and I have myself noted, that streams of common water constitute a treatment for certain inflammations, and especially for ulcers of the legs. It is thus that, for an affection of this kind, I went, when fifteen years of age, to receive upon my leg, for the space of near six weeks, and from two to four hours a day, the water which turned the wheel of a mill; and it is thus that the peasants of my native village were in the habit of holding their limbs under the rapid streams of running water.

[The practice of saturating light dressings of linen with continued imbibition of cool water, is, nevertheless, on the same principle as cold ablutions to the whole surface in the highly ardent and violent fevers of hot climates, of eminent practical efficacy, also, in such latitudes, in all local inflammations, bruises, sprains, &c., after the reduction of the more acute symptoms by bleeding, &c. In the continued elevated temperature of intertropical regions,

and the consequent rapid tendency to putrefaction, we have a powerful counteracting antiseptic remedy in this application, preferable, under all circumstances of constitution, disease, climate, or season, to the shock and revulsions which may be caused by continued irrigations, which cannot be regulated. In addition to cold water dressings, the additional impregnation, with diluted alcohol, (*aguardiente* of the country,) soon becomes necessary and most efficient, the moment the second stage is arrived. So also the chloride lotions. In cold climates and seasons, the cold wet dressings are generally to be avoided under any form.—*T.*]

Article VII.—Application of Hot Air.

M. J. Guyot, a very ingenious young physician, of extensive scientific attainments, proposed some years ago a mode of dressing altogether opposite to the preceding. M. Jules Guyot, in fact, wishes that wounds, or solutions of continuity in general, should remain dry, and under a temperature of 25 to 40 degrees Reaumur, (i. e. 88° to 122° Fahrenheit.) For that purpose, he encloses the wound or diseased part in a sort of box, which is hermetically sealed, and the air of which is kept at the proper degree of temperature by means of a tube and a lamp. To fulfil the intentions of M. Guyot, the temperature of this species of stove, in which the wound is confined, must always be nearly the same, and generally a little more elevated than the natural temperature of the body. Some trials of this dressing have been made in my department in the hospital of La Charité; but they have neither been sufficiently numerous nor varied to allow of my making an exact appreciation of their value. I fear only, from what I have seen, that the efficacy of such a treatment may not be in proportion to the irritation it occasions, the attention it exacts, and the expense it would involve.

Article VIII.—Application of Liniments.

Dressing with liniments is so simple, that we almost always leave it to the patients themselves, or the persons charged with taking care of them. We mean by this term, a liquid topical application, which has oil for its vehicle, and certain active medicated substances for its curative ingredients. It is in this manner we make liniments of olive oil, oil of sweet almonds, (*amande douce*,) &c., to which we sometimes add camphor, or ammonia, or preparations of opium, phosphorus, soap, ether, extract of belladonna, henbane, &c. &c. Certain compounds, in which there enters no oil, have also taken the name of liniments. It is on this account that the mixture of the ointment of mallows, (*althea*,) of camphor, and of laudanum of Sydenham, and the solution of a certain quantity of camphor or ammonia in yolk of eggs, are prescribed under the title of liniment, though oil may be excluded from it.

Liniments are applied as unctions or frictions, twice or thrice a day. We saturate with them a piece of flannel or woollen stuff, which serves for rubbing the part gently, and which it is often use-

ful to leave upon it in the interval from one application to another. Sometimes we merely spread them on the diseased part with the fingers, such liniments, for example, as do not contain oil. We afterwards apply over the part a soft piece of linen, or a piece of flannel, or blotting-paper.

Article IX.—Employment of Embrocations.

Embrocations differ but slightly from liniments. They consist of applications of different kinds of oils impregnated with certain medicinal substances, and which are rubbed upon the skin, and retained there by means of pieces of linen or some other stuff. Thus, the application of a piece of flannel, saturated with camphorated oil of chamomile or any other oil, and placed on the abdomen, bears the name of embrocation. It is the same with oily unctions that are applied to the face, breasts, or any other region of the body, where we desire to renew them often. In fact, embrocations which are scarcely other than liniments on a large scale, might, strictly speaking, be made to include, also, certain applications of alcohol or ether, employed upon the surface of the body.

Article X.—Fomentations.

When we wish to heat a part, or to keep it in a moderate, uniform degree of temperature, by means of substances charged with caloric, we make use of fomentations. [The smoothing-iron, tin boxes filled with hot water, or a brick previously heated and wrapped in linen cloths, and then placed near the limb, serve also for convenient modes of fomentation.—*T.*] The same applies to bottles of hot water, flannels, napkins, and every other piece of linen that we heat and afterwards apply upon the trunk or limbs. It is, therefore, a kind of dressing that we assign to the nurses, or to the patients themselves. Nevertheless, there are also wet fomentations, that consist of pieces of linen or other stuff saturated with simple or medicated liquid, and which are sometimes used instead of poultices. These liquids, which are sometimes of plain water, and at other times of emollient, tonic, astringent, resolving, irritating, narcotic, or other decoction or infusion, are employed tepid, or even a little hot, and serve as applications, which differ so little from ordinary wet dressings as to make it unnecessary to dwell longer upon them here.

Article XI.—Lotions.

Lotions form distinct applications in themselves, or constitute a part of several kinds of dressings. It is in this way we employ liquids upon the surface. We thus bathe (*lotionner*) or wash, several times a day, the surface of diseased eyes, with collyria of laudanum, belladonna, lead, &c. In the same way, we wash most wounds and injuries, and even inflamed surfaces, either with tepid

water, lead-water, or some medicated liquid, every time we uncover them, before renewing the dressing. It is important, in applying lotions, not to be too particular in removing the plastic matters, which are apt to become adherent upon the bottom or towards the circumference of the wound, and to be careful only in cleansing its surfaces from irritating matters that may be attached to it.

Article XII.—Gargles.

Those liquids, simple or medicated, which we use to wash out the *pharynx*, and also the mouth, are prescribed under the name of gargles. A gargle is generally composed of from four to six ounces of liquid, and the patient should make use of it from four to six or eight times a day, in order to consume, in the space of twenty-four hours, the quantity of liquid which I have just mentioned. The patient first fills his mouth with it; then, by throwing the head backward, he forces the liquid to pass into the pharynx, while, by a series of moderate and alternate efforts, (*par saccade*,) he drives out the air which a long inspiration had accumulated in the lungs. This expiration, preventing the liquid from descending, forces it forward by slight movements, producing a certain sound, which characterizes this particular kind of lotion to parts. Gargling is combined, often, with what might be called a *snuffing* up, (*reniflement*,) or washing out of the nostrils. Liquids employed as lotions or gargles, may be snuffed up, and thus carried through the nasal passages to the pharynx, and voided by the mouth; in the same way as when introduced by the mouth into the pharynx, they may be forced up and ejected outwardly through the nostrils.

Article XIII.—Collutories, (*Collutoires.*)

Collutories are applications of a liquid, or sirup-like consistence, principally intended for diseases of the mouth, or pharynx; that is, medicinal substances that are applied by means of a pencil of lint, linen, or sponge, to the different ulcerated or inflamed regions of the mucous membrane lining the bucco-pharyngeal passages. The substances used for gargling, snuffing up, and for collutories, are almost always employed cold; they are, in fact, lotions, fomentations, or washes of the nasal, pharyngeal, and buccal cavities.

Article XIV.—Fumigations.

The employment of fumigations is made in a great variety of ways, both as to the nature of the substances used, and the manner of applying them to the parts. Sometimes the fumigation is composed only of the vapor of water, or this impregnated with sulphur or any other medicinal substance. At other times, however, the fumigation takes, more particularly, the name of vapor bath. We have thus fumigations of various kinds—aqueous, sulphurous, mercurial, &c. &c.

Fumigations to the nose are composed of water, milk, or the decoction of different plants. To effect this, it is only necessary to cover the vessel which holds the ingredients that are boiling, by means of a large pasteboard horn, (*cornet de carton*,) and to keep the point or apex of this horn in the opening of the nostrils, taking care to change it alternately from one nostril to the other. By placing the beak of the horn in the mouth, opposite one of the eyes, or any other given point upon the face, in the place of directing it towards the nose, we have a fumigation for the mouth, pharynx, eye, forehead, cheek bone, &c. If it is unnecessary to direct the vapor precisely upon one point of the face more than another, we have no occasion for the horn; the patient has only to cover himself with a sheet or any large piece of linen that may enclose him and the heated liquid as it were both in one chamber. He inclines his face towards the vessel from whence the vapor is exhaling, and in this manner receives the fumigation.

If the fumigation is to be made with liquids, decoctions, infusions, &c., we may either remove the vessel from the fire, and inhale its vapor while cooling, or keep it at a sufficiently elevated temperature, either upon a chafing-dish or a furnace. If we are fearful about the respiration in covering the head as I have just indicated, the fumigation may be made in the open air, prolonging it to a somewhat longer period. Certain kinds of fumigations, as those that are composed of vinegar, camphor, benzoin, cinnabar, dried plants, or powders in general, as belladonna, henbane, tobacco, &c., are made by sprinkling some of those substances upon a chafing-dish of burning charcoal, or upon a strongly heated piece of metal, a fire-shovel, (*pelle à feu*,) for example. Cinnabar, often employed formerly in venereal affections of the scrotum or anus, was first placed upon coals, and its smoke then conducted upon the diseased part, by means of a pasteboard funnel, (*entonnoir en carton*.) Vinegar thrown upon the fire, or a hot shovel, escapes in the form of vapor, which it is easy to direct in the same way.

We obtain fumigations of the dried leaves of plants by smoking them in the manner of tobacco. We have thus, at the present time, prescriptions of cigars of belladonna, henbane, digitalis, &c., in various diseases of the chest.

(Fig. 138.)

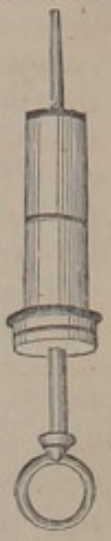
Article XV.—Injections.

The term injection is applied to the washing of certain deep-seated regions. It comprises all liquids which we are obliged to force with a syringe into the interior of certain canals, or the bottom of certain cavities. Strictly speaking, the term injection is synonymous with a liquid thrown by a syringe.

Injections for the ear are made with a small syringe terminated in an olive-shaped form, (Fig. 138.) Those of the lachrymal ducts require Anel's syringe, of which we shall speak under the article *fistula lachrymalis*, (*Atlas*, pl. VIII., figs. 9 and 10.)

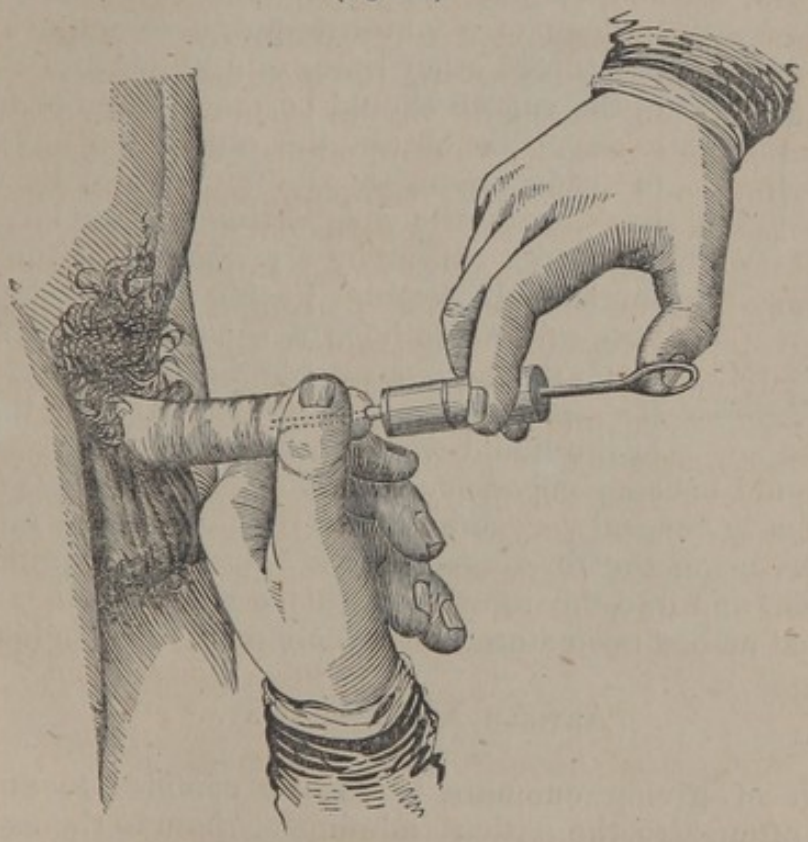
To inject between the lids and eye, it is better to use a small syphon syringe, slightly conical in shape, like the *urethral syringe*, (Fig. 139.) For the mouth and nose, if we wish to inject copiously, we have need, sometimes, of a syringe of larger size. The same remark applies to abscesses, and fistulous passages in all the regions of the body. If the cavity to be washed is very large, we have recourse to an enema syringe.

(Fig. 139.)



Injections of the urethra are made with syringes to contain about an ounce of liquid, (Fig. 140 ;) the syphon portion is introduced completely into the canal, which latter is held so that it closely embraces the instrument, while with the other hand the piston is forced upon the liquid, (Fig. 140.) It is important that the finger making the compression should not go beyond the point of the syringe, and that the injection thus forced in should be retained a minute or two in its place, or, if it is not of a very active nature, that it be

(Fig. 140.)

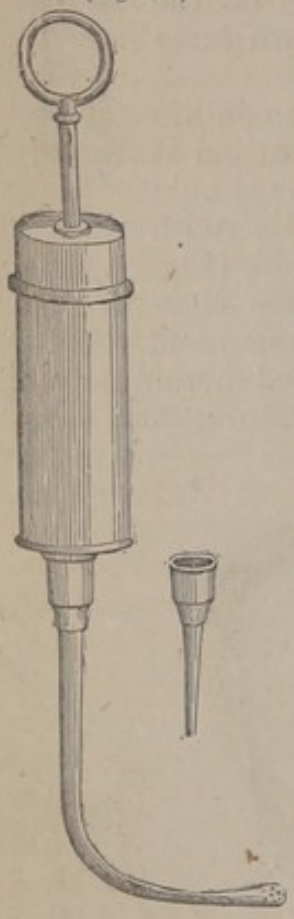


repeated two or three times at each sitting. The tendency of these injections is rarely to penetrate into the bladder. Supposing, however, that there may be something to apprehend in this respect, we should prevent it by supporting the perinæum upon the angle of a chair, or a hard pelote, during the whole period of the operation, or by causing some one to make pressure on this region with the finger.

Injections into the bladder could readily be made with the same syringe, which should be filled several times ; but it is decidedly

preferable to use one of greater dimensions. We begin, then, by introducing a catheter, (*sonde*,) to which we afterwards adapt the syphon of the syringe. Nevertheless, this syringe, applied as for injections of the urethra, or simply prolonged by a canula of gum-elastic to beyond the fossa navicularis, will succeed nearly as well.

(Fig. 141.)



Injections of the Vagina. Diseases of the vagina and uterus often require the use of injections. The syringe used in such cases contains from four to six ounces, and is known under the name of the *toilette syringe*, (*seringue de toilette*—Fig. 141.) This instrument is a straight syphon, like the hydrocele syringe, if the injection is to be made by any other person than the patient. On the contrary, this syphon must be bent in the form of an arc, or almost at a right angle, if the female herself is to be charged with the operation. This syphon, which may be terminated by an olive-shaped extremity, perforated in its top in the manner of a watering-pot, is sometimes made of pewter, at other times of gum-elastic. Injections of the vagina should be made three or four times a day. To obtain the object we have in view in using them, the female should lie upon her back, with the epigastrium somewhat lowered, the nates raised by a cushion, and the legs and thighs half flexed. In this position she makes a first, and sometimes a second injection, in order to wash the parts. She holds the next injection for some minutes, to prolong a little the contact of the liquid with the diseased parts.

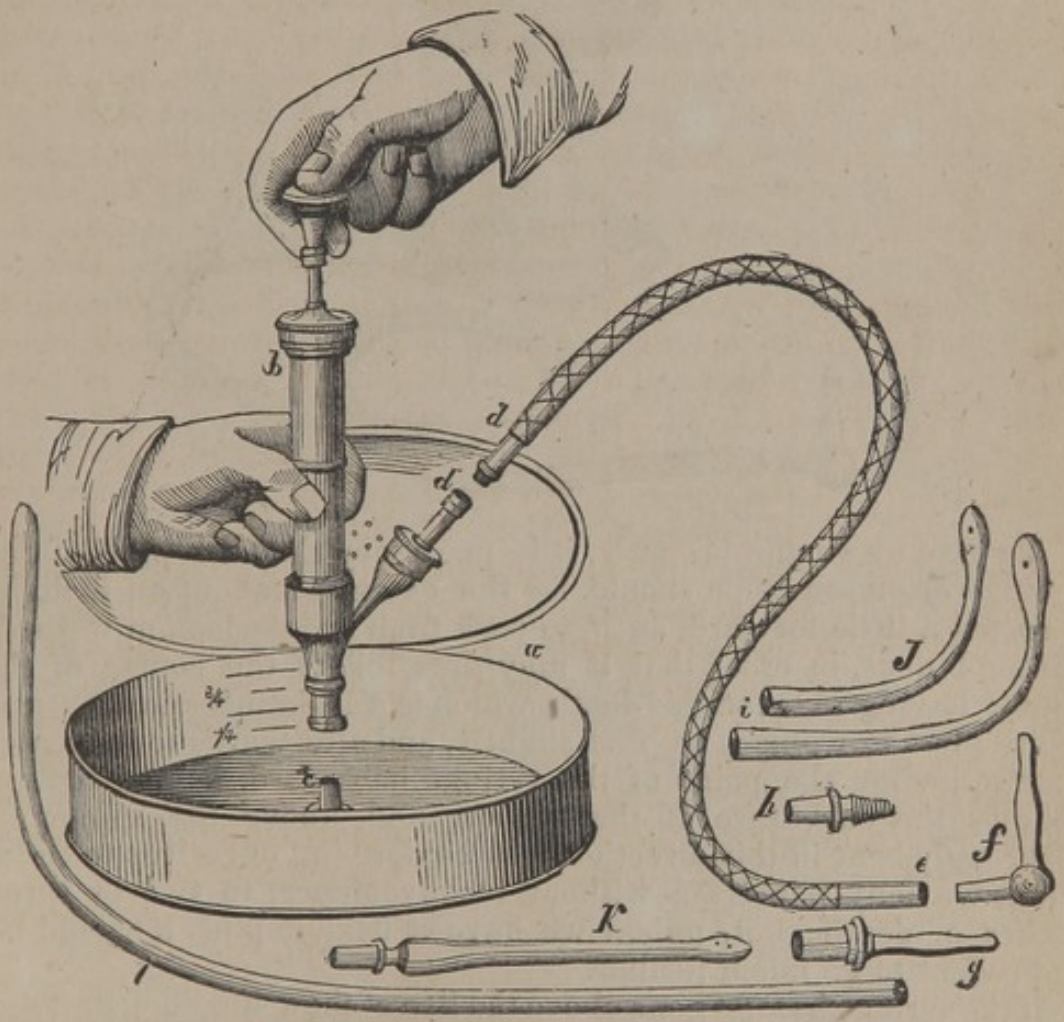
If it should become necessary to make injections *into the womb*, which is not in general very difficult, we should begin by introducing a catheter, using the forefinger of one hand for our guide, as far as the neck, and into the interior of this organ; in other respects, we proceed as has been stated for injections of the bladder.

Article XVI.—Enemata.

The art of giving enemata is usually confided to nurses and invalids; often, also, the patients administer them to themselves. It is, however, an operation of much delicacy, and one which may become dangerous, if not guarded by proper precautions. It is necessary, therefore, that the student or surgeon should know at least how to point out its rules and direct its performance. The syringe we use to give a clyster, is generally of the capacity of a pint; if we fill it entirely, the enema is complete. It is in this way it should be given when we desire to encourage the stools. If, on the contrary, we wish to deposite in the rectum emollient or medicated liquids, in the character of topical applications, or *internal*

baths, we fill it only one half. When we wish certain liquids or substances to be absorbed, it is not proper to inject more than a quarter of the syringe. These quarter portions of an enema, impregnated with narcotic substances, camphor, cinchona, cubebs, or balsam of copaiva, form a bulk of sufficiently small volume not to distend the intestine, but to permit the patient to retain and absorb it as if he had taken it by the mouth. The syphon of the syringe, in such cases, is, as in the injection syringes, ordinarily conical, or it is cylindrical and straight where the clyster is to be given by another person. When we wish to make the injection go far up, we adapt to

(Fig. 142.)



it a tube of gum-elastic, and the syphon should be curved like the vagina syringes if we wish the injection to be given by the patients themselves. Then the patient passes the instrument from before backward, between his thighs, so as to make its beak enter the anus; pressing afterwards on the piston, he gently forces the liquid forward with as much facility as a nurse placed behind with a straight syringe would do it.

The instruments termed *clysoirs* and *clyso-pompes*, invented in our times as substitutes for syringes, are a kind of forcing-pump, (*pompes foulantes*—Fig. 142,) provided with a reservoir, and with flexible

tubes, (*conduits*—Fig. 143,) also with a beak or a syphon that allows the patient to give himself any kind of injection into the rectum, and to introduce with facility the different kinds of enemata or clysters.

(Fig. 143.)

To give an enema properly, it is necessary that the pipe of the syringe or clyso-pompe should, for the extent of about an inch, be directed a little forward, as if to pass from the perinæum towards the umbilicus, in order that it may thus follow the course of the anus; having reached this depth, which is a little more in man, and a little less in woman, we first slightly, and afterwards to a greater extent, incline the point of the syringe backward, as the rectum follows the curvature of the sacrum, and, above the sphincter, is strongly bent in this direction. In conforming ourselves to these rules, we may penetrate without inconvenience, to two or three inches of depth; but, unless we have a flexible pipe, it would be imprudent to go much further.

If the syringe has not gone above the line of the sphincters, its point almost always buts (*arc-boute*) against the bas-fond of the bladder, or the posterior wall of the vagina, and the liquid comes out in proportion to the distance the instrument has gone in, or it stops, and does not enter at all. The same resistance is met with higher up, if the pipe has not been properly inclined backward, or if it is caught in any way in the folds of the intestine. It is then that a serious accident may happen. If, in fact, in order to overcome this unlooked for resistance, we push upon the syringe, there may result from it an abrasion, chafing, (*éraillure*,) or even a perforation of the vagina, of the posterior part of the intestine, or the perinæum. These kinds of lacerations seem to be possible, also, by the action even of the

liquid itself, forcibly driven into the syringe which has been thus obstructed or imprisoned, (*enchevêtrée.*) We must not, therefore, suppose that a danger of this kind is merely hypothetical; there have already happened eight instances within my own knowledge, four of which occurred in the hospitals of Paris, and four in the city. The patients in these cases experience, suddenly, a violent pain, sometimes immediately followed by syncope, and soon after by nervous symptoms more or less alarming; there afterwards take place vomitings, and all the symptoms of a violent peritonitis, or extensive inflammation of the pelvic cellular tissue. If, under these last mentioned circumstances, the patients survive, a gangrenous suppuration soon takes place about the rectum, showing itself near the margin of the anus or perinæum, and rendering it necessary to make numerous incisions that again place in jeopardy the life of the patient. It is in this way that six of the cases I have just enumerated perished, among whom was a young lady who had herself administered the enema with a clyster pipe. Of the two cases that survived, one has an enormous cavity in the interior of the pelvis, which has never yet entirely ceased to suppurate; the latter, a lady, aged about forty years, and mother of a distinguished in-door pupil of the hospitals of Paris, did not recover until after having undergone very serious difficulties, and submitted to nearly a year's course of treatment. [Dr. Mott has seen one case only, in all his practice, and that was in New York. The entire mucous coat of the rectum sloughed off.—*T.*]

Article XVII.—Douches.

The *douche* is a kind of injection which sometimes has also the character of an enema: we mean by this word the projection of a liquid, or gas, upon the body of an individual at a certain distance from the reservoir. There are ascending and descending douches. We give the name of descending douches to those which are made from an elevated place, and that of ascending to those that are made from below upwards, upon the anus, for example, with the view of overcoming certain obstinate constipations, or into the vagina, to act upon the neck of the womb. In the douche, the liquid sometimes falls in drops, sometimes in a minute stream, (*par filet,*) at other times in a jet, or like a shower of rain, or in rays as through a watering-pot. In short, these different kinds of douches are made from a point more or less elevated or with a greater or less degree of propulsion. To make the descending douches ascending, we have only to prolong the tube or canal, which is connected with the reservoir, and curve it from below upward in a bathing tub, or some other vessel, at some distance under the perinæum; the cock being open, then allows the water to yield to the pressure which acts upon it, and to be thrown upon the diseased part.

The vapor douches, chiefly employed in diseases of the skin, are either dry or wet. The dry douches are made with heated atmospheric air, but they are but little used. The wet douches, which are made with the vapor of pure water, sulphurous, aromatic, and

other vapors, are applied by means of a long pipe, which may be made to act in any direction upon different parts of the body. So, also, is it easy to direct vapor douches upon the eye, ear, nose, mouth, or any other region of the body. We may have an exact idea of the manner of applying the douche, by recalling to mind what firemen do in extinguishing fires, or gardeners in sprinkling public places or gardens.

Douches resemble, it is true, to a certain extent, irrigations and injections; but they differ from them in this, that their object is to excite the parts by the repeated shocks of the liquid, so that the liquids should be propelled from a greater height, or with greater force, as they are intended to produce a shock rather than a change of temperature, or mere washing of the parts; while the effect of irrigations is to moisten or cool the parts.

Article XVIII.—Baths.

By baths, we generally understand the substances into the midst of which we plunge the whole body, or some part of it, so as to act upon its surface or temperature. We have thus hot, cool, and cold baths; baths of water, vapor, sand, or ashes. A bath is called general, when we plunge the whole body into it up to the neck. The duration of these baths continues from half an hour to an hour, or an hour and a half.

In foot-baths, the limbs ought to be plunged into the liquid to a level at least with the ankles or the calves. Such are called *pediluvia*, and consist sometimes of hot water only, which is occasionally made stimulating by adding thereto a handful of mustard flour, or salt, with a glass of vinegar, and they are to be continued from ten to twenty minutes. [A far more effective bath of this kind, and of infinite value in practice as a powerful counter-irritant, is the addition to the pediluvium of half a pound or a pound of cayenne pepper.—*T.*]

The *hand-baths*, (*manuluves*,) are prepared precisely in the same way.

The ordinary temperature of a bath is from 26 to 29 degrees of Reaumur, (*i. e.*, 90° to 98° Fahrenheit;) some persons bear it very well to 30 degrees, (100° F.,) and even to 31 degrees, (102° F.,) while others find it sufficiently hot at 26 degrees, (90° F.) In general, a bath becomes exciting, and even rubefacient, (*rubéfiant*,) beyond 30 degrees, (100° F.,) as it has the character of a cool bath from 18 to 25 (72 to 88° F.) degrees, and a cold bath under 15 degrees, (66° F.)

Liquid, like vapor baths, are distinguished into simple and medicated. The first consist of pure water, the others of water containing gelatine, if we wish to render them nutritive, or some aromatic ingredient, or sulphur, mercury, the alkalies, &c. It is important in giving a bath, that the patient should not be in too small an apartment, that he should not have eaten for the last two hours, and that, from the beginning to the end, he be not exposed to the slightest current of air. It is also necessary, if the chamber

be small, that the air penetrate freely into it; without that, the rarefaction of the atmosphere by the aqueous vapor would soon fatigue the respiration, and might occasion syncope. It is well to be enabled to have it in our power, from time to time, to introduce into the bathing tub, while the patient is in it, hot or cold water, that the liquid may be kept at the same temperature from the commencement to the end of the bath.

Dry baths, such as those that may be made with sand, ashes, and bran, and which were formerly used in the treatment of dropsies, and to restore the circulation to parts threatened with gangrene, are scarcely any longer employed at present. The only trace of them which remains among us, is the satchels, (*sachets*,) or sort of cushions, analogous to fracture cushions, which, after being filled with hot bran, ashes, or sand, some practitioners still place around limbs in which the principal arteries have been tied. Though it may have been right to reject baths of dung and other substances, whose use has become repugnant because of their filth, it is not so, perhaps, to have laid aside dry baths in dropsy, and infiltrations which do not depend upon the manifest lesion of any viscus.

In fact, we procure by these dry baths, still better than by insolation, an absorption of the serous fluids, (*des liquides blancs*,) and a desiccation of parts that are engorged, which we can obtain by no other medication, internal or external.

Article XIX.—Precautions required in Dressing.

When we are about to apply a dressing to any wound whatever, it is useful to ask ourselves what are the rules that ought to be followed to make it as advantageous as possible. To say that the surgeon ought to place himself in a convenient position, that the part should be properly cleansed, that the pieces of the dressing should be laid on gently, applied with delicacy, and in a manner to sooth rather than to fatigue the patient, and that the wound should be placed in a suitable situation after the dressing, is to teach nothing to the pupil, for these are the suggestions of natural good sense, that have no need of being particularized. But the surgeon ought to know to what point he should protect wounds from the action of air, cold, or heat; to what extent they may be cleansed of the blood or other matters that may cover them; how we are to proceed with the first dressing, and with those that follow; the advantages or inconveniences of frequent or procrastinated dressings, of those that may be removed, or of those that are to be immoveable.

§ I.—*Action of Air.*

Many surgeons in former times were under the persuasion that wounds should be exposed as little as possible to the action of the external air; they therefore recommended the patient to be surrounded with bed-curtains; to have prepared beforehand all the pieces and articles which there might be any occasion for; and when the wound presented a large surface, to cover successively

the different parts of it with the new dressing, in proportion as the old one was removed; some went so far as to recommend holding different kinds of chafing-dishes, or other means of propagating heat, around the patient, to protect him from the possibility of becoming in any way chilled, and to remove all apprehension of change of temperature during the whole course of the dressing. The action of the air appeared to them dangerous, both because of the irritating properties which they imputed to this fluid, and of the emanations of which it might be the vehicle. It is not without surprise that I have seen these ancient errors revived in our own days, and sanctioned by the name of Dupuytren. Atmospheric air is so far from being injurious by its momentary contact with traumatic surfaces, that many surgeons still ask the question, if wounds do not heal much better in the open air than by the most methodically adjusted dressings. It is at least certain that animals get well very rapidly of their wounds, though they remain from the beginning to the end in contact with the atmosphere. The precautions, then, that are recommended on this head, are utterly useless. To uncover any wound or ulcer, to cleanse any injury whatever, to free it of the portions of the dressing that enveloped it, cannot, in the whole, require more than a quarter or half an hour. But the atmosphere is incapable, in this space of time, of producing, in its character of gas, the least serious accident. Consequently, in these matters we should confine ourselves to avoiding currents of air, and sudden reductions of temperature, (*les refroidissemens brusques*,) and throw a piece of linen over the uncovered wound, if from any cause whatever we should be prevented from immediately finishing the dressing.

The despatch recommended by authors could be of no utility, except there should be prevailing in the wards or apartments where the patient was, some contagious or miasmatic disease, susceptible of being communicated through the suppurating surfaces. It is, however, not the less true, that, to perform a dressing well, a surgeon should take care to have prepared and arranged beforehand, in proper order, all the articles which he supposes he shall have occasion to make use of.

§ II.—*Treatment of the Wound at the First Dressing.*

The first dressing of wounds presents different varieties, according as it is to unite by first intention, or that we dress to obtain secondary cicatrization.

Union by the First Intention. In the first case it is indispensable that the blood should be effectually arrested, and all the clots carefully removed; that no blood whatever any longer exudes from the surface of the wound. To arrive even with more certainty at this result, Parish in America, and also a great number of surgeons in England and Germany, and Dupuytren in France, have established a precept not to dress recent wounds, but after the lapse of some hours; but this method, which is advantageous in certain instances,

is fraught with so many inconveniences in others, that it cannot be adopted without much qualification.

As we are obliged to use adhesive plasters to obtain immediate union, it is necessary, after having removed the blood by means of washing, to sponge and carefully wipe the edges of the wound, and the whole cutaneous surface in the neighborhood, with a napkin or some dry pieces of linen. We then attend to the ligatures, which, after one of their threads is cut near the knot, must be brought forward and collected near the lower angle of the wound, or placed separately in a right line upon the point nearest to the knot. After having turned them back, we fasten them upon the skin by means of a piece of adhesive plaster placed crosswise. This is much better than enclosing them in a small piece of linen by themselves, or by a ligature compress, or fastening them permanently under the turns of a containing bandage. In this kind of dressing we proceed thus: first, the adhesive straps; secondly, the perforated linen; afterwards, the lint; then the compresses; and finally, the bandage. [Dr. Mott approves very highly of leaving many wounds exposed for some time, even for the space of an hour or more, especially where there is an oozing of blood, or apprehension of much hemorrhage. It is therefore better, also, in such cases, to leave such wounds undressed for many hours, and when we do dress them, to dress them loose and with lint, and allow them to suppurate, and not hope for first intention. Much is thus saved, by avoiding consecutive hemorrhage, removal of dressings, &c.—*T.*]

Union by the Second Intention. When we are not to unite immediately, there is no need of cleansing and of completely washing out the wound, or of so carefully drying the skin in the neighborhood. In the place of retaining also one of the halves of each ligature, we may cut both at the distance of some lines from the knot. This being done, we apply upon the whole wounded surface small balls of lint, naked if we wish, to guard against any bloody exudation, but upon a plain or perforated piece of linen spread with cerate, if the case is one of an opposite nature. When the wound is not very deep, we substitute for the balls of lint one or more plumasseaux. In any case, it must be remembered that the balls themselves are to be covered with plumasseaux, and that, setting out from this point, the dressing does not differ from the preceding. The application of the adhesive plasters and the bandages at the first dressing, should be made in such manner as not to interfere with the tumefaction, which must inevitably take place in the course of the first two or three days.

§ III.—*Removal of the First Dressing.*

The *removal of the first dressing*, generally creates much apprehension in the patient. The fears of patients on this head, are explained by recalling to mind, that even up to the commencement of the present century, almost all wounds, stuffed with lint or sponge and dressed naked, were uncovered on the day after the first

dressing, or upon the day following. Then, in truth, the first dressing was rendered excessively painful. Now, it is not perceptibly more painful than the others. Not taking place until after the lapse of three or four days, it has been anticipated by the suppuration, and by the saturation of the under portions of the dressing. The perforated linen, which rests bare upon the wound, being spread with cerate, is raised and separated without the necessity of the least degree of painful traction; if there are balls of lint and sponge, we do not detach them until they have been insulated by the pus. This method, already extolled by Magati, is, at the present time, that of all good practitioners. It has, nevertheless, been the object of some recent attacks, and rejected as injurious by a surgeon of the hospitals of Paris, who, returning to the routine of the ancients and that of nurses, recommends that after great operations the dressing should be renewed upon the second day. He has, without doubt, inadvertently imagined, that by this course he could guard against the purulent discharges, (*les fusées purulentes,*) erysipelas, and other inflammations, whereas it would be the best means of favoring them, for it is only after the third or fourth day generally, that such accidents show themselves.

This period of three or four days, however, necessarily has many exceptions. For example, if the part was in too great pain, and if the wound seemed to cause too violent a reaction, we should uncover it in the first twenty-four hours, or at least before the end of the third day, taking care, however, unless there should be some special indications to the contrary, to remove only the portions of the dressing that were either too hard or improperly placed, and to leave untouched the deepest seated portions. In other cases, in cold seasons, for example, or in treating regions or tissues where suppuration goes on tardily, and where we wish to obtain a free and immediate union, (*une réunion franchement immédiate,*) we may wait even to five or six days. At the end of this time, we must, in general, saturate all the dressing with tepid water; but the bandages, compresses, and sometimes even the lint itself, are then sometimes so strongly glued together, or indurated by the blood, that the water softens them with difficulty. In this case, we must soak them at least for half an hour beforehand, or detach them piece by piece, until we reach the edges of the perforated linen. This being clothed with cerate, allows of being separated and removed with all the pieces it supports, without drawing any upon the wound.

§ IV.—*Hours for Dressing.*

The hour selected for dressing is generally in the morning; this arises from a practice dictated by the occupations of every one, and from the time that has elapsed since the period at which we were enabled to make the last dressing to the wound. When there is but one dressing in the twenty-four hours, this practice has the advantage of giving more tranquillity to the patient for the remainder of the day; but it has the inconvenience of leaving him less at

his ease for the night. Moreover, we see patients who desire to be dressed both night and morning. I would not say, here, that the dressing of the morning should be made after sunrise, and that of the evening after sunset; for there would result from this, that in the month of December, for example, the two dressings would take place at the interval of five or six hours, while in July they might be separated by twelve or fifteen hours. The best course in this matter is, to dress the patients towards eight or nine o'clock in the morning, and from seven to eight in the evening.

These frequent dressings belong to almost all those of the secondary character; they are useful when we are treating wounds that suppurate abundantly, or are employing certain topical applications—cataplasms, ointments, and liniments, for example. In other cases they are calculated only to irritate the wound, and to retard the process of cicatrization.

[No healthy wound, Dr. Mott thinks, should be dressed over once in twenty-four hours. They should be let to suppurate freely. They do much better in their own pus, and they are injured by too frequent dressing. A compound fracture is a good illustration of this sound practical precept.—*T.*]

§ V.—*Dressings at Long Intervals, (Pansements rares.)*

Formerly, many surgeons dressed all wounds once, twice, three, or four times a day. Now, we call those frequent and ordinary dressings, which are repeated at least once in twenty-four hours, and delayed dressings, [*i. e.*, at long intervals,] those which do not take place every day. These last are divided into two orders. They merit, in fact, the name of immoveable when they are only renewed every two, three, four, or five days, in such manner as to make it necessary to change them a certain number of times during the course of the cure.

Permanent dressings should be understood of those which, when once applied, remain in place until the wound is cured. This kind of dressing, which the Egyptians, Greeks, Arabs, and Spaniards appear to have often employed, and which M. Blaquière revived in 1815, has been definitively adopted by the elder Larrey. In fact, Maréchal, on his part, has made a fortunate application of it at the Necker hospital, in the treatment of wounds, and the observations published by M. Sazie, are of a nature to awaken attention upon this point. I have already described in what manner we may best carry out this dressing for fractures. As to wounds, we proceed in the same manner as for a simple dressing, but with the precaution not to touch the bandage, if no accident supervenes, until at the end of ten or twenty days, the epoch at which the union of the parts ought to have been effected. M. Larrey, who renders the dressing perfectly immoveable in this case, as in the treatment of fractures, applies it as well to wounds that are to suppurate, as to those which he wishes to unite by the first intention. Protecting the parts from contact with the air, applying to them a uniform

pressure, and enabling them to escape all traction or inflection, (*tout tiraillement, toute inflexion,*) the bandage, imbued with the white of egg, or starch, or with dextrine, gives the pus an opportunity of spreading and concreting at a distance from the wound, without preventing, says M. Larrey, the regular progress of the cicatrization.

For my own part, I do not think, in the instance of wounds, that the immoveable or permanent dressings have all the advantages that M. Larrey attributes to them. It has always appeared to me right to renew, from time to time, the dressings of wounds in a state of suppuration; nor can I think we can question the advantage of renewing the dressings in ordinary wounds, provided there be no reason to suppose that there will be a complete agglutination.

The immoveable dressing, then, is not in fact preferable to ordinary dressings, but for wounds complicated with fracture, or those in which it is important to prevent the slightest movement, or where we have reason to hope for an absolute and immediate union.

[*Leaving the Dressings on.* We would receive this last remark of the author with some qualifications, especially as to immediate union. In all those fractures of the body near the great centres of circulation and sensation, Dr. Mott has always impressed upon his pupils the importance, wherever it can safely be done, of *leaving on the first dressings, for wounds complicated with fracture or not,* for many days, or even for *weeks,* or as long a time, in fact, as possible. More especially has he insisted, and does still insist upon this practice as a surgical axiom, in all fractures of the cranium, however vast or complicated, as success of the most marked kind has ever resulted to him from this course, even where several inches in extent of scull and considerable portions of brain have come away, directly from the injury, or in the course of trephining. Even in cases, also, where a portion of the longitudinal sinus has been torn away or lacerated, he adopts the same course, as in these rather rare instances no other addition is made to the dressing than the insertion of a single pledget of lint into the wounded sinus, which arrests the hemorrhage definitively, especially in the application of the adhesive straps, with a moderate pressure, over the compresses, upon the incisions. A recent remarkable case of this kind occurred here to Dr. Mott, in which the sinus was wounded in the vicinity of the occiput, and two circular perforations had to be made with the trephine in the direction of the sagittal suture, the under table of the parietal bone being splintered off so as to press upon the dura mater. The dressings were left on, full a fortnight, and consisted only of the pledget above mentioned, light compresses over the approximated edges of the wound, and a few adhesive plasters crosswise on the scalp, the whole making only a moderate pressure. The plan of Dr. M. is, to leave the dressings on until they are *self-separated* by the lubricating effect of the subjacent bland pus that constantly besmears and protects, and rapidly pro-

motes the already far-advanced or nearly-completed granulations. At this time, the under portions of the dressing are so imbued with the partially decomposing exudations that have soaked into them, that they become offensive, and must be removed. The danger of removing the dressings to the brain at an earlier period, is, that of exciting inflammation in this organ; and when the brain has become once accommodated to the pressure of the dressing, it is better to defer the second dressing till the critical period is passed over, which is generally within a fortnight. Serious consequences have arisen from interfering with the dressings at an earlier period.—*T.*]

TITLE II.

ELEMENTARY OPERATIONS.

I SHALL include, under the name of Elementary Operations, all those which enter into the province of minor surgery, (*la petite chirurgie.*) I shall consequently explain, in this place, what relates to the different modes of bleeding, cauterization, drains, (*exutoires,*) rubefacients, (*rubéfactions,*) vaccination, &c.

CHAPTER I.

BLEEDING, OR SANGUINEOUS EMISSIONS.

BLEEDING is understood of every operation, which consists in abstracting blood from the human body, with the view of relieving or curing it. This operation is divided into many kinds, according as it is practised on venous trunks, arteries, or the capillary system. It takes the name of bleeding, properly so called, when the extraction of the blood is made from one vessel only. In this case, also, we give it the name of general bleeding. If we perform it by means of leeches, scarifications, or the opening of several small veins, it receives more especially the name of local bleeding. General bleeding is known under the title of phlebotomy, or simply blood-letting, when it is performed on the veins; if an artery is opened, it is designated by the name of arteriotomy.

Article I.—Phlebotomy, or Bleeding properly so called.

The employment of blood-letting goes back to a period so remote in the history of nations, that we know nothing precise of its origin. The negroes of Guinea, the Hindoos, the Chinese, the Scythians, the inhabitants of the Oceanic isles, (*de l'Océanie,*) made use of it before medicine was reduced to the form of a science; every thing proves, then, that the history of the hippopotamus, spoken of by Polydore Virgil, should be considered as a simple fable. We may, also, conceive how the loss of blood caused by wounds, might have given man, at the origin of the world, the idea of taking blood from him artificially on the occasion of certain maladies. However that may be, phlebotomy is an operation which may be performed, and which the Greek and Roman physicians performed, in fact, on most of the superficial veins of the body. To believe Oribasus, Antylus had already laid down rules for bleeding in the forehead, angle of the eyes, mastoid region, tongue, hand, bend of the arm, ankles, and ham. We may add, that at the present time, bleeding in the dorsal veins of the penis, those of the scrotum, neck, limbs, and certain tumors, also deserves particular notice.

§ I.—*Bleeding at the Arm.*

(Fig. 144.)

Physicians who had imagined that blood-letting might be simply *evacuant* or *depletive* when applied indifferently to this or that vein, *derivative*, on the contrary, when performed between the diseased organ and the heart, and *revulsive* when as far as possible from the region to be relieved, ascribed a great importance to the veins upon which the operation should be practised; at that time their choice lay between bleeding at the arm, neck, or foot. Now, however, since those distinctions of the schools have lost all their value, blood-letting by the arm is almost the only kind employed. Even on the supposition that we have gone too far in this matter, and that phlebotomy in other regions has relapsed into unmerited oblivion, it is nevertheless always true, that the theoretic reasons which governed the practice of the ancient physicians are evidently too futile to require to be discussed at the present day.

A. *Veins at the Fold of the Arm*—(Fig. 144.)

In the arm we perform bleeding upon all the veins of a certain size which become prominent under the skin. Thus, the cephalic vein of the thumb, the salvatella or dorsal veins of the hand, the different veins upon the body of the forearm, and the cephalic

vein in the deltoid groove, when it appears too difficult to reach it in the bend of the arm, may be had recourse to. In this last region, the veins are so distributed as most usually to present five in number.

I. Outside and upon the outer prominence of muscles is found the *cephalic*, which receives, in passing from the anterior surface of the supinator longus, on the side of the biceps, the median cephalic and the anterior radial. This vein, accompanied (*longée*) by the external cutaneous or musculo-cutaneous nerve, from which it is separated in the arm by the aponeurosis to near the external condyle, (*epicondyle*,) is situated between the superfical fascia and the aponeurosis properly so called ; lower down it is also accompanied (*côtoyée*) or surrounded by nerves that vary exceedingly as to their number. If it is true, as is asserted, that a surgeon of our epoch says he has never seen nerves in the neighborhood of the cephalic vein, it is because he could not have dissected it but upon one or two subjects, in whom, by some anomaly doubtless, they were wanting.

II. The *basilic*, situated on the inner muscular prominence, passes over the inner condyle (*epitrochlée*) to gain the groove of the biceps. The cutaneous nerve enclosed in the same sheath is almost always situated upon its inner side above the bulge of the muscle.

III. The *median* is seen at the lower part of the region, or near the apex of the triangular space which separates the two muscular masses at the bend of the arm. This vein, which comes from the anterior or palmar region of the fore-arm, and which is either inclined to the external or internal side, soon divides into three branches, one of which enters deep between the muscles through the aponeurotic aperture, to become united with the deep-seated veins, and the two others, which separate in the manner of the two branches of a Y, to join the basilic and cephalic.

IV. *Median-Cephalic.* The external or cephalic branch of the median vein follows the outer inter-muscular groove, is surrounded with nervous filaments, and at one or two inches above its origin opens into the cephalic vein, properly so called.

V. The internal branch or *median-basilic* crosses very obliquely the brachial artery, from which it is only separated by the aponeurosis, then crosses the tendon of the biceps, reaching the basilic a little above the articulation. In short, this vein approaches much nearer to the artery while in the hollow of the fore-arm than a little above, because of the fibrous bandelette of the biceps, which has the effect to separate the vein from the artery in this last-named place much more than in the former.

All these veins, though subject to numerous anomalies, sufficiently resemble in their general grouping the form of a capital M.

Situated between the sub-cutaneous superficial fascia and the sub-cutaneous deep fascia, they are more or less easy to be distinguished, according as the embonpoint of the arm is more or less considerable. This arrangement is the cause, on the other hand, why the relative position of the artery or nerves with the veins is

not sensibly changed by the infiltrations or obesity of which the bend of the arm may be the seat.

It results from these anatomical considerations, that bleeding upon the fore-arm is more easy in the median basilic vein, but at the same time more hazardous, than in the median cephalic; that, strictly speaking, phlebotomy may be performed upon all the veins at the bend of the arm; that, if the veins are more projecting and more distinct in thin than in fat persons, they have also the inconvenience of rolling more easily under the skin, and of being less fixed; that, if in fat persons the vein is therefore difficult to be distinguished, the compensation for this is, that it is more steady and somewhat more separated from the parts to be avoided; that they are all surrounded with nervous filaments, and that, therefore, it would be absurd, in this respect, to prefer one to another.

B. *Preparations.*

To perform bleeding at the arm, we must procure lancets; prepare a light, tepid water, cold water, vinegar, or some other volatile liquid; two bands, (*bandes,*) one about a yard in length, called the *bleeding ligature*, the other nearly three yards long, designed as a bandage on the limb after the operation; a small square compress, folded six or eight times; some compresses or pieces of linen to wipe with; a sheet folded, or a napkin, to protect the clothes of the patient; finally, a vessel to receive the blood, forceps, scissors, and a probe in case of need.

I. *Lancets.* Without being able to say at what epoch the lancet was invented, or who was its inventor, we at least know that, up to the time of the dawn of civilization, phlebotomy was performed with other instruments. The lancet of the present day is composed of a blade and its handle, (*chasse.*) The frame or handle is made of two slips of shell, pearl, or horn, fixed upon the heel of the blade, which they embrace by a rivet that goes through all the three pieces. These two pieces of the handle, which may be made to turn and move upon one another, and upon either one of which we may also turn or arrest the blade, afford every facility for opening and cleansing the instrument.

The lancet, properly so called, terminates in a point which has given to it the different names by which it is known. If this point is wide, and, as it were, blunted by the rapid approximation of its two edges, it constitutes the *barley-eared lancet*, (*lancette à grain d'orge*—Fig. 145.) When a little more pointed, it makes the *oat-eared lancet*, (*lancette à grain d'avoine*—Fig. 146.) When still more pointed, it becomes the *pyramidal or serpent-tongued lancet*, (*lancette pyramidale ou à langue de serpent*—Fig. 147.) In fine, if the heel of the lancet goes back considerably behind the edge of the handle when opened at a right angle, it takes the title of the *Spanish lancet*. The abscess lancet, which was formerly used, and which some persons still employ for arteriotomy, did not differ from ordinary lancets but by its dimensions, which are nearly twice their size. A

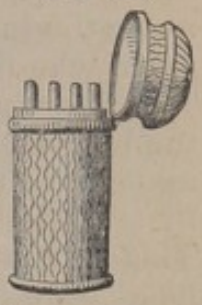
case called the *lancet-case*, (*lancetier*—Fig. 148,) contains the four or six lancets we have most frequent occasion for.

(Fig. 145.)

(Fig. 146.)

(Fig. 147.)

(Fig. 148.)



II. *Hour for bleeding.* When we perform phlebotomy for an acute affection, we bleed indifferently at almost any hour of the day. If, on the contrary, it is for mild diseases, or that the bleedings are precautionary, in fine, such as are not urgent to be performed at the moment they have been ordered, the morning is generally preferred. Moreover, it is proper that the patient should not have eaten at least for three hours, and that he does not eat afterwards for an hour or two. There is for bleeding, as we see, a time of election and a time of necessity, which the surgeon should not confound.

III. *Position of the Patient.* We may bleed patients standing, (*debout,*) sitting, or lying. We do not bleed them standing, however, except with the view of more rapidly producing syncope, this position being at the same time the least convenient for the surgeon and the most fatiguing for the patient. The sitting posture on a chair, an arm-chair, or stool, is that which is generally adopted when the patient is not obliged to keep his bed. In this position there is every facility for the assistants and the surgeon; the patient has no need even of removing his dress; but there results from it a manifest tendency to syncope, and additional embarrassment when any accident obliges us to lay the patient on his back. Every person, therefore, whom we wish to bleed, should be placed, by preference, in his bed, either seated or in a horizontal position.

Whatever in other respects may be the position that may have been chosen, it is necessary to spread a napkin between the upper part of the arm and the parts of the clothing or of the bed which might be soiled by the blood. We afterwards roll up the sleeves of the patient to near the arm-pit, so as completely to uncover the veins which we have just been speaking of. If the limb should be found strangulated by the portion of dress thus rolled up, it is necessary to rip it, or take it off.

IV. The *ligature*, called the *bleeding bandage*, is a strip of red flannel an inch wide, and a yard or a yard and a half long, (Fig. 149.) Being pliant and sufficiently firm, it answers very well the end we have in view; but without admitting that it may in reality alarm the patient, that it seriously exposes to the transmission of certain contagious affections, it is just to say, that one end of an ordi-

(Fig. 149.)

nary bandage may perfectly well take the place of it, and that it then becomes entirely superfluous. Whether, however, we make use of the bleeding bandage, a riband, or the ordinary linen bandage, we must proceed in the same manner in applying it. We place the hand of the patient upon the side of the chest of the surgeon, who fixes it in this spot with the upper part of his own arm. This bandage, then applied by its middle part upon the forepart of the biceps, at an inch or two above the vein we wish to open, should make two turns on the lower part of the arm, and should be tied by a single bow-knot, the loop (*anse*) of which should rest above. This band, the purpose of which is to retain the blood in the superficial veins, ought not, however, to be so tightened as to prevent the arterial circulation and arrest the pulsations at the wrist. It is sometimes placed higher up, sometimes lower down, even to half an inch from the point where the lancet is to be inserted, according as it appears to distend the veins better in one region than another. We fasten it only by a single bow-knot, the two heads of which hang down and outside the arm, in order to loosen it with more facility, if that should become necessary in the course of the operation. When it is arranged, we bend the patient's arm, and then place it for a few moments in front of his chest.

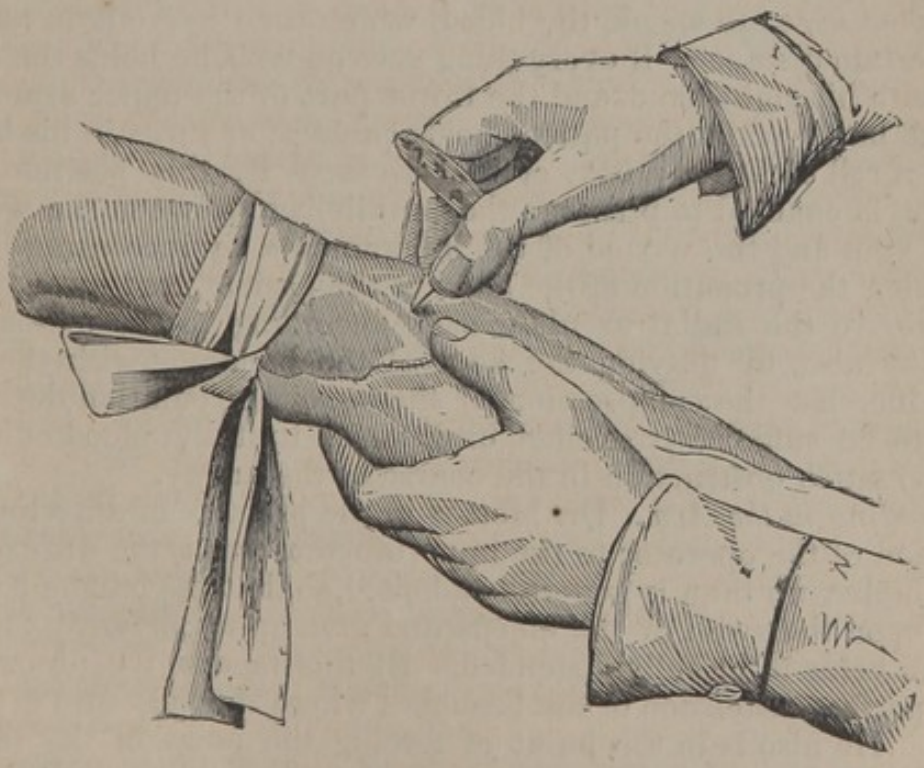
C. *The Operation.*

The surgeon then arranges his instruments. He chooses the lancet of the shape of the barley ear, if the vein is superficial or voluminous, or he is apprehensive that he shall not properly hit the moment of elevating the lancet, (*ou s'il craint de ne pas exécuter convenablement le temps d'élévation de la saignée.*) On the contrary, he uses the oat-eared shape lancet, when the veins are less apparent or deeper, and when he has been much practised in bleeding. The serpent-tongued is scarcely ever now employed, and we no longer use in France the Spanish lancet. Opened at a right angle, or at one that is a little obtuse upon its handle, the lancet is immediately carried up to and placed between his lips by the extremity of its handle, so that its point is turned towards the arm that we are about to bleed. Returning to the patient, the surgeon extends his fore-arm, examines its vessels, makes some friction from below upward along the course of the veins, assures himself by the aid of the finger of the position of the artery, and of the tension of the bandelette of the biceps, and endeavors to find if there exists or does not exist any vascular anomaly in front of the elbow. He then fixes the hand of the patient between his chest and the upper part of his arm, in the hollow of his axilla, that he may embrace the patient's elbow with his hand on this side, placed downwards in a supine direction, so as conveniently to stretch the integuments in the bend of the arm. He may also, by holding his hand in a state of half-pronation, fix the vein with his thumb while his fingers are spread over upon the elbow. It is with his left hand that he thus supports the right arm, whilst it would be with his right hand that

he would fix the left arm, so that we use our right hand to bleed the right arm and our left hand to bleed the left arm. On the supposition that the surgeon is not ambidexter for this operation, and that he would be obliged to use his right hand for both sides, he should place himself outside, with his back towards the head of the patient when he is to bleed in the left arm. Then carrying inwardly the right hand that holds the lancet, to bring it from the chest towards the bend of the arm, while the left hand extends and fixes the fore-arm, he would succeed nearly as well as by the other method.

I. *The Operative Process*, (*manuel opératoire.*) The arm being fixed, and the vein to be opened properly chosen, the surgeon takes the lancet, which he held in his mouth, and embraces it at its heel between his thumb and his first two fingers half-flexed. Obtaining, then, by means of his two other fingers, a point d'appui on the inner part of the elbow, he then, by forcibly flexing his fingers, draws back the heel of the lancet towards the palm of his hand; then, by a movement of extension, he quickly carries its point into the vessel by an angle more or less acute and a puncturing motion, (Fig. 150.) The absence of resistance, the appearance of a small drop

(Fig. 150.)



of blood, and a sensation impossible to describe, soon prove to him that the anterior wall of the vein is passed. Then elevating his wrist, he pushes the anterior edge of the lancet towards the opposite side and withdraws it in an upward curvilinear [or oscillatory] motion, (*mouvement d'élévation et de bascule.*) These two motions, also, are so quick, and so completely involved in each other when the bleeding is well performed, that it is difficult to distinguish them

with the eye. Perhaps, however, it would be more convenient to seize the lancet as we would a pen, and plunge it in perpendicularly.

The puncturing movement, which some persons have recommended to be made horizontally, with the view of avoiding the artery more completely, and which others direct to be made almost perpendicularly, would render the upward movement, to a certain extent, useless. When we use the barley-eared lancet, the opening of the vein corresponds almost inevitably to the middle of the incision in the integuments. With the oat-eared, or serpent-tongued lancet, we should, on the contrary, have too oblique a wound, if the upward movement was not united to that of the puncture.

The lancet being withdrawn, the blood immediately leaps out. But if we look to performing the operation with all possible neatness, we immediately apply the thumb upon the vein below the puncture, while with the other hand we shut the blade upon one of the pieces of its handle, and pass it into a vessel filled with cold water. Up to this time, the face of the patient should have been turned to the opposite direction, or covered with a bandage. The assistant approaches, provided with a vessel to receive the blood, and presents himself in front of the puncture. The surgeon now, after having brought the fore-arm forward, ceases to compress the vein, and releases, so to speak, the blood, which then jets out in an arc to a certain distance. If every thing goes on well, he holds the fore-arm with his right hand, and the lower part of the upper arm with his left hand, while the patient holds, presses, or turns in his hand, either a roll of linen, a box, or lancet-case. By this position, the surgeon is enabled to preserve the parallelism between the wound of the vein and the wound of the integuments, by increasing or diminishing the pronation of the hand of the patient, and by drawing the skin to the radial or ulnar side, according to the indication. He may also, by untying the knot of the bandage with the left hand, increase the compression, if the venous circulation does not seem to be sufficiently excited, or diminish it, if the blood encounters too much obstruction in the course of the artery.

[*Bleeding in the Arm.* Dr. Mott is in the practice of drawing the attention of the operator to the importance of tying the arm somewhat higher up than is generally adopted, so that the bandage shall press upon the swell of the biceps and give an opportunity for the median veins to be fully distended. By this means, we procure a more perfect distension of the branches where the puncture is to be made. He also is in the habit of forcing the point of the lancet (which should neither be too acute nor broad, but of a medium angle on a long curve) into the vein by a firm, slow, graduated pressure, rather than by a sudden sweeping plunge, or puncture, as hastily practised by some, who may thus divide the vein through and through, if not also an abnormal arterial branch concealed below, and thus cause great if not dangerous mischief by extravasation into the tissues, a false, circumscribed, or diffused aneurism, &c., requiring often amputation. There is no necessity, whatever, of hur-

ry, if the lancet is sharp and the vein firmly fixed by the thumb of the left hand, be the integuments ever so thick or tough. Also, this cautious method is eminently important in fat persons, where the vein is deep-seated in the adipose tissues, and where we must often grope our way by the *touch* or *feeling* only. Here, too, in such persons, there is this compensating advantage, that the cutis is usually thin and delicate, and easily punctured. The left hand of the surgeon should, by long practice in early life in the dissecting room, be made as familiar, if possible, with the handling of instruments as the right, for it is, in the opinion of Dr. M., the true and safest, and certainly the most professional mode, to use the left in bleeding the left arm of the patient. The hand of the patient should be held, before and after the operation, edgewise; that is, the thumb fronting upward and the fingers grasping around the upright spoke, for example, of the back of a chair which is firmly fixed. The grasping fingers may be kept in motion, squeezing, as it were, the round piece of wood they embrace. The arm should be held slightly flexed, because it is easiest for the patient, and therefore least likely to be changed, and it is also the best position for securing a full flow of blood.—*T.*]

II. *Quantity of blood to be drawn.* We draw in this way from three ounces to three or four pounds of blood, and it is rare that we wish to take less or more. An ordinary bleeding is about ten ounces. The surgeon, moreover, is to direct whether there is to be abstracted a greater or less quantity.

III. *Palettes.* The vessel which is to receive the blood may be a plate, saucer, wash-basin, dish, &c.; but to ascertain with more certainty the quantity taken, vessels have been contrived which bear the name of palettes or poelettes. As these vessels, which contained three ounces in the time of Dionis, have generally now a capacity of four, errors on that account might occur in practice, if we did not take the precaution to prescribe bleeding by ounces rather than by palettes.

(Fig. 151.)

There are found in hospitals a kind of porringers, containing about twenty ounces, which are divided by four or five circular grooves, (Fig. 151,) indicating so many palettes of four ounces, so that without changing the vessel we may know when there has been drawn either one, two, three, four, or five palettes of blood.

IV. *Closing the Vein.* To close the vein, the surgeon having untied the ligature, immediately applies the thumb upon the puncture, or a little below it; replacing the hand of the patient under his armpit, as at the commencement of the operation, he causes a vessel to be brought filled with tepid water; then wipes the parts soiled with the blood, first with a wet, then with a dry linen. This being done, he takes the small square compress, and quickly adjusts it upon the puncture in place of his thumb. [Dr. Mott

prefers a small pledget of lint next the wound, and then the compress. The lint is softer and more delicate, and less irritating, and is more likely to remain adherent if the bandage should become displaced. A strip of adhesive plaster is preferable to a bandage.—*T.*] I have always found it better, in this case, to draw with the left thumb the upper lip of the wound a little outward, while compressing also the vein, at the same time that with the right hand we apply the compress from below upward, to force upward the lower lip; relaxing then the first lip, we see it redescend and place itself in contact with the other lip; from whence it happens that they have no longer any tendency to separate, and that immediate reunion is almost certain.

Moreover, it is important that the pressure exercised by the left thumb in such cases should be above the commencement of the branch which connects the median veins with the deep-seated veins in the bend of the arm. Without that, the blood would continue to flow, and might alarm the young surgeon.

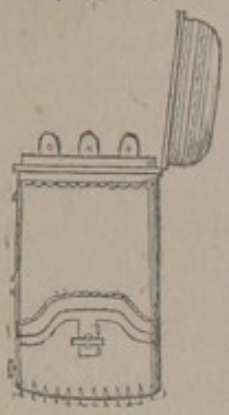
The thumb, placed on the square piece of linen, maintains the compression, while with the right hand the surgeon surrounds the region with a figure of 8, the crosses of which correspond to the puncture, and which is tied by a knot outside, or fastened by pins above the outer condyle. The forearm, which has been gradually placed in a state of flexion during the application of the bandage, is then brought in front of the patient's chest, or a scarf is arranged to hold it. It should be kept thus without moving for twenty-four hours. At the end of this time, the small wound is generally united, and it is only for extra precaution that we sometimes leave on the bandage till the day after. We must not, however, forget that it is from neglecting to keep the elbow properly at rest, that the wound in many persons becomes inflamed, and the source of serious accidents.

[Some surgeons are in the habit of using special bandages, expressly woven for tying up the arm with. Such are about an inch in width, and are made elastic by the threads of caoutchouc interwoven with them. They are always fastened by pins, and their elasticity completely adapting itself with a more uniform pressure to slight movements at the elbow joint, prevents the turns of the bandage from slipping or becoming displaced, and renders the injunction of rigid immobility, which is often unpleasant and annoying to the patient, not so imperative. Dr. J. K. Rogers, of this city, prefers these bandages.—*T.*]

V. *Cleansing the Lancet.* Standing by the side of his patient, the surgeon now coolly wipes his lancet, and shuts it up. This instrument should never be cleaned in hot water, which might rust it or injure its temper. This is a duty, also, which should not be confided to any one. The lancet being turned upon one of the blades of the handle, is first wiped on one of its sides, always from its heel to its point, and with fine linen. It is then turned upon the other blade of the handle, the latter itself having been previously wiped, that we may cleanse the other side, and afterwards dry also the second

blade of the handle as was done with the first. We succeed full as well, also, by pressing the lancet, completely opened, on fine linen between the thumb and finger, provided we take care to suspend the pressure whenever the point of the instrument, drawn by the other hand, arrives between the fingers.

(Fig. 152.)



After this cleansing, the lancet is replaced in its small case of shell, silver, gold, or silver gilt, known under the name of the *lancet-case*, (*lancetier*,) and which, as in this figure, (Fig. 152,) may be made to end below in a kind of scarificator. It is true, however, that most surgeons at present dispense with this article, and carry their lancets in the folds of their instrument-case.

D. *Difficulties in Bleeding.*

Simple and easy as bleeding in the bend of the arm in appearance is, it is, nevertheless, sometimes a delicate and very embarrassing operation. Its difficulties depend upon many causes.

I. *Intractability of the Patient.* Children, and even adults, cannot remain tranquil from the moment we bring the lancet near their veins, and suddenly jerk back the arm as soon as they feel themselves touched by the instrument. By long habit and much address we overcome this difficulty, by keeping the eye and instrument steadily upon the retraction of the limb, and thus, to a certain extent, perform the operation while following the movement. But a more certain process, and which I have often succeeded with, consists in keeping the elbow firmly fixed upon the knee, previously elevated by means of a stool, or upon the chair of the patient, while we hold also his hand and forearm in the manner mentioned above. It is then almost impossible for him to change the position of his arm, and the surgeon is wholly at liberty, if he is well assisted, to open the vein as he wishes.

II. *The Vein over the Artery.* At other times bleeding presents difficulties, because the only vein which is apparent is that which corresponds to the artery; for example, the median basilic. In this case we sometimes succeed by pronating the hand of the patient in order to force the artery a little deeper within the tendon of the biceps, and separate the vein from it, the vein in that case being immediately raised up by the aponeurosis. If this movement should not produce a sufficient separation to inspire confidence, it would be necessary, in case the vein was large and superficial, to puncture it by applying the lancet flatwise and horizontally. Some persons have devised for this particular case a very sharp-pointed lancet, which has but one cutting edge like that of a bistoury, and which is to be inserted very obliquely, taking care to keep its back towards the side of the artery. But besides that this requires a special instrument for the purpose, we must be convinced, from the least reflection, that it would not be free from danger. The only way,

then, in such cases, is to look for another vein, or to have recourse to the address of a professed bleeder.

III. The *veins* are sometimes so *deep* that they cannot be distinguished through the skin but with very great difficulty. When that is owing to their absolute diminutiveness, we must seek for others. If, as is so often seen among the women of Turkey, Asia, and all Africa, the *embonpoint* of the patient is the cause of the difficulty, we are generally enabled, provided the ligature is properly tightened, and we carefully press the different points at the bend of the arm with the pulp of the finger, to distinguish one of the median veins—for example, the median cephalic—under the form of a tense elastic cord, and with a blue line which is visible through the skin. As in this case the vein is completely surrounded with fat, the surgeon punctures it without the fear of its gliding from under the instrument, and proceeds to plunge in the lancet to a certain depth, to procure the quantity of bood desired.

Sometimes, also, the veins are but slightly visible in consequence of the emotion the patient experiences, and the enfeebled state (*état maladif*) he finds himself in. In this case we have recourse to immersion of the limb in hot water, keeping it there for a greater or less length of time, which, however, has the disadvantage of reddening the skin, and masking in some degree the track of the veins. In other cases we use gentle and repeated frictions on the forearm, or make the patient move his fingers, or we leave the ligature on for a quarter or half an hour. If all this does not succeed, and the indication of bleeding is imperative, we search for another vein.

IV. *The blood dont flow or flows badly.* Another difficulty in bleeding is, that the vein being opened, there is some obstacle to the flow of the blood. This depends sometimes upon the ligature being either *too tight* or *too loosely applied.* The cause of the difficulty in such cases sufficiently points out its remedy. Sometimes, also, it is the dress which *strangles* the limb in the manner of a second ligature above the first. All that is required in that case to remove the difficulty, is to loosen or divide (*débrider*) the portion of dress in question. A *flake of fat* sometimes protrudes into the incision in the integuments; it is to be thrust back with the head of a probe, or cut off by the scissors.

V. Sometimes, also, the *incision* is in reality too small; the surgeon ought then, without hesitating, to enlarge it forthwith. With the oat-eared lancet, we sometimes make an opening in the vein larger than at the skin; in this case we must immediately replace the point of the instrument into the puncture, and divide the teguments by finishing the upward movement of the operation of bleeding. On the supposition, also, that the *vein* which is opened may be too small, we must immediately proceed to another bleeding. It is possible, also, that there may not be a perfect *coaptation* (*parallelisme*) between the opening of the skin and that of the vein; we then successively draw the opening in the integuments in different directions, until it meets that in the vessel. If this conjunction should appear impossible, we puncture the vein in another place.

VI. If the flow of blood should be impeded by the *debility of the patient*, we should have recourse to frictions upon the track of the veins, slight strokes (*secousses*) or slaps (*chocs*) upon the front part of the forearm, or make the patient flex his fingers. In certain cases the blood does not run because the patient is on the point of fainting, or is seized with some cerebral affection, or other condition, which arrests or considerably retards the venous circulation. Here we have no other resource than to wait for the restoration of the functions of the heart.

VII. Patients who have been frequently bled, sometimes have the principal veins in the bend of the arm *riddled* (*criblées*) *with cicatrices*. This condition of the parts not only often conceals the vessel, but also is attended with the disadvantage of flattening it, diverting it from its natural course, and even sometimes of obliterating it. It would be idle to suppose that the same process would answer in all cases to surmount the difficulties resulting from this peculiarity. If the vein is really obliterated, which is generally indicated by its abrupt disappearance above the cicatrices, we must puncture farther down. When the calibre of the vein is preserved, there is no difficulty in bleeding above. We may then also easily puncture below, or with more advantage upon the cicatrices themselves, because, from their being less moveable, the vein, when once recognised by the finger, is for the most part easily divided.

[Another serious and unforeseen difficulty might be found in the cicatrix. Thus, Dr. Mott mentions a remarkable case, wherein a prolonged and painful neuralgia at the bend of the arm, from bleeding, in a lady, was not relieved until a small filament of nerve, that had been caught as it were, or wedged into the firm texture of the cicatrix while the latter was consolidating, was actually dissected out of its imprisonment. Where, therefore, a cicatrix or many of them exist, and unconnected with any neuralgic pain in the part, there would, *à fortiori*, be still greater safety in making the aperture in that point, so far as concerned the possibility of causing the accident we have named.—*T.*]

E. *Accidents from Bleeding.*

Though trifling in appearance, the operation of bleeding is not the less exposed to numerous accidents, such as, dry bleeding, (*la saignée blanche*,) thrombus and ecchymosis, syncope, inflammation of the neighboring tissues, lesion of the lymphatics, puncture of the fibrous or nervous tissues, and phlebitis.

I. *Missing the Vein.* We say that a surgeon has made a *saignée blanche*,* [literally, white bleeding,] when the puncture he has made in the arm is not followed by a flow of blood. This accident may arise from our having wished to puncture a vessel that was too deep or too rolling, (*trop roulant*,) or badly supported, or from the

* [We think a *saignée sèche*, or *dry bleeding*, would be more expressive, if sarcasm is intended upon the blunder or *faux pas*.—*T.*]

skin itself being flabby, or the bend of the arm badly lighted, or from the patient having made an unexpected movement, or, in fine, from some one of the difficulties which I have before enumerated. Sometimes, however, the blood does not run, though the vein has been opened. I have already remarked above, that syncope, a vivid emotion, or a lesion of the brain, were ordinarily the cause of this last mentioned accident. When the saignée blanche is owing to the vein not having been touched, we must, provided we can distinguish the vessel at the bottom of the puncture, immediately have recourse again to the lancet, and open it; in the contrary case, and should this prove difficult, it is better to puncture the same vein, or another vein, upon a different point.

II. *Thrombus.* If there should occur effusion of blood between the teguments and vein to such extent, before the bleeding is over, as to cause a sluggish tumor to be formed, in shape of a bump, (*bosselure,*) of which the small wound represents the apex, it is called a thrombus. This accident is owing to the parallelism between the vein and tegument having been disturbed; in some cases it prevents us from taking the quantity of blood we desire. If the surgeon notices it in time, he brings the two punctures together as exactly as possible; if that should not be sufficient, and the blood should stop running too soon, we should have to choose between dilating the wound with a lancet, and a new puncture, either on the same arm or the other; but, unless we should be perfectly sure of succeeding by the first course, it would be more advisable to adopt the other. After the bleeding, whether it has been perfectly effected or not, the thrombus acts like any other effusion of blood in the cellular tissue; that is, it insensibly disappears by absorption, and need never cause any uneasiness. We promote its resolution by covering it with a graduated compress saturated with a resolving liquid, as, for example, a solution of common salt, lead-water, or brandy.

III. *Ecchymosis* means a livid or bluish spot which appears around the wound, and sometimes to some distance above and below it, upon the second or third day after the bleeding. This has no other inconvenience than that of leaving, for the space of from six to twelve days, the appearance of a bruise in the bend of the arm; it is an accident which does not require any treatment.

IV. *Syncope.* Many patients are seized with faintness, (*lipothymie,*) or fall into a complete syncope, before having lost the quantity of blood we wish to take from them. Timidity, or some idiosyncrasy and peculiarity of constitution, are often the cause of this accident.

Syncope is promoted by a large opening of the vein, and by the erect position of the patient; it occurs, also, from the individual having eaten but a short time before, or from his having been seriously put out of humor by some unforeseen circumstances. As soon as it happens, we must place the thumb on the puncture, lay the patient in a horizontal position, and throw cold water or vinegar and water upon his face; if after some minutes he comes to

himself, and we have not yet taken a sufficient quantity of blood, we release the vein in order to continue the bleeding; in the contrary case, we remove the ligature to proceed to the dressing of the wound, and the employment of the different remedies used in syncope.

V. *Lesion of the Lymphatic Vessels.* Some surgeons pretend that after bleeding there may take place an exudation of lymph from the puncture; that in fact the puncture itself may remain fistulous. This, in my opinion, is, if I am not deceived, an imaginary accident, to whose account probably has been placed some other kind of wound; but it is not the less true, that bleeding is sometimes the cause of disease in the lymphatics, and of *angioleucitis*, characterized by certain red lines which extend from the puncture towards the axilla or the hand, and by the painfulness (*endolorissement*) of the supra-articular and axillary ganglions, and which takes place at the expiration of some days, as a consequence of bleeding, as well as from any other wound.

VI. *Puncture of the Nerves.* The ancient authors attribute numerous accidents from bleeding, to wounding the nerves in the bend of the arm. It might in fact be possible, in performing this operation, to puncture the branches of the musculo-cutaneous, the internal cutaneous, or possibly even the median nerve; but the inflammations, the gangrene, and death even, said to have followed this kind of lesion, must obviously be ascribed to something else: what has been written upon puncture of the nerves, has rather been predicated upon preconceived opinions than upon well-recorded facts. At present it is so rare to see accidents after bleeding which cannot be explained without calling to our aid the puncture of the nerves, that no one scarcely any longer speaks of these kinds of wounds. Nevertheless, if, after a puncture of the lancet at the bend of the arm, there should supervene violent pains, convulsions, or tetanic symptoms, as has been asserted, and without our being enabled to refer them to some particular inflammation, we should cover the limb with compresses saturated with decoction of marsh-mallows, or with emollients sprinkled with tincture of opium, or wet them two or three times a day with some narcotic liniment, at the same time that we should give internally calming and anti-spasmodic drinks: the section of the nerve would not be allowable until after the trial of these remedies.

[Dr. Mott has met with a number of cases of neuralgia from puncture of the nerves in bleeding at the bend of the arm. In the case of his, related a few pages above, the neuralgia not only supervened immediately after bleeding, but was afterwards increased by the traction upon a filament of the nerve imprisoned in the incision when cicatrization took place.—*T.*]

VII. *Puncture of the Tendons.* Formerly they attributed to puncture of the tendon of the biceps, or of the aponeurosis, almost all the accidents which occasionally follow bleeding; but besides that this puncture is difficult in ordinary cases, we know at the present time that it could not produce the dangerous consequences that are imputed to it. Who, in fact, does not perceive that the puncture

of a tendon or aponeurosis, or that the puncture, or even section of some of the nervous filaments in the neighborhood of the veins of the arm, could not of themselves cause the least degree of danger. [This remark of the author, as is seen by the grave neuralgic symptoms which are mentioned above, as occurring in the practice of Dr. Mott, from implicating a filament of nerve in the bend of the arm, and requiring the exsection of the filament, must be taken with some allowance.—*T.*] All that we may say on this head, in favor of the opinion of the ancients, is that a punctured nerve, aponeurosis, or tendon, may give rise to inflammation in the lamellated cellular tissue, which is reflected upon or surrounds them, and thus become the source of serious inflammation.

VIII. *Inflammation of the Wound.* If the lips of the puncture have been properly brought together, if the limb has remained unmoved, and the compression has not been too great, the wound from bleeding is almost always united at the expiration of twenty-four hours. [We have repeatedly seen it in healthy, robust subjects, and once even in a delicately formed female of 80 years, *perfectly united* in the space of *four hours*, so as to allow the bandage to be removed with safety. In one case recently, it was effected in *three* hours after taking a pint and a half of blood.—*T.*] On the contrary, the neglect of these precautions, and the employment of a soiled lancet, expose the wound to the risk of inflammation and suppuration.

While the edges of the puncture only are red, swollen, and painful, there is no danger, and the application of simple dressings or emollient cataplasms, and afterwards, at the end of two or three days, a diachylon plaster, suffice for the cure.

If, on the contrary, this condition of things is accompanied with engorgement of the subjacent tissues and a certain degree of tumefaction, it may, perhaps, be the commencement of a formidable disease.

IX. *Erysipelas.* Bleeding, like every other species of wound, sometimes causes simple erysipelas, which is recognised by its ordinary appearances upon the skin. Unfortunately, the erysipelas it most frequently occasions is of the phlegmonous kind. This rarely occurs before the expiration of two, three, or four days, and its usual cause is a simple inflammation of the edges of the wound. The patient then complains of pain, heat, and swelling in the bend of the arm; the tumefaction, as in every other phlegmonous erysipelas, occupying chiefly the sub-cutaneous tissue, and extending itself to a greater or less distance upon the arm or fore-arm. The treatment of this erysipelas should be energetic and prompt. If the affection is yet in the condition of a small phlegmon, emollient cataplasms and the expulsion of the pus by pressure might, in the beginning, suffice. At a more advanced period, it would be necessary, while continuing these means, to recur immediately, if there existed a purulent collection, to methodic compression, associated with resolvent fomentations, or even to the application of a number of leeches. The employment of numerous incisions would be preferable only where there existed purulent collections with a separation of the teguments. On the supposition that neither compression nor

leeches were desirable, we might make trial of strong mercurial unctions.

X. *Phlebitis.* In place of puncture of the nerves or tendons, modern surgeons have introduced inflammation of the veins. It is certain that bleeding may, and often does, in fact, occasion purulent inflammation of the internal membrane of the punctured vein, and that, therefore, it may produce all the consequences of phlebitis and purulent infection—a species of poisoning that rarely fails to prove fatal to the patient; but I had said, in the year 1825, (*Anat. des Régions*, tom. i., art. *Pli du Bras*,) that there had been attributed to phlebitis consequences which do not belong to it; that is to say, that persons had characterized with the name of phlebitis almost every case of phlegmonous erysipelas, or of *angioleucitis*, produced in consequence of bleeding. It is important, then, that the surgeon should endeavor to avoid this confusion, and that he should learn to distinguish the three diseases which I have just named. He will not err in noting that angioleucitis, before becoming very severe, already occupies a very considerable space; that phlegmonous erysipelas is accompanied with extensive, diffused, and, ordinarily, uniform tumefaction, making the bend of the arm its centre, or prolonging itself, in the direction of the axilla, along the groove of the biceps, in the form of a long caky induration, (*plaque longue*,) more or less painful, accompanied with symptoms only of general inflammation; while phlebitis is characterized by a dull pain, the sensation of a hard and knotty cord, and the existence of red patches, (*plaques rouges*,) irregularly distributed along the course of the veins, and, finally, at the end of some days, by tremors and symptoms of putrid fever.

In short, we must recollect that, in such cases, as in all others, phlebitis may be *external*, that is, occupy only the exterior envelopes of the vein; *internal*, having for its seat the internal coat of the vessel; or complicated, when formed by the union of the two preceding varieties.

It is external phlebitis, more especially, which has been confounded with phlebitis properly so called, though it belongs rather to phlegmonous erysipelas; and it is especially internal phlebitis which is dangerous, because of the pus which it may infuse into the blood.

The causes of phlebitis are sometimes impossible to determine; it is true, that a dull-edged or dirty lancet, or a repetition of punctures, and which tear rather than cut; also, that a bad dressing and improper movements of the patient in the first twenty-four hours—in fine, that every thing which is capable of disturbing the union by first intention of the lips of a wound, are sufficient to explain its cause in a great number of cases; but it is also true, that bleeding, performed in the best manner possible, and a puncture with the cleanest and best prepared lancets, do not always exempt us from this terrific disease.

No remedy has yet been found for phlebitis, when it is internal and has already become extended. In the beginning, and while it is yet circumscribed, we should have recourse to the same treatment as for phlegmonous erysipelas; that is, either to the free ap-

plication of leeches and emollient cataplasms, a properly adjusted compression, strong mercurial frictions, or temporary (*volant*) blisters, sufficiently large to extend beyond the limits of the inflammation.—(See *Introduction*, supra.)

XI. *Wounds of the Artery.* Another accident, which may happen in performing venesection, is the puncture of the artery. This occurs either from some sudden movement of the patient, or from some anomaly in the vessels, or because the humeral artery is too closely united to the vein which it had been thought advisable to open, or, in fine, from the awkwardness of the surgeon. As soon as the artery is opened, the blood issues out with force, and in successive jets, (*per saltum*,) and immediately assumes, in the basin, a red color, and a lively and frothy appearance. As, however, there are individuals whose blood, as they themselves describe it, is full of life, (*vif*,) and in whom a simple puncture of a vein is succeeded by that leaping motion, and a flow of blood of a highly red color, we must not rely exclusively on the appearances mentioned.

We may ascertain with certainty if the artery has been wounded, by compressing the vein immediately below the puncture with a certain degree of force. If the blood is arrested by this pressure, there is nothing to fear, the vein only is opened. If, however, its jet thereby becomes stronger, it is an additional reason for believing that there is a wound of the artery; it could, however, happen that a communicating branch between the deep-seated and superficial veins might deceive us.

All doubts will be removed by shifting the pressure to the inside of the arm and above the elbow. By this mode, in fact, if the artery is wounded, the blood will be stopped, change its character, and cease to leap out in curved jets; while in the contrary case, the stream will pursue its ordinary course. Moreover, as it might happen, also, that an abnormal division of the brachial artery might be found at some other points than those of its ordinary track, it would be necessary, before pronouncing definitively, to make pressure in this manner successively upon the inside and the outside, and on the middle part of the front and lower part of the arm; or better still to make the first compression in the hollow of the axilla against (*contre*) the inner side of the humerus. It is for want of taking all these precautions that some surgeons, alarmed by some of the symptoms above described, have thought they had punctured an artery, when the vein only had been opened. It is in this way I have seen some practitioners lose their self-possession, and abandon their patient, because they had observed that the blood leaped out in jets, though they had punctured the basilic vein below the artery; and others become alarmed in the same way, because, not reflecting that they had made pressure below the deep-seated median vein, they attributed to a wound of the artery the continuation of the flow of venous blood.

Should, however, this accident happen, the surgeon ought so to conduct himself, if he can, as to maintain his self-possession sufficiently not to betray his fears to the patient. We must say to

the patient that his blood is highly vitalized or inflamed—that this is a reason why much should be taken from him; in tranquillizing him, we must place him in such a position as to permit the blood to run until it has nearly caused syncope, if the constitution or health of the individual do not present objections. To arrest the blood in such cases, we must make upon the puncture a circumscribed and much stronger pressure than for ordinary venesection; we therefore form, by means of small graduated compresses, a sort of pyramid, whose apex should rest on the wounded region, and which should be fastened by means of a figure of 8 bandage, and afterwards by a roller extending from the wrist to the armpit. Formerly this compression was effected by neatly enclosing in a piece of paper or linen, a solid plate, or a *sou*, for example, which was then slipped between the folds of the graduated compress. We justify these precautions in the eyes of the patient, by telling him that if his arm were less securely bound, the heat and activity of his blood, and the vivacity of his constitution, might expose him to the danger of having the wound reopened. We afterwards frame reasons to induce him to support this dressing from eight to fifteen days, and even to have it reapplied if there should be danger of its becoming displaced.

In case the hemorrhage does not reappear, we may possibly in this case effect a cure of the wound in the vessel. No one, however, at the present time, admits that this wound can be cicatrized without obliteration of the calibre of the artery. It is nevertheless true, that in two cases that were admitted into the hospital of La Charité, in 1836, in consequence of puncture of the brachial artery at the bend of the arm, the cure was accomplished without the pulse ever having ceased to beat in any point of the whole extent of the forearm. I may add, that similar facts have been noted by a surgeon of London, who in one case had an opportunity of proving, by dissection upon the dead body, both the actual cure of the former wound, and the preservation of the calibre of the vessel. It is nevertheless true, that, after the removal of the bandage, and even in spite of the bandage, and in the very first days, there will be found either a primary false aneurism, or one by infiltration, or a circumscribed false aneurism, or a varicose aneurism, (*un aneurisme variqueux*,) and that from that moment there is no longer any other resource than the ligature of the artery. (See *Ligature of Arteries*.) We must, however, take care that we are not deceived by false appearances. I have seen after venesection an infiltration of blood, which, though so large that it occupied the entire thickness of the bend of the arm, was cured without any bad consequences following, by the employment of compression and resolvents, (*résolutifs*,) though every one supposed it a primary false aneurism. On the other hand, I have seen the pulsations of the artery produce a thrombus so uniform, soft, and regularly elevated as to lead to the belief of a circumscribed aneurism. In another case there was a purulent collection, accompanied with a slight degree of pain, which deceived the surgeon in the same manner. [In extensive practice, especially in the vitiated consti-

tutions of hospital patients, we must not, as the author justly remarks, be surprised to find, after the utmost care as to the edge and cleanliness of the lancet, and dexterity in the manipulation of it, that more or less inflammation—rarely, however, phlebitis or the forms of erysipelas—will ensue. The inflammation, ordinarily, is that of the pure phlegmonous character from any incised wound, but it is frequently followed by more or less suppuration in the superficial parts immediately surrounding the wound, which must be treated, as in other cases, by poultices, and afterwards incision into the purulent sac.—*T.*]

I am of opinion therefore that we should, in every case, treat this accident by resolvents and methodical compression, as if it were really in our power to effect a radical cure, and that we must not resort to the ligature until after having made trial of the other means from eight to fifteen days, unless, however, there should supervene some complication of a serious character.

Bleeding in the Hand. The veins we have recourse to, under such circumstances, are those on the dorsum of the hand or of the forearm. The rule is, to puncture that which is the most prominent; but as the veins which return from the index finger and thumb to form the cephalic, and those which come from the index and middle fingers, and from the little and ring fingers, to form the salvatella, give rise to two trunks of considerable size, it is commonly upon the cephalic of the thumb, or upon the salvatella, that we perform venesection in the hand. In this case it is better, but not indispensable, to remove the ligature from the arm, and place it above the wrist. In fact, the puncture of the cephalic vein of the thumb, or of the salvatella, is wholly without danger, if we take care not to touch the subjacent tendons. We should more frequently have recourse to this mode of venesection if the veins in question always presented a sufficient degree of volume, were equally apparent in all individuals, and that we always had it in our power to abstract from them the quantity of blood desired. Unfortunately, however, this is not always the case, and it is precisely in persons in whom the veins at the bend of the arm are but little prominent, that those in the hand also are smallest.

Bleeding in the Cephalic at the Shoulder. It is in consequence of this difficulty that it has been proposed, at the present day, to make an incision of an inch in length on the forepart of the shoulder, in order to reach the cephalic between the deltoid and pectoralis-major, at the bottom of the deltoid groove. But besides the objection, that in this case the vein is accompanied by the descending branch of the acromial artery, it is situated so deep that it would be more easy, and much less dangerous, to arrive at it by an incision of the same kind in the external groove of the biceps, at the distance of three or four fingers width above the external condyle.

§ II.—*Bleeding in the Neck.*

Venesection at the neck, employed in the sixth century by Alexander Trallianus, and afterwards extolled by Paul of Ægina, and

the Arabs, was so much in vogue in the sixteenth century that Thomas Bartholinus professes to have had recourse to it a hundred times with success. Nevertheless, it is rare that it is resorted to at present. Without pretending to decide in this place if it be true that it may have more influence upon diseases of the head than bleeding by the arm, I will nevertheless give a careful description of it.

A. *The Veins that may be opened in the Neck.*

The veins of the neck that are selected for this operation are the external and anterior jugulars.

Situated between the platysma myoides and the cervical aponeurosis, the external jugular descends obliquely from the parotid region, into the supra-clavicular depression, crossing, in a very oblique direction, the outer side of the sterno-mastoid muscle; many branches of the cervical plexus surround it in its superior half. Below, where it is farther removed from nervous filaments, it receives many veins from the shoulder before it terminates in the sub-clavian or internal jugular vein.

The anterior jugular vein, which is often wanting, and which only attains to a considerable size in persons in whom the upper half of the external jugular is but little developed, descends from under the chin and lower jaw, or from the face, where it is united with the facial, obliquely downwards and outwards, to terminate in the internal jugular vein, a little below the thyroid cartilage.

The anterior jugular might be punctured, without difficulty or danger, instead of the external jugular; but as it does not always furnish the quantity of blood we wish to extract, and as we almost always have it in our power to use the external jugular itself, it is scarcely ever thought of when wishing to draw blood from the neck.

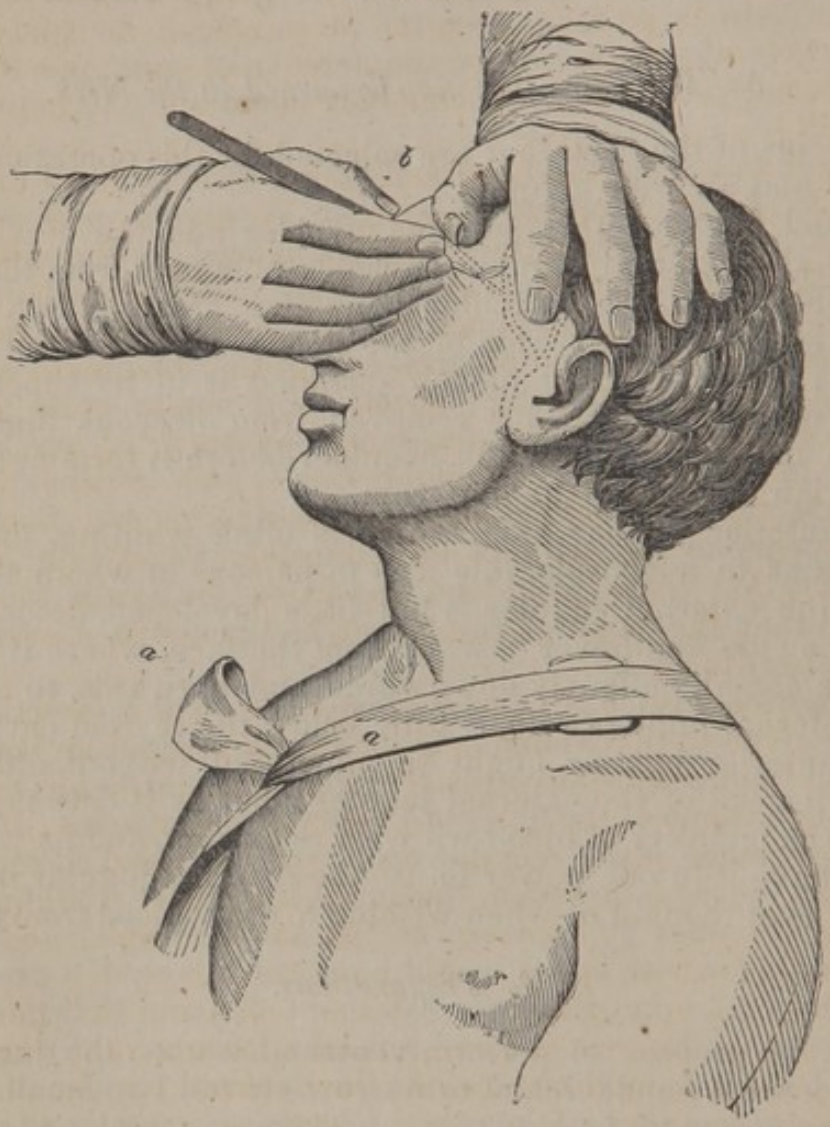
B. *Preparations.*

When we propose to perform venesection upon the jugular, we must procure a handkerchief or narrow cravat, two small bands, a square compress, some cards, or a groove of metal, and the other articles of which I have spoken in treating of bleeding at the arm. We may also, as in this last, place the patient in a chair, but it is far better to operate upon him in bed.

I. *Compression.* We commence by making pressure under the point to be punctured. This pressure may be effected in different ways. The machines invented for this purpose are entirely useless. The most simple mode is, to place a graduated compress of some thickness upon the lower part of the vessel in the supra-clavicular depression, and to cover it by the middle of the cravat, or a narrow band, whose extremities are attached by means of a knot under the axilla of the opposite side, (Fig. 153 *a*,) or held tight in this direction by an assistant. We obtain the same result by causing pressure to be made upon the vein by the thumb of another person, or by compressing it ourself below the point we wish to puncture,

while the skin is made tense above by means of the index and middle fingers. M. Magistel, who has published a very good treatise upon bleeding, sometimes effects this compression by means of a porte-cachet supplied with a pelote; but it is evident that the finger of

(Fig. 153.)



the operator, or a cravat, or the extremity of a band, or a riband, passed from the supra-clavicular region to the hollow of the opposite axilla, perfectly accomplish the object in view, while they interfere as little as possible with the operation itself. If the vein should not be sufficiently swollen, we should cause the patient to move his jaws as in mastication.

C. *Puncture of the Vein.*

There are, in fact, many reasons for opening the external jugular in its lower half, rather than in the neighborhood of the parotid region. First, it is generally smaller above than below; again, it is at that part of it near the os hyoides where it is most surrounded with nerves; nevertheless, we should not puncture it at the ex-

treme lower part, as it might then be difficult to make pressure below, and the branches of the cervical plexus here again surround it at this point. We make choice, moreover, of the right or left side, as in the arm, according to the convenience of the surgeon or patient, or according to the size or prominence it presents upon one side rather than upon the other. [A convenient point is where the vein is passing over the sterno-cleido-mastoid muscle, first, because the vein can be rendered more prominent in this point; secondly, because you can here command the hemorrhage better.—*T.*]

The patient, having the head and face a little inclined to the opposite side, being properly supported by alèzes, and with the shoulder a little depressed, the surgeon, placed on the side of the bed, stretches the integuments and the vein with the left hand, takes the lancet in his right, and punctures the vessel with the same precautions as in bleeding by the arm, except that he makes a wound a third larger. Some authors recommend not to cross the vein from one side to the other, for fear, say they, of producing a thrombus in the deep-seated cellular tissue, and causing there inflammation, purulent collections, abscesses, &c.; but these fears are, it appears to me, without any plausible foundation, and I do not believe that there would be any cause for alarm, though we had found that the point of the lancet had penetrated even to the aponeurosis of the neck.

The question also has been discussed, as to the direction that should be given to the wound. If made obliquely, from below upwards, and from within outwards, this wound would divide, nearly at a right angle, some of the fibres of the platysma-myoides; in which case the puncture easily remains open, and the blood flows freely. Made in an opposite direction, the cut of the lancet would pass between two bundles (*faisceaux*) of the same muscle, and would make a wound whose edges would have, as it is said, a great tendency to become approximated. Without denying that there may be truth in the substance of these remarks, I ought, nevertheless, to say, that having sometimes opened the external jugular in one direction, and sometimes in the other, I have never seen that there was any great difference in the result. However, I would not advise the preliminary incision and use of the bistoury, as spoken of by M. Magistel.

D. *Flow of Blood.*

As soon as the vein is opened, and while the pressure is continued, the surgeon deposites his lancet in clean water, and receives the blood directly into a basin, if it issues out in an arc; or if, as is most frequently the case, the blood dribbles out slowly, (*coule en bavant,*) he places under the puncture the extremity of a card, curved in the form of a gutter, to conduct the fluid into a basin, or any other vessel. If, after having begun to run, the blood should appear to stop, we should cause the patient to have recourse to the move-

ment of mastication, or, at least, we should endeavor to remove the difficulties which have thus retarded the flow of the blood.

The desired quantity of blood being once obtained, we remove the pressure and then apply the thumb on the puncture, in order to give time to wash and wipe the parts soiled by the blood. Without recurring to adhesive plasters, which endanger erysipelas, or to the suture, which would be more painful than the bleeding itself, we apply, instead of the thumb, a small graduated compress, as in bleeding at the arm. [Nevertheless, there can be no objection to adhesive plasters, decidedly the most to be relied on here, and almost in all cases, for dressing of wounds, to keep the compresses firmly and securely attached. Infinitely preferable, we should deem them, to a folded cravat or kerchief.—*T.*]

The best containing bandage in such cases is a cravat, the middle of which is placed on the sound side of the neck, crossed on the graduated compress, and its extremities attached under the opposite axilla. On the next day, or the day after, the bandage may be removed. We must take care not to make any pressure upon the air passages.

E. The *accidents* to which we are exposed in puncturing the external jugular vein, are, as in that of the arm, the missing of the vein, (*la saignée blanche*,) thrombus, puncture of the nerves and lymphatics, and different kinds of inflammation. Nevertheless, we have here neither tendon nor large artery to disturb us, but it is one of those veins by opening into which many persons think atmospheric air may be introduced into the heart and kill the patient. It is for that reason it is recommended not to remove the pressure from it until at the moment when we apply the graduated compress to the puncture, and also that we should apply this compress from below upward, before raising the thumb.

Phlebitis and phlegmonous erysipelas would be attended here with yet more dangers than in the arm, because of the neighborhood of the chest and heart.

§ III.—*Bleeding in the Foot.*

Like that of the jugular, bleeding in the foot, so frequently in use even in the last century, is now scarcely ever employed, notwithstanding the exertions made by Leroy and Fretau in its favor. It is rarely any longer resorted to but for some congestive affections of the head or uterus. It is, moreover, designated by an incorrect name, for the puncture is almost always made on the veins of the leg, and not on those of the foot.

A. *Veins.*

We might, in truth, open, in almost any part of it, the great venous arcade, which runs from the roots of the toes to the internal malleolus, after the manner, in some degree, of the cephalic from the thumb, and towards the external malleolus after the manner of the salvatella; but, if we performed venesection upon this, it would,

in general, yield but too little blood. As in the hand, so in the foot, we do not bleed there, except where we have no other resource.

The *internal saphena*, situated between the integuments and the tibia or aponeurosis of the leg, is accompanied, also, from its origin to the knee, by the nerve of the same name. It is rare that we find it behind the malleolus, but almost always situated at its commencement, on the inner or anterior surface of this eminence.

The *external saphena*, ordinarily of less size than the internal, and generally more irregular, is situated at first nearly between the tendo-Achillis and the fibula, ascending from thence towards the ham, where it receives, from the upper and posterior half of the thigh, a long anastomosing branch before it terminates in the popliteal vein. It is likewise accompanied by its nerve of the same name.

B. *Operation.*

To bleed in the saphenas, we require a ligature and most of the other articles already mentioned, but we require, moreover, a suitable vessel and hot water for a foot-bath. This venesection is more easy in the evening than in the morning, or in persons that have taken some exercise than in those who have not left their beds during the day.

The patient may be seated in a chair or an arm-chair, or upon the edge of the bed; this last position is the most convenient for all. We commence by placing the limb we wish to bleed in the hot water up to the beginning of the calf, in order to produce a congestion in that part, and to render the veins more prominent. The surgeon then arranges his dressings; at the end of some minutes he removes the limb from the bath, examines the veins, and applies the ligature. Between the calf and the knee, or above the knee, this ligature produces less effect than at three or four inches above the malleoli.

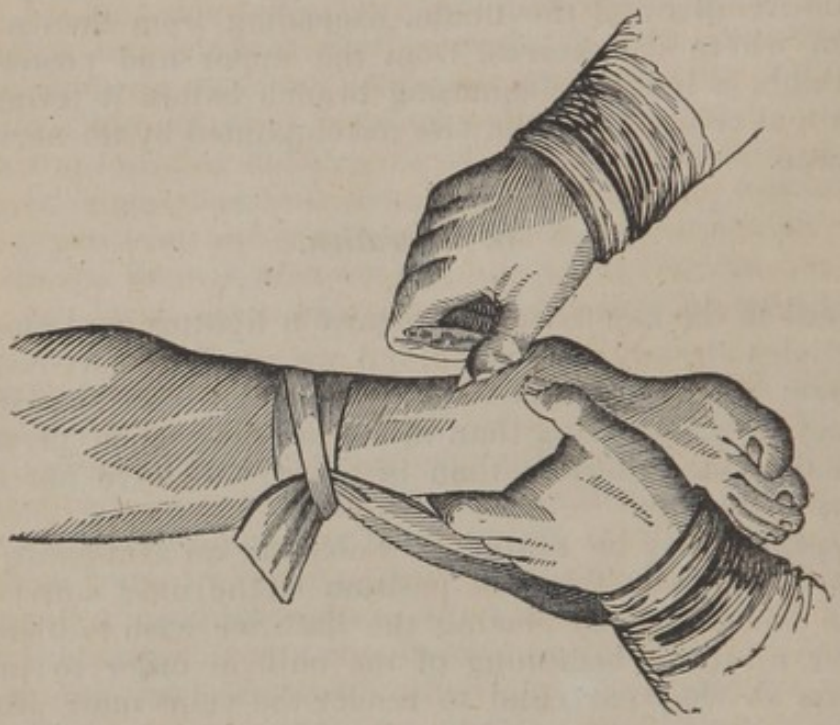
After having properly compressed the parts by a double turn of the bandage, we fasten this ligature by a knot, outside if it is the internal saphena vein, and inside if we wish to open the external saphena. We immediately replace the foot in hot water; after which the surgeon seats himself in front upon a stool, provides himself with an alèze folded four or eight times, places his lancet in his mouth, withdraws the foot of the patient and fixes it upon his knee, carefully wipes it, as well as the lower part of the leg, causes the knee to be held by an assistant, fixes the vein with the thumb of the left hand at the point where it appears most easy to open it, and punctures it (Fig. 154) with the right hand if he operates on the right leg, as has been said in speaking of the other modes of bleeding, taking care to make the opening rather large than too small.

Whether this vein be opened transversely, obliquely, or lengthwise, it nevertheless gives rise, occasionally, to a jet of blood in the form of an arc at first, while at other times the blood from the very

beginning runs with difficulty. If it runs in a jet, we receive it in a vessel, as in bleeding at the arm; but if, what is infinitely more common, it escapes dribblingly, (*en bavant,*) we immediately replace the foot in hot water, so that the puncture may be found at a short distance below the surface of the liquid.

That the bleeding may not be arrested too quickly, we rub the part from time to time with the finger, or with linen, with the view

(Fig. 154.)



of preventing the formation of clots within the lips of the puncture. We cause the patient, moreover, to move his toes.

In short, we cannot in this manner ascertain but very imperfectly, and that by means of the greater or less discoloration of the water or of the linen that we place in it, the quantity of blood abstracted.

When we wish to stop it, we remove the ligature, bring back the foot to the knee, place the thumb on the puncture, wipe the limb with care, remove the foot-bath, apply a small square compress, then fasten it by means of a figure of 8 bandage, which surrounds the tarsus or the instep by its anterior loop, and the lower part of the leg by its upper loop; the figure of 8 being terminated by one or two turns and a double knot or pin on the side opposite to the wound. It is this bandage which we designate under the name of *stirrup*, (*étrier.*)

C. *Accidents* from bleeding in the foot are almost all referable to a wound of the saphena nerves. We cannot, in fact, wound the arteries but in consequence of anomalies difficult to foresee.

The size of the internal saphenus nerve, and its intimate relations with the vein, are such that it is almost impossible to avoid it. Though many accidents imputed by Sabatier and others to the

wounding of this nerve, may be referred to inflammation of the lymphatics, or of the sub-cutaneous cellular tissue, if not to that of the vein, it is difficult, however, not to admit that puncture of the nerves of the leg has been sometimes followed by accidents of a serious character. The symptoms, as in the arm and neck, would be pain, convulsions, &c. For these, also, we must use similar remedies. Erysipelas, and all other kinds of inflammation, are infinitely more easy to control when they are the result of this kind of venesection than of the others. But an accident which is peculiar to it, is the puncture of the periosteum and the breaking of the lancet. I do not, however, think that the first of these accidents merits all the importance which has been ascribed to it. As to the second, it may doubtless happen, but it is rare. We should remedy it immediately, by enlarging the wound, and proceeding to search for the point of the instrument with a forceps. Left in the tissues, this small foreign body could cause at most only a phlegmonous inflammation there, and afterwards a small abscess, which would ultimately cause its separation from the parts.

§ IV.—*State of the Blood drawn from the Veins in Bleeding.*

When patients are bled in the arm, the blood being received and preserved in a vessel, may be examined at leisure, for the space of twenty-four hours. At the moment it escapes from the vein, we often hear the patient, or the persons who surround him, cry out, that it is *thick*, *clear*, *lively*, (*vif*,) or *altered*, according as the jet is more or less rapid; but without denying that its greater or less degree of coagulability, or plasticity, (*plasticité*,) may insensibly narrow the aperture of the vein and retard the jet from it, the surgeon ought not, however, to accord any degree of importance to these common expressions. When the blood is deposited in the vessel, it takes on a variable aspect, according to the nature of the patient's disease, and also according to the manner in which it has flown. Thus, the blood of an individual perfectly healthy will remain red and vermilion, while that of a pleuritic patient, or one affected with rheumatism, will present a coat of yellowish fibrine two to three lines thick; and that of an individual laboring under typhoid fever will remain fluid, (*diffluent*,) greenish, or of a variegated black color. We must recollect, besides, that, in the same diseases, this aspect will not be the same when the blood is drawn by a small orifice as when it issues through a large one, or when it dribbles out as when it escapes by a continued jet, or when it is received into a flat, wide vessel as when it falls into a narrow and deep palette. [Nevertheless, most important deductions in practice are, in our opinion, to be made from these appearances of the blood drawn, which are independent of any contingencies of the shape of the vessel used, &c. These are, its dark or bright color, and its inspissation or attenuation—in other words, its thick, glutinous, fibrinous character, in plethoric, robust habits and entonic inflammations, causing almost its immediate and entire coagulation and consolidation, in a few

minutes, throughout its whole substance; or its limpidity, or fluid, thin, and watery appearance in dropsy and adynamic fevers; its coal-black color, tarry consistence, and highly carbonated condition, where respiration and decarbonization are defective, as in phlegmatic temperaments and sedentary persons that feed well; also, its bright, frothy, sparkling, vermilion, arterial color and natural consistence in the sanguine temperament, and when the lungs are large and expanded, and much exercise is taken.—*T.*]

§ V.—*Bleeding in certain particular regions.*

Besides the veins of the arm, neck, and foot, the ancients bled, also, in those of a great number of other regions—the *occipital* or *auricular*, the *frontal*, the *angular* of the orbit, the *nasal*, the *sublingual*, and the *dorsal* of the penis, for example; but now, and since the discovery of the general circulation of the blood, we never scarcely use this mode of venesection, so much lauded by the Greek physicians, and especially by Marcus Aurelius Severinus. Perhaps, in truth, it has been rejected in too summary a manner. For my part, I am not convinced that bleeding in the veins in the *forehead*, or in the *vena preparata*, and in the veins of the *mastoid region*, has not some advantages in inflammations of the scalp, (*cuir chevelu;*) nor that that of the *angular* vein, which is continuous with the ophthalmic in the orbit, is devoid of efficacy; nor that the bleeding of the *ranine* veins in diseases of the tongue, those of the *scrotum*, *penis*, *knee*, and, in general, of the veins nearest to the diseased part, ought not, in many cases, to be preferred. M. Janson, in the present day, has extolled these modes of venesection, and I have often employed them with very favorable results.

In conclusion, we perform bleeding of the *vena preparata*, or of the forehead, by compressing the vein with the thumb between the two eyebrows, while we puncture it on the point where it is most conspicuous. The *vein of the large angle* of the eye, communicating with those of the orbit and face, would have to be compressed near the caruncula lachrymalis, and on the root of the orbitar process, if we wished to arrest the course of the blood there. When we open the ranine veins, we must puncture them rather in the direction of the lower wall of the mouth than of the proper tissue of the tongue, if we would avoid with certainty the arteries of the same name. The dorsal veins of the penis, which are ordinarily of sufficient size, should be compressed posteriorly near the symphisis pubis; those of the scrotum, and those which run upon the surface, either of the joints or certain tumors, having no fixed course, should be distended and punctured after the manner of simple varicose veins.

In all these varieties of venesection we must, if we wish to draw a certain quantity of blood, expect to be obliged to puncture several veins successively, or the same vein in many places. It is for this reason, doubtless, that almost all practitioners at present substitute leeches in the place of this operation.

Article II.—Arteriotomy.

It appears that bleeding by incision of the arteries was in use at the time of Hippocrates, Celsus, Galen, and Aretæus; and a great many surgeons continued still to practise it in the fifteenth, sixteenth, seventeenth, and even eighteenth centuries. At the present day it is almost entirely abandoned; and I much fear, in spite of the reasons urged in its favor by MM. Larrey and Magistel, (*Traité Pratique des Emissions Sanguines*, Paris, 1838, p. 44 et suiv.,) that arteriotomy will remain in the oblivion into which it has in reality fallen. No one, for example, will venture to return to bleeding by the radial artery, nor to that of the arteries of the tongue. Arteriotomy, even in the mastoid region itself, will not be reinstated in favor, and that of the temporal region is the only one that has any chance of being preserved.

The temporal artery, in truth, is of sufficient size to furnish a suitable quantity of blood. Situated superficially between the skin and aponeurosis, supported by bones rather than by soft parts, and separated from every important organ, it may be opened without difficulty, and afterwards compressed with the certainty almost of effecting its obliteration. The objection, however, is the danger of an aneurism succeeding to the puncture, as has often happened, and of experiencing difficulty in arresting the blood, or of finding the bleeding stop of itself before having furnished the desired depletion, and also the chance of obtaining as good a result by the simple opening of a vein. If, however, it should be thought necessary to recur to the opening of the temporal artery, we must not open the trunk of this artery immediately above the zygomatic arch in front of the tragus or helix, but one of its branches on the side of the forehead, about fifteen lines anterior to the meatus auditorius. There, in fact, the artery is nearly outside of the temporal muscle; it is prominent under the skin, its pulsations are easily felt, and it rests almost immediately upon the bone; if its anterior branch should seem of sufficient size, the operation in fact may be performed much farther in front, and on a line with the external orbitar process. In every case we require a strong lancet, or a bistoury, a long narrow band, a graduated compress, and the other articles necessary in bleeding at the neck.

The patient, lying down or seated, ought to have his head held to the opposite side; with the left hand the surgeon fixes the artery, while with the right, armed with the instrument, he divides it; in order to render the vessel more conspicuous, the patient, if he is not in a state of unconsciousness, should be recommended to press his jaws tight together. The lancet is inserted transversely or obliquely, as in venesection. If, however, the bistoury is used instead of the lancet, it is equally important to make it penetrate from the integuments to the artery, (Fig. 153 *b*,) and also from the deep-seated parts to the exterior, as when we puncture, the important point here being to cut the vessel completely through in

the place of performing a simple puncture. As soon as the artery is opened, the blood ordinarily leaps out with force ; it is received either directly into a vessel, or by the aid of a card or gutter of tin; if it stops too soon, we wash the puncture with tepid water, in order to detach the clots from it. When the bleeding is terminated, the artery is compressed above and below with the thumb and index finger of the left hand; the parts are washed and wiped ; the small square compress is applied, and then compression is made, either with the packer's knot, (*le nœud d'emballeur*,) which patients generally support badly, or, what is better, by means of some turns of the bandage, properly applied. I do not think that the suture or torsion should be used here in the beginning. The accidents from opening the temporal artery are reduced, in fine, to the possible formation of an aneurism, or to the puncture of some nervous filaments. [A small globular, superficial, purple-colored aneurism, with a thin cuticular pellicle for its sac, and of the size of a pea or hazelnut, may form, it is true, immediately after the cicatrix is completed ; but it is generally perfectly cured, and the artery in this part effectually obliterated, by well-directed compression, persisted in for several weeks, or even months, in spite of occasional rupture of the sac and hemorrhage, which may alarm the young surgeon. I have not, in any of those cases, found it necessary to recur to a ligature.—*T.*]

Article III.—Local Bleeding.

We generally give the name of local or capillary bleeding to that of the small vessels, when performed as near as possible to the diseased region. It is a name, however, but little suitable to it, for bleedings at the anus for diseases of the abdomen, those at the epigastrium, and at the parietes of the thorax, for affections of the stomach and lungs, those at the neck for diseases of the encephalon, are full as much general bleedings as those by the arm.

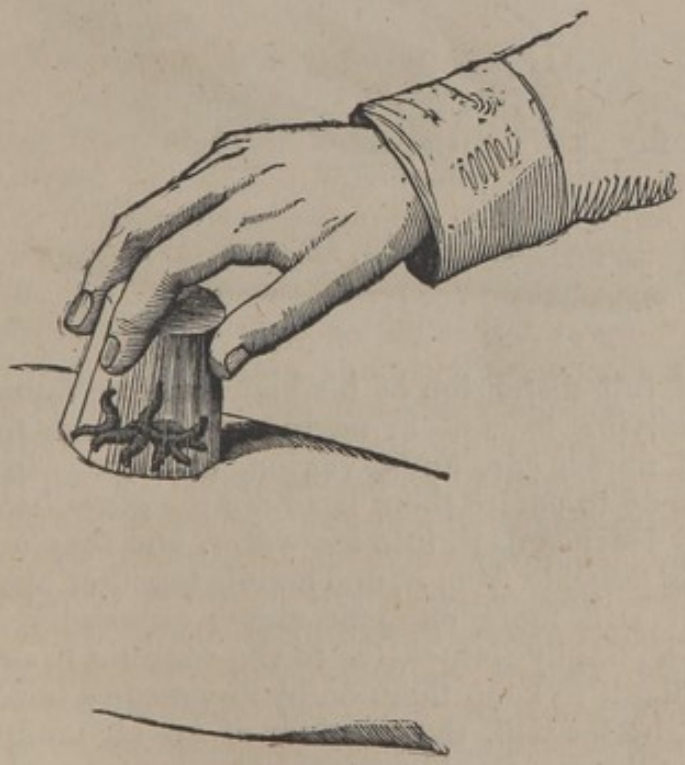
The name of capillary bleeding is not much of an improvement in expressing the idea of the practitioner, for there are local bleedings performed on small veins (*veinules*) that are too large to retain the name of capillary. It must be conceded, then, that the term local bleeding, whatever be its object, should be applied to the opening of vessels too small to give egress to a large quantity of blood. This bleeding is effected by means of leeches, the lancet, bird-peck punctures, (*des mouchetures*,) or scarifications.

§ I.—*Leeches.*

A. The leech is an animal of the family of hirudo, and employed in medicine from almost immemorial time. The best are the leech termed *medicinal*, of a greenish hue, and marked with six narrow iron-colored bands, and the officinal leech, whose color is browner, and whose longitudinal bands are of a rusty tint.

B. *To apply* leeches, the part must be previously washed, and sometimes even besmeared with sweetened water, milk, or blood. When the leeches are hungry and sprightly, all these precautions are unnecessary. On the contrary, if they do not incline to bite, we may heat them or dry them by rolling them between folds of dry linen, so as to excite them gently. Also, we apply them sometimes singly, or in mass. In the first case, each one is seized by the fingers, either naked or between linen, so as not to lose hold of them until they are well attached. Some persons, as M. Magistel and others, seize them near their posterior extremity with a forceps, and force them thus to fasten themselves on any part we choose. The pupil should know that the leech, by its vermicular movement and unctuous coat, slips through the fingers with remarkable facility. In the second case, we make use of glasses or the hand, holding the leeches in a piece of linen. The small liquor glasses [wine-glasses] are preferred for circumscribed regions, or when we do not wish to apply but a small number of leeches. The tumbler, (*le verre de cabaret*,) on the contrary, is used, if we have a large surface, and wish to apply from ten to fifteen leeches. These animals, placed in the glass, and having no other exit, are obliged to fall back upon the living tissues, (Fig. 155,) and rarely fail to attach

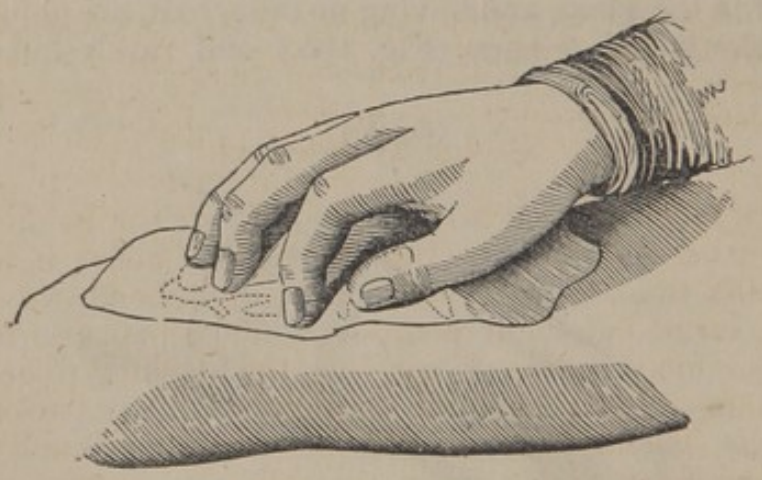
(Fig. 155.)



themselves in a very short time. Sometimes, however, they remain, as if asleep, near the bottom of the glass, and do not detach themselves from it unless we apply some cold substance. Even though the leeches bite well under the glass which covers them, there results, nevertheless, the inconvenience of the punctures being too

nearly approximated together, if we use a small glass, or, if it is a large glass, of having them frequently collect, as in a circle, around its circumference. But we use, generally, the hand, provided with a piece of linen, instead of the glass of which I have just spoken. The leeches are then gathered into a compress, in order to apply them immediately to the integuments, in such manner as to keep the linen moderately pressed around all that part of the skin which the leeches occupy, (Fig. 156.) If this precaution were not taken, the leeches would soon escape, and would be lost by creeping about in all directions. The small *cuvette* of silver wire, in form of an egg-stand, which some persons have devised for this purpose, is a useless contrivance. The fingers, the forceps, the glass, and the hollow of the hand, provided with linen, are accessible to all and always sufficient. [When these usual modes, however, fail, as they too often do, a glass tube, with a narrow aperture, through which the leech can merely protrude his mouth, (that is, his pointed extremity,) while a bulge in this part of the

(Fig. 156.)



tube admits of full distension of his body, will be found useful, especially in applying leeches in narrow passages, as to the tonsils, tongue, gums, nares, ear, anus, vagina, &c., &c. In all cases, a sovereign remedy to excite them is, to dip the glass, before using it, or placing the leeches in it, into ice-water, and they are soon glad to get as far as possible from it, and huddle together upon the warm skin. Another still more efficient mode, especially in applying leeches to loose, flabby tissues, (as to the scrotum in orchitis, &c.,) where it is difficult to keep them on by any means, is, to use a cupping-glass, or, better still, the receiver of an air-pump, and after exhausting it till considerable congestion is produced, put on the leeches, and a gentle stroke or two more of the pump, compelling the leeches to look to the blood for the supply of oxygen to their spiracles, will make them seize greedily hold of the minute vessels. A mode to induce them to bite, recommended recently, is that of placing them in beer or ale before applying them. —*T.*]

It is also unnecessary to apply leeches one by one, but upon certain regions, or upon some cavity lined with mucous membrane, for example. We know when the leech is attached by his distension and the suction movement of his pump, as well as by the pain he causes. The time he requires to fill himself varies from half an hour to an hour and a half. They increase to three, four, or five times their bulk. If the leeches do not fall off of themselves, we may easily loosen their hold by sprinkling them with salt, tobacco, or, better still, with ashes. To remove them by force, or by pressure on the skin, would endanger tearing their mouths and leaving in the tissues some particles of their cupping apparatus, (*ventouse.*) Persons who have recommended cutting off the posterior extremity of the leech, to make the blood run more abundantly, forget that this operation causes the animal to fall off immediately. Running a thread through his tail, in order to have better command of his movements, would incur the risk of preventing him from biting, and perhaps soon cause his death.

Each leech draws from two to four gros of blood.* There flows as much, also, sometimes from the puncture ; but I do not know what credit to attach to the assertion that the leech abstracts *two and a half* times his weight of blood.

C. *To stop the Bleeding.*

In all cases when the leech has come off, we are in the practice usually of letting the puncture flow for half an hour; if, at the expiration of this time, there is nothing to apprehend, we cover the part with a large emollient poultice, which thus absorbs the remainder of the blood ; if we do not wish the bleeding to be copious, or if it continues beyond the time required, there are various means of checking it. The first of these consists in covering each puncture with small pieces of *agaric*, or in sprinkling them with *colophane*, *ashes*, or *spider's web*. *Styptics*, such as *vinegar*, *eau de Rabel*, *creosote*, or a *very hot compress*, might do equally well, aided by a certain degree of pressure.

Sometimes the hemorrhage resists these first measures, so as to endanger the life of the patient, especially in infants. In that case we may recur to *cauterization* with the *head of a probe*, or with the *bird-beaked cautery*, (*cautère en bec d'oiseau.*) The crayon of nitrate of silver has always answered with me, in uniting compression with it. This crayon, cut in the form of a cone, should be applied by its apex into the puncture, and held there one or two minutes. As the blood immediately tends to spread the caustic, it is advisable to substitute quickly, in place of the lapis infernalis, a small hard ball of lint, and small pieces of agaric, or very narrow graduated compresses, and to press on these objects with the thumb until the blood ceases to flow. We are yet more certain to succeed by compressing the contour of the puncture

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[* See the measure of a *gros* above.]

with a ring, while we cauterize as above. It would not be practicable to apply the *suture*, or to seize the two sides of the wound and *strangle them between the branches of a forceps*, but in a small number of cases, and they are means still less to be relied on than those I have just mentioned. I cannot say that a cupping-glass, applied upon a part that the leeches have quitted, will avert all the hemorrhage, by filling all the punctures with clots, as M. Ridolfo believes. For myself, I do not believe this kind of hemorrhage can resist compression, cauterization by nitrate of silver, the employment of the small ring, or the red hot iron methodically applied. [The *most efficacious* and *certain mode* of *putting a total stop* to the exudation of the blood, which is often alarming in infants, for example, in leeching the neck for croup, &c., where pressure cannot be made without strangling the air-passages, is to pass a fine needleful of delicate but strong white silk thread, with a fine sewing-needle, through the lips of the puncture once or twice, as in taking up a stitch, and then fastening the ligature with a firm knot. It is done in a moment, and the bleeding is instantly stopped, creating much surprise to the alarmed friends and bystanders. This delicate and easy operation may be performed upon all the punctures that continue obstinately to bleed, though that is not generally the case with more than two or three at most. I am indebted for this ingenious and important suggestion to Dr. Richard K. Hoffman of this city. In reference to M. Ridolfo's recommendation of the cupping-glass to check the blood, it will be seen, in our previous note, that the effect is and must be, by its suction, directly the reverse. Torsion might sometimes answer, were it not for irritating too much the already inflamed puncture. It is to be remarked, says Dr. Mott, that in infants it is sometimes next to impossible to apply the stitches as above mentioned, but that a more easy and quite as effectual a mode is, to insert a delicate needle across the perforation, and then to fasten it there and draw the aperture together by the figure of 8 twisted suture.—*T.*]

D. *Preservation of the Leeches.*

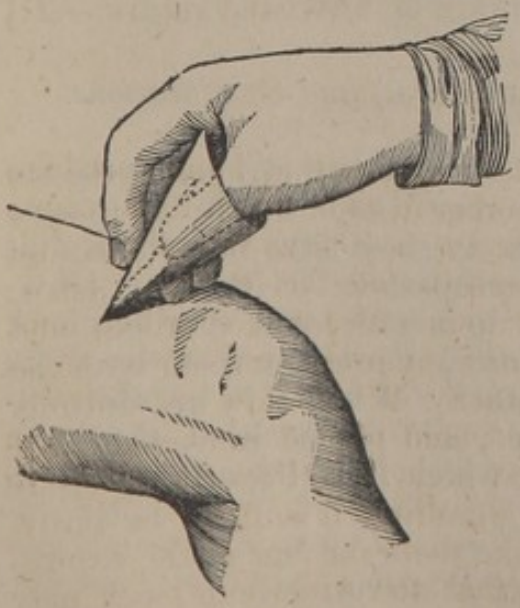
When the leeches have fallen off, it may perhaps be advisable to preserve them, to be used at another time. There are many methods employed to effect this, but the best is to throw them on the hearth, and to allow them to creep there on the hot ashes. That is much better than sprinkling them with tobacco or salt, and especially than disgorging them by force, by pressing them with the fingers from one extremity to the other. When they are entirely empty they are cleaned and washed, and placed in vessels half filled with water, which are changed every three, four, five, or six days. To preserve them in large quantity, it suffices to throw them into large basins, and not to take them out but at the expiration of some months. [It is stated that the American leech may be depended upon for doing its duty, if it be kept previously in distilled water.—*T.*]

Punctures from leeches do not generally require any care; if they are not irritated, nor their scabs torn off, a period of two to four days is sufficient for the cure. They are, however, sometimes the cause of erysipelas, angioleucitis, and small abscesses.

E. *Regions of the Body where Leeching may be Applied.*

With the exception of the track of the arteries, or of the large subcutaneous veins, as in the limbs and neck, we may apply leeches to every part of the body; we must also add, that we may, by avoiding the vessels themselves, apply them without any inconvenience to the limbs. Thus, we place them upon the large angle of the eye, the temple, and the mastoid processes, for ophthalmias and cerebral affections; to the anus, pudenda, and groins, for diseases of the abdomen and genital organs; to the epigastrium, for affections of the stomach; on the entire abdomen, for inflammations of that cavity; and generally to every part where the blood appears to have accumulated. At the angle of the eye we apply them by a small glass, or place them on one by one. On the skin of the eyelids they occasion often a considerable swelling, which must not alarm us; upon the inner lining of the lower eyelid it is also necessary to apply them in succession, and in such manner that they do not puncture too near the ciliary edge of the organ. In that place it is rarely advantageous to employ more than two or three at a time. Moreover, they occasion but little pain there, and fill themselves quickly. It is when we apply them to the nares, tonsils, and gums, that we may require the forceps to hold them, or we may make them pass through a cone of glass, or a piece of card rolled up in the shape of a trumpet. The card is in my opinion the best. The beak of it, being of sufficient width to allow the mouth of the leech to pass through it, ought not to be so large as to allow the animal to escape entirely from it. Applying thus the apex of the card to a convenient spot, the leech is directed by means of a ring, or by the finger, (Fig. 157,) as by a sort of piston, and we have then no fears that it can escape. To the anus leeches ordinarily attach themselves very quickly; to prevent their getting into the intestine, it has been recommended, uselessly, as I think, to plug up the anus by means of a small tent of oiled linen. To apply them to the neck of the womb we make use of the speculum, and the entire speculum (*spéculum plein*) is preferable. The instrument being adjusted, the leeches are placed in it, and

(Fig. 157.)



are forced along, or of themselves soon make their way to the os tincæ.

F. *Leeches Internally.*

If it should happen, as in certain instances it is said to do, that the leeches have escaped into the rectum, we should destroy them there by means of injections of salt water or tobacco infusions. If they should have got into the œsophagus, or even the stomach, we must in that case also have recourse to salt water. Tobacco fumes and vinegar would be less efficacious. In the larynx or trachea, the accident would be more formidable, and we should be obliged to have recourse to tracheotomy. [In conclusion, we consider the glass tubes with a bulge at one extremity, as described in a note above, preferable to a trumpet of pasteboard, wine-glass, or any other contrivance.

Consequences of Leech Bites. Among the most formidable in appearance, and slightly alluded to by the author, is the abundant serous effusion, or sub-cutaneous œdema, which their suction power, communicated to the capillaries in all loose, flabby textures, occasions, giving rise to a tumefaction apparently alarming, as (when applied to the eye) in the whole face, resembling a sudden attack of erysipelas, closing up the eyelids, and causing much uneasiness, from the dryness, tension, and heat of the stretched dermoid tissue. So in the scrotum and penis, causing in the latter, sometimes, an œdematous inflammation, or even phymosis or incarceration of the glans, more serious than the original disease for the removal of which they were employed. In all such cases, a mild emollient, cooling lotion, such as of pulverized slippery-elm bark solution strained, or flax-seed, and afterwards a very weak solution of lead-water or diluted ether and alcohol combined, as in true erysipelas, are all that is required in addition to saline purgatives and abstinence.—*T.*]

§ II.—*Bird-Peck Punctures* (*Mouchetures*) *and Scarifications.*

Leeches, while they draw a certain quantity of blood, produce an irritation which many physicians regard as of much importance in local bleedings; and there are many physicians who think that no other kind of bleeding can be substituted for leeches. However that may be, the bird-peck puncture and scarifications, which also have the effect of irritating the tissues, at the same time that they allow a certain quantity of blood to be abstracted, have often been prescribed in place of leeches: they are, however, two different operations, which it is important not to confound.

A. *The Bird-Peck Puncture.*

The name of *mouchetures* is given to those simple prickings per-

formed on the integuments, with the view of unloading the parts of the fluids that may have stagnated, or been infiltrated into those tissues. We have recourse to it in cases of serous infiltration, whether of the limbs, trunk, scrotum, or penis, in individuals affected with anasarca, or local cellular dropsy. We recur to it in some cases of congestion or sanguineous engorgement of the conjunctiva, nares, tonsils, tongue, inside of the mouth, and even in the treatment of certain kinds of erysipelas. To perform these punctures, there is no need of needles, nor any other special instrument; the ordinary lancet, directed perpendicularly (Fig. 158) upon the tissues, and drawn back in the same manner, after having been quickly plunged into them to the depth of a line or two, always suffices. The punctures performed in this way should be numerous and made with rapidity. The only inconvenience they present is that of exposing to the risk of erysipelas, and of thus causing in debilitated and dropsical patients (*individus anémiques ou infiltrés*) inflammations which sometimes speedily pass into gangrene. [The most convenient and speedy way of making these punctures is with the lancet open, at an acute or right angle, upon its handle, which latter is held lightly between the thumb and fore-finger, placed near the extreme point of the handle, so as to have a better lever. This is the origin of the term bird-peck puncture.—*T.*]

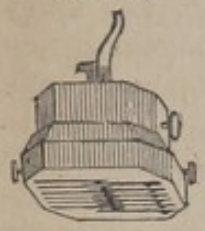
(Fig. 158.)

B. *Scarifications.*

I do not mean here the puncturings made directly into the small veins which are often seen on the surface of diseased regions, or on certain tumors: this is a kind of local phlebotomy. The scarifications, which are actual incisions, and not simple punctures, constitute one of the most ancient modes of bleeding. They were in use at the time of Galen and Oribasus, for we remark in these authors that Antylus, for performing them, was in the habit of using a scarificator with many blades. From those remote times scarifications have never been entirely abandoned. If, to effect them, we no longer use a sharp-edged shell, flints, or stalks of wood, there are still employed particular kinds of scarificators for the conjunc-

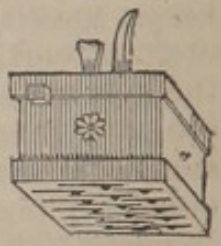
tiva, interior of the nares, or urethra, or for the cutaneous surface. The German scarificator, (Fig. 159,) the English scarificator, that which the manufacturer Charrière (Fig. 160) has modified, or that of M. Larrey, (Fig. 161,) are the only ones which deserve to be re-

(Fig. 159.)



(Fig. 161.)

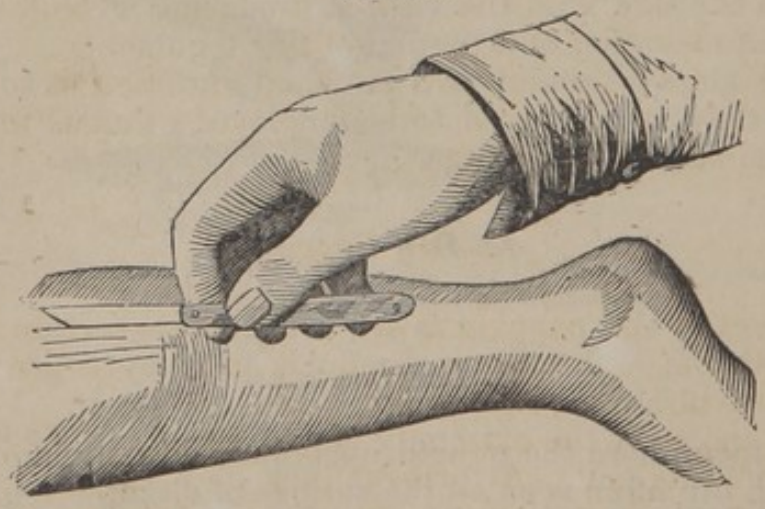
(Fig. 160.)



tained. Moreover, the lancet, bistoury, or razor, or the fleam (*flamme*) of veterinarians, suffice for all cases.

Scarifications are sometimes intended as a substitute for bleeding or leeching; at other times to subdue certain inflammations. In the first case they are made, indifferently almost, with the lancet, bistoury, or razor, instruments that should be held like an arc, or in the fifth position, and which ought not to penetrate over half a line in depth, and should be drawn rapidly across the skin from space to space, (Fig. 162.) In the second case, we scarcely use other than the bistoury. In that case, it is generally advisable to penetrate to the sub-cutaneous layer; for these are true incisions, from one to two inches in length, which we make at a distance of twelve

(Fig. 162.)



to fifteen lines apart, upon regions affected with phlegmonous erysipelas, or infiltrations tending to gangrene. In these cases the convex bistoury should almost always be preferred. If we incline to employ the razor for scarifications, it is advisable to use that which ends in a rounded extremity. When we employ the scarificator, it is first necessary to make its blades recede into the box by turning the spring of the instrument. This being applied upon the skin, we press upon the button which makes the spring act, and the

blades immediately cut into the skin by moving in the arc of a quarter-section of a circle. In this way the twenty scarifications are made at once, and the operation is over in an instant. But we penetrate always to the same depth, whatever may be the region which requires to be scarified, and we obtain in this manner punctures rather than true scarifications. With the razor, lancet, or bistoury, on the other hand, we make incisions as superficial, long, or deep, and as few or many, as we may desire. With some practice, we may execute them almost as rapidly as with the scarificator; and young surgeons, moreover, find in this exercise an excellent means of familiarizing themselves to the handling of the bistoury.

The use of the scarificator, then, should be reserved for patients who are exceedingly timid, and for intractable persons, or such as cannot be reasoned with.

The scarifications do not require any particular treatment afterwards. They are small wounds which cicatrize immediately, and which, moreover, could not require any other attentions than those given to wounds in general.

§ III.—*Cupping-Glasses.*

After the leeches have dropped off, or when we have performed puncturings or scarifications, we sometimes wish to prolong the flow of blood by applying a cupping-glass to the wounded part.

We understand by cupping-glasses, a sort of bell-shaped vessel in which a vacuum is created, and which is then immediately applied upon the skin with the view of producing a congestion, tumefaction, and elevation of a portion of this tegument.

Cupping-glasses present two principal varieties, as to the object for which they are intended to be employed; that is to say, there are dry and scarified cuppings.

A. *Dry Cupping.*

The object of dry cupping is solely to irritate certain regions of the integuments, and to draw the fluids to it by a greater or less degree of revulsion. The cupping-glass itself was anciently the extremity of the horn of some animal. At present they are of different shapes—some have the form of small bells surmounted by a button, (Fig. 163,) or of a simple gourd. In a case of necessity we might use an ordinary drinking glass—they are, also, of various sizes.

(Fig. 163.)

In some countries, in Italy and Germany, for example, dry cupping was used in the time of Dionis, under the title of *hygienic means*, as the *massage* and electricity are at the present time in

France; but with us there never have been any grand vaulted halls nor stoves, whither we could repair and have ourselves cupped at pleasure, as in Germany.

To apply dry cupping, we must first rarefy the air, or create a vacuum in the vessel in some way or other. We effect this by various modes; the Germans confine themselves to dipping the glass into very hot water, from whence it is drawn out quickly, to be applied immediately upon the skin. A more simple mode consists in keeping the flame of a spirit lamp for some seconds within the cupping-glass, and then transferring this last to the integuments as quickly as possible. This is the mode of MM. Backler, Rohmer, and Buchel, who, in importing dry cupping from Germany, have endeavored to infuse a taste for it in Paris. This is an easy, expeditious method, requiring but little address to perform it with ease. It is found more convenient, however, to rarefy the air in the glass by burning in it either tow, lint, cotton, or paper, especially paper manufactured from silk, or we may simply burn alcohol. I do not speak of the small candle, the sulphur matches, or night-lamp, that some introduce into the cupping-glass upon a bit of card, because they are bad contrivances. It is desirable that the wool or paper used should be slightly impregnated with alcohol or ether. In other respects these substances should be very dry, light, and thin, (*raréfiées.*) After having placed them at the bottom of the vessel, we apply the fire to them; or, better yet, if paper is used, we make it into a peloton of net-work, (*à laciniures multiples,*) and very porous, which we light while we hold it in the forceps, and then immediately place it in the cupping-glass. The important point is to apply this upon the skin before the ignited body is entirely extinguished. It must, however, be on the point of being consumed, otherwise it might burn the patient in falling upon his skin.

The skin is immediately expanded and swells while it reddens under the cupping-glass. We leave the glass on one or two minutes. To remove it, we depress the integuments upon some point around its circumference by means of the thumb, while with the other hand we endeavor to make the glass incline to the opposite direction. The slightest opening effected in this manner, allows the air to enter, and the cupping-glass to be detached. We afterwards reapply it upon other parts of the skin, as many times as we judge proper, or we have a number of them, which we place on immediately, before detaching the first. We thus apply cupping-glasses to the breasts, to arrest certain uterine hemorrhages, to the anus, to reproduce hemorrhoids, and on different parts of the body, under the character of a revulsive.

B. *Scarified Cuppings.*

When we employ cupping-glasses to draw blood, we apply them after the separation of leeches, to prevent the bites of these worms (*annélides*) from closing, or upon the punctures or scarifica-

tions, to promote their bleeding. In the two first cases it suffices to recall what I have said of dry cuppings and of the application of leeches, to understand the whole operation. As to scarified cuppings, properly so called, they are employed most usually in the following manner: the first step consists in rarefying the skin as above; the glass being removed, we rapidly scarify with the lancet, bistoury, razor, or scarificator, the congested portion of the skin, so that the small wounds are sometimes simply parallel, or dispersed in quincunxes, (*quinconces*,) or crossed like window frames, or made so as to include small rhombs, (*losanges*,) or sometimes in imitation of certain fancy figures, &c.

The cupping-glass, prepared as in the first case, is reapplied as quickly as possible, and so on with the others. The blood oozes out immediately from all the wounds, and escapes into the glass in greater or less quantity, according as the vacuum has been more or less complete. When we have taken the necessary quantity of blood, or the cupping-glasses produce no more, we detach and empty them; we remove the blood from the skin, then, if we judge proper, reapply them without additional scarifications, taking care, nevertheless, not to replace the edges of the glass too often in the same groove of the skin, for fear of producing a cauterization. We might, in this manner, abstract a large quantity of blood from the same place, but it is better to increase the number of cupping-glasses.

C. *Air-Pump Cupping-Glass.*

This instrument is composed of the ordinary cupping-glass, and the body of an air-pump, (*pompe aspirante*,) which is adapted to it or removed at pleasure, (Fig. 164.) We avoid thus the necessity of rarefying the air of the cupping-glass by heat; it is sufficient, in order to create the vacuum, to apply the glass to the skin and to set the pump in motion; by opening a cock on its side we allow the air to re-enter into the glass, and thus detach it whenever we wish. When the scarifications are finished and the instrument reapplied, we may draw a large quantity of blood; we then remove the glass and clean the parts, then recommence in the same manner, till we have produced the effect desired.

Other persons, Sarlandière among others, have transformed the air-pump cupping apparatus into an instrument called *bdellomètre*, (Fig. 165.) It is a pump cupping-glass, armed with a scarificator of five or six blades; so that the instrument once applied, allows of the vacuum being made, the skin to be scarified, and the bleeding completed without changing any thing.

D. *Cupping-Glass of M. Toirac.*

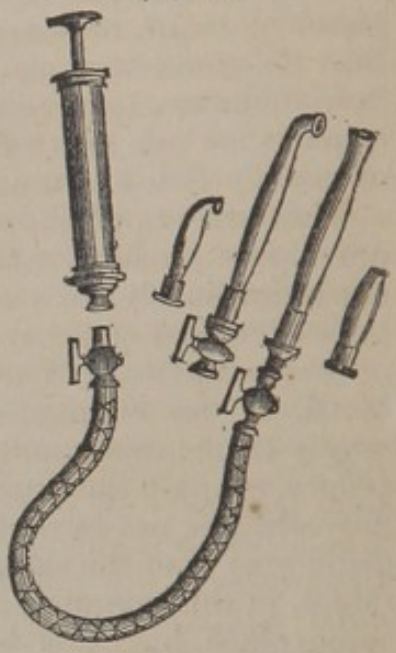
To conclude, there are others, M. Toirac in particular, who, to make a more effectual substitute for leeches, have devised small spindle-formed glasses with narrow apertures, or ordinary cupping-

glasses, which by means of a long tube of flexible tissue, or gum-elastic, communicate with the body of a pump, so that we may apply them at a great distance, and at the bottom of any cavity whatever. Thus modified, (Fig. 166,) the air-pump cupping-glass would better

(Fig. 164.)

(Fig. 165.)

(Fig. 166.)



deserve the title of an *artificial leech*, than the instrument to which the English have applied this name.

Of all the modes of applying the scarified cuppings, or cupping in general, there are really none to reject but the *bdellomètre*, since, in one respect, it does not exactly answer the intention of the surgeon, and, on the other hand, is too much complicated.

Local bleedings should not be confounded with general bleeding; in addition to the fact that they do not abstract blood rapidly, (some persons having gone so far as to advise to apply leeches only one by one, that they may thus succeed each other for the space of twenty, thirty, and forty-eight hours,) they also have the effect of creating a special irritation upon the integuments. It must not, however, be forgotten, that by phlebotomy we abstract from the patient venous blood only, blood consequently which has lost a portion of its nourishing principles, and which has become charged with a large proportion of excrementitious matter, (*détritus ;*) whilst by leeches, puncturings, and scarifications, we draw also arterial as well as venous blood. It has even been thought, erroneously, however, as I believe, that of equal quantities of blood abstracted, local bleeding debilitates more than general.

CHAPTER II.

CUTANEOUS IRRITATIONS.

We create upon the skin irritations that are either temporary or permanent, under the title of frictions, rubefacients, vesication, and suppuration.

Article I.—Frictions.

Some practitioners employ, though rarely at the present time, frictions continued for a long time, sometimes on certain articulations, which it is desirable to render more supple, sometimes along the entire course of the vertebral column, with the view of exciting muscular action, or of counteracting certain deep-seated affections. There are employed for this purpose the coarser descriptions of brushes, or portions of rough linen, which are briskly rubbed, and with some degree of force, upon the parts we desire to irritate.

The principal precaution to take in such cases is, not to rub to the degree of congesting or reddening the skin, nor to proceed so far as to abrade it, (*à l'exulcérer,*) or make it bleed.

Article II.—Massage.*

The massage, which is much used in Russia, Germany, and many other countries, under the character of a hygienic resource, and for which they have constructed in those countries establishments like ours in France for bathing, consists in pressure, traction, and all sorts of movements that another person may impress upon the different regions of the body. The individuals who devote themselves to this employment, press, pinch, (*compriment,*) and rub with their hands the middle portion of the limbs; they twist, draw, bend, and extend the fingers one after the other; they act in the same manner upon the articulations of the wrist, elbow, shoulder, foot, leg, and thigh, and do this with the view of rendering the muscles and ligaments, in fact, the whole fibro-muscular system, more supple. As the massage may be made effectually useful, especially if there be associated with it a hot temperature and vapor baths, as in a great number of chronic affections, particularly in those pains

* [This may be translated by the word "shampooing," an ancient process in the East, from which that of *massage* is undoubtedly derived.—*T.*]

termed rheumatic, it deserves to be retained, and its application should be under the direction of a surgeon.

Article III.—Rubefaction.

We redden the skin by creating there an artificial and unnatural redness, analogous to that of an incipient erythema. The means employed for this purpose are hot water and all substances impregnated with caloric, provided they are held at a certain distance from the body, or are not long enough in contact with it to produce phlyctænæ. Mustard flour, however, is almost the only thing now used for this purpose. We must take care to have it pure and fresh, and not mixed with other farinaceous matters, and that it is made into cataplasms. Under this form it takes the name of sinapism.

Up to within a recent period, *sinapisms* were made with vinegar and mustard flour, under the idea that the vinegar rendered them more active; at present we are in the practice of another method. The progress of chemistry having shown that the volatile oil of mustard was decomposed by the vinegar, and that hot water retarded its disengagement, induced M. Trousseau to prepare sinapisms with cold water. I have generally used them in this way since 1834, and it is certain, that in this form they act as well, at least, as with vinegar. I have made a comparative trial of the two kinds, by putting the vinegar sinapism, for example, on one side of a patient, and the water sinapism on the other; but experience has shown that the sinapism made with water is the most active.

Nothing, moreover, is more simple than the application of the sinapism. The mustard flour is mixed with the water precisely as has been said in speaking of naked cataplasms; the paste is afterwards spread upon a thick piece of linen, the edges of which are flattened down in order to make the cataplasm more perfect. Applied sometimes to the plantar, or to the dorsal surface of the foot, the legs, or some other region of the body, even to the breasts, with the view of recalling menstruation, or between the shoulders to check hemorrhage, the sinapism ought to remain in its place from one to three hours, according to the degree of irritation we wish to produce, or according to the sensibility of the individual. If we removed it too quickly, it would produce no effect; in leaving it on too long, it might cause vesication.

It is well to add, that with patients in a state of unconsciousness, as women in convulsions or spasms, (*éclampsie*,) and in cases of dangerous fever, apoplexies, &c., they may appear at first to have had no action, though they have, in fact, produced on the skin a considerable degree of irritation. It is to be remarked, that persons who have remained three, four, and five days without exhibiting any appearances upon the place which the sinapism occupied, have, nevertheless, at the moment when the senses resumed their natural functions, been affected not only with rubefaction, but also vesica-

tion, and in some cases even with eschars. I saw this particularly in a lady attacked with puerperal convulsions, and whom I attended in consultation with M. Larrey. [To render the mustard sinapism still more active and expeditious, it is often advantageous to sprinkle it over with cayenne pepper.—*T.*]

When the sinapism is removed, we should cleanse the part with tepid water, if it should not be requisite to produce an intense degree of rubefaction. If there should already be too much pain and redness, we must cover the part with cerate, or some other emollient substance; in the contrary case, we may confine ourselves to cleansing and wiping it with linen.

In the place of genuine sinapisms, we sometimes make use of mustard cataplasms, or baths. There are cataplasms of flaxseed meal, the exposed surface of which is sprinkled with mustard flour before applying them on the skin. As these cataplasms are incapable of causing vesication, and are prescribed only as gentle excitants, they should remain on all night, or all day, and they exact, moreover, no special precaution.

Article IV.—Vesication.

The practice of vesication has been most extensively employed in all times. It consists in producing upon the surface of the skin blisters filled with a white or serous fluid. We effect this object with a great variety of substances. Most of the acrid plants, almost all the ranunculas, also the euphorbias, and the spurge-laurel, furnish a material for obtaining this result. It is for this purpose that bruised spurge, (*ésule*,) thistle, (*tithymale*,) euphorbia, and ranuncula, or the juice of these plants, and the clematite and oil of anacardium, have often been employed. At the present time, however, in order to produce vesication, we scarcely ever use any thing else than ammonia, boiling water, substances dipped in boiling water, or different preparations of cantharides.

Ammonia, when applied to the skin, causes vesication almost immediately. We rarely use it, unless it be indispensable to act with great expedition. We then wet a piece of linen, or a tent of lint or sponge with it, and, holding it in the forceps, pass it over the teguments, or keep it there unmoved for the space of a minute.

The Pomade of Gondret, composed of liquid ammonia and lard, produces most frequently a simple rubefaction, and not a true vesication. We rub it in with the finger, morning and evening, upon the region we wish to irritate, as on the skin of the eyelids, forehead, and sinciput, for example, in some cases of amaurosis, until the epispastic effect, or a considerable degree of rubefaction, is obtained.

Boiling water also produces vesication very rapidly; but as it is difficult to measure its effects, it has been proposed to employ it under another form. Carlisle, an English surgeon, obtained blis-

ters by placing a wet linen, folded twice or four times, upon the point to be irritated; and by then applying to the linen the nummulary cautery (*cautère nummulaire*) heated to a reddish brown: it is a mode too imperfect to be retained.

The *hammer*, used by M. Mayor, is evidently preferable. With this instrument, which is found everywhere, and the flat and somewhat broad head of which is dipped in boiling water, we procure the same effect as by the process of Carlisle. None of these things, however, can take the place of the blister, properly so called. With the preparations of cantharides we are better enabled to give to the vesication the form and extent we desire. Moreover, the vesication caused by cantharides is not the only effect that we may expect from them.

Blisters with Cantharides. Among the insects comprised in the family of meloe, there are two species, the mylabra of chicory and the cantharides, which are specially endowed with vesicating properties. The researches of M. Bretonneau have, it is true, shown that the mylabras might, in cases of necessity, replace cantharides; but this latter is too well known, and too easily procured, to allow of our attempting to substitute other insects in its place.

Under the character of blister we use various preparations of cantharides. *Cantharadine*, applied to the skin by means of paper or oiled linen, causes vesication with certainty and great rapidity. It is a mode introduced into practice by M. Bretonneau, and one with which I have myself been equally well satisfied. Others have proposed vesicating paper, from which we have only to cut out the slip, to be applied to the surface of the teguments; but the method the most common, and which procures the most certain results, is the following: we spread the blistering ointment upon a piece of fine skin or sparadrap, or, better still, on a piece of linen. After the plaster has been properly formed, we sprinkle it over with finely powdered cantharides. We then give a margin to the edges by a small quantity of the gum diachylon, or fold over the edges of the linen upon its border. The skin having been previously cleansed, and afterwards rubbed with vinegar, then immediately receives the blister, which is then fastened with strips of adhesive plaster and compresses, or with a compress and proper containing bandage.

In lieu of blistering ointment, we may, in a case of necessity, make use of leaven, (*levain.*) or any paste whatever, which may, in the same manner, be sprinkled with cantharides. The same result could also be obtained, if we simply placed the blistering powder, wet with vinegar, upon a piece of diachylon plaster. This powder, soaked with oil, and placed on linen, could equally well be substituted for the plaster; but the plaster being more convenient, in more common use, and of more certain effect, will continue to have the preference.

With either of these preparations, our object is to produce two results: 1. A more or less active irritation upon the skin; and 2. A

more or less abundant evacuation of serous fluid. For the first purpose, the blisters are employed as revulsives; in the second, they ought to be regarded as evacuants. However, whether they be prescribed for one or the other of these objects, they are not the less divisible into two kinds, *temporary*, (*vésicatoires volants*,) or *permanent* blisters. Blisters are limited to revulsives but in a few cases, when, for example, they are not used to the extent of causing vesication, (*des phlyctènes;*) then their effect is reduced to a simple rubefaction. Whenever they raise the cuticle, an exudation of fluid takes place, and they belong to the class of evacuants. It is from not having contemplated their action in this point of view, that the schools of solidists and anatomists have reduced blisters to the character of simple external irritants. For myself, I am convinced that blisters may, in regard to the lymph, be compared to leeches; and as respects the blood, to cupping: so much so, that I would willingly establish in therapeutics *serous* or *lymphatic*, as well as *sanguineous* emissions; *lymphatizing*, (*lymphées*,) as well as *bleeding*, (*saignées.*)

§ I.—*Temporary Blisters.*

Most practitioners understand by a temporary blister, (*vésicatoire volant*,) one that is not left sufficiently long upon the skin to elevate the cuticle, or one that is shifted from one region to another. Others say that the temporary blister should be kept on till the epidermis is separated, and that, having *cut* the bladder on its dependent part, we should take care not to remove the cuticle, and should dress the surface with dry linen. I admit that we may consider a temporary blister under this point of view, but I generally employ them in another way. With me the temporary blister differs from the permanent only in this, that we do not excite suppuration from it after the removal of the plaster. Thus, vesication being produced, I empty the bladder by simple punctures with the lancet or a pin; I also often remove the whole of the separated cuticle. But in place of beet (*poirée*) leaves, or an exciting ointment, I cover the surface with blotting-paper, (*papier brouillard*,) or simple linen, besmeared with cerate. Used in this manner, the temporary blister appears to me to constitute a mode altogether peculiar, which I have frequently used in the last ten years for the purpose of *lymphatic emissions*. The temporary blisters, also, which I use for this object, differ altogether in size from that of ordinary blisters; to point out their dimensions in one word, it is sufficient to say, that the plaster should extend from half an inch to an inch beyond the limits of the swollen or inflamed part. Under this form temporary blisters may be applied with advantage over the entire cranium, in concussions (*commotions*) of the brain; upon the whole circumference of the neck, in certain cases of angina; upon one-half of the thorax in pleurisy, or pericarditis; on the entire epigastrium, in a great number of affections of the stomach; on a

large portion of the abdomen, in a crowd of acute or chronic affections of the hypogastrium; on the entire of the great articulations in arthropathies of the soft parts; on a limb affected with phlegmonous erysipelas, angioleucitis, or phlebitis; on the greater part of the inflammations of the lymphatic glands; and on a great number of phlegmonous inflammations. [The great difficulty in these *vésicatoires volants*, as they are called, is, that after even the smallest sized phlyctænæ, or clusters of minute vesications only, are once produced—and they may be in two hours in a young, and in three or four in an adult person—it is next to impossible to prevent the irritation in most cases from going on to suppuration.—*T.*]

§ II.—*Permanent Blisters.*

Blisters that are to *remain on*, are also evacuants, but no longer in the manner of the temporary blisters which I have just spoken of. Designed to keep up on some part of the skin a slight degree of suppuration, they also have the advantage of abstracting from the blood any deleterious ingredient; but they do not produce such abundant evacuations that they can be compared to sanguineous emissions. Moreover, they are applied almost always at a considerable distance from the disease, and only in the character of revulsives. However this may be, those two kinds of blisters require the same kind of processes in their application. It is only in relation to the subsequent dressings that they differ. When once applied, as has been said above, the plaster, taffeta, paper, or epispastic linen, is secured by means of the containing bandage best adapted to the form of the region to be covered; the blisters are afterwards dressed in the two following ways.

A. *Temporary Blisters.*

Upon the supposition that we wish to preserve the epidermis, we must, after having punctured and emptied the bladder, place over the part a piece of linen, or dry paper, and secure it by a roller or circular bandage. As the exudation continues from the irritated surface for some days, the portions of the dressing imbibe it, become hardened, and are sometimes difficult to detach; it is, consequently, better to besmear the paper or linen with a thin covering of emollient ointment or cerate. In cases where we might apprehend too much exudation, the perforated and cerated linen might be substituted for blotting paper. We place the gateaux of lint and the compresses over this, and then support the whole by means of a bandage, as in any other simple dressing. If we wish to remove the cuticle, and the sometimes very thick layer of plastic lymph which is found under it, we separate it at first on one of the points of the circumference of the phlyctænæ, and afterwards detach the remainder of it, either by tearing it away, or cutting it off with the

scissors. The skin, being put in contact with the atmosphere by this operation, is greatly irritated, and ordinarily becomes the seat of very acute pain. It is, therefore, advisable, when we look more to the evacuant than the revulsive effect of the blister, or when we have to deal with nervous and timid subjects, to substitute a large emollient poultice at every other dressing. The cuticle is detached without pain at the removal of the first or second poultice, and without its being necessary to cut or tear it.

After this first dressing, the temporary blister should be covered every morning with paper or linen spread with cerate, and not with leaves of succulent plants, (*plante grasse.*) Treated thus, it dries, ordinarily, in from three to six days. We must, however, recollect, that its circumference, or a margin (*liseret*) of unseparated cuticle, constantly remains; that this margin, I repeat, often remains irritated, and tends to suppurate in the manner of a tourniolle. We put a limit to this slight difficulty, which might serve as the point of departure for an erysipelas, by taking care cautiously to detach from the margins of the blister the smallest particles of separated cuticle.

B. *The blister, which is to remain on,*

always requires that the cuticle should be removed, that we should dress them for a day or two with simple greasy substances, a beet leaf besmeared with butter, for example, and afterwards proceed in good season to the use of stimulating ointments.

These ointments, known under the names of epispastic ointment, ointment of garou, and savin, are used to spread upon the linen which we directly apply to the denuded integuments. Sometimes we use a beet leaf, or that of the cabbage, or ivy, or a piece of taffeta spread with gum, or blotting paper, or simple linen. With taffeta and the leaves of succulent plants we generally obtain a more abundant and bland suppuration. But the paper and linen are more convenient for use.

Permanent blisters should ordinarily be of the breadth of a five-franc piece. As they are to be kept on for a certain number of months, it is important to circumscribe them with precision, and to prevent as much as possible their spreading and slipping. We effect this object by a very simple precaution: a piece of linen, pierced with a circular hole and spread with cerate, is first placed so as to leave uncovered that extent of skin only where we desire to establish suppuration; the plaster spread with stimulating ointment is then applied over this aperture; there remains nothing more than to place over the whole a compress folded double, and the necessary containing bandage.

Unless there should be acute pains, or too abundant a suppuration, the blister, in mild seasons, should only be dressed once in every twenty-four hours. Uncovering it morning and evening, as most patients wish, would only tend, by irritating the surface, to vitiate the secretion of pus.

Blisters to the legs, thighs, or head, are supported and dressed in the same manner as those to the trunk, by means of the ordinary containing bandages. It is the same with blisters to the nape of the neck and the mastoid region. It is the blister to the arm only that requires a particular bandage. In this region the first bandage we use is a roller; but we must be particular to begin it at the lowest part near the elbow, and to extend it to the border of the axilla, taking care not to make it so tight as to interfere with the circulation below, but to give it sufficient firmness, however, to keep the other portions of the dressing protected from all displacement.

We must here add, that there is found in commerce, and at the bandage-makers, different kinds of bracelets and pieces, which enable the patients themselves to perform this dressing with the greatest degree of ease. Finally, the permanent evacuant (*exutoire*) blisters should generally be placed on the inside the calf, towards the middle of the inner side of the thighs, on the outer and middle part of the arm, and on the middle of the posterior region of the neck, seeing that they are more easy to keep on and to dress in those regions than anywhere else, at the same time that they are, in those parts, in the neighborhood, also, of a good deal of cellular tissue and numerous lymphatic vessels.

Notwithstanding the employment of blistering ointments, it often happens that the blister tends to dry up. Independently of the constitution of the patient, this result may happen from the ointment not being sufficiently irritating, or, in fact, from its being too much so. In the first place, we must change it, or increase its strength, while, in the other, it is to be weakened by diluting it with lard. Above all, it is here important to quiet the irritation, and to remove, by the aid of emollient poultices, or taffeta-plaster spread with cerate, the white layer deposited on the blistered surface. We subdue the excess of irritation, the erythemas, and the tendency to erysipelas, in the neighborhood of every blister, by lotions of lead-water, compresses soaked in elder (*sureau*) water, or by poultices of flaxseed. Moreover, we must recollect that the temporary blister, and even that which has suppurated but from fifteen to twenty days, produces very little change upon the mucous net-work of the skin, and leaves scarcely any trace after its cicatrization; whilst, in the course of a considerable length of time, blisters may produce fungosities and ulcerations which it is not always easy to cure, or which, at least, after their cure, leave indelible marks upon the integuments.

Article V.—Drains, (*Exutoires.*)

The word *exutoire* is applied to a suppuration artificially kept up on a circumscribed space upon the surface of the body; under this character the permanent blister is a drain. The same may be said of issues, or cauteries, and the seton.

§ I.—*Issues.*

Cauteries, or issues, (*fonticules,*) are small superficial ulcers, established with the view of preventing, moderating, or curing certain diseases. Like the blister, and drains in general, the issue is, at the same time, revulsive and evacuant. Like the blister, also, we employ it in two different ways: 1. On certain tumors, in the neighborhood of certain articular swellings, on the sides of the spine in some cases of diseases of the spinal marrow or vertebræ, and on different points of the thorax for various affections of the chest. In these respects, issues may, to a certain degree, be compared to the temporary blister, since we apply them as near as possible to the disease, and, in general, suppress them soon, preferring rather to shift them upon different points, than to keep them always on the same.

2. In the character of derivatives, or revulsives, issues have some analogy with the permanent blister, since we ordinarily place them on regions remote from the disease, and we sometimes keep them in the same place for many years, and in some patients during even their whole lives. On the sides of the perinæum, along the spine, and on the articulations, upon different kinds of tumors, and the contour of the parietes of the thorax, cauteries, or issues, should be dressed by means of bandages adapted to the form of each of those regions.

The permanent issue, being scarcely ever applied but to the cranium, and upon the nape, arm, thigh, or leg, requires, on this account, to be regulated by some general rules.

Thus, for the *head*, we generally apply it upon the anterior fontanelle.

In the *nape*, I prefer placing it in the *sub-occipital fossa*, that is, in the kind of depression bordered on each side by the splenii muscles, above by the occipital bone, below by the spinous process of the axis, and corresponding to the posterior occipito-atloidean ligament, than to place it, as is generally directed, near the middle of the posterior region of the neck. In the place that I indicate, the issue is nourished by a considerable quantity of cellular tissue, continuous, in some degree, with the external surface of the dura mater, and in the near neighborhood of important vessels and nerves. It is, therefore, a region very favorable to the action of drains, when we desire to act upon affections of the brain or eyes.

In the *arm*, the cautery should be applied in the depression bounded above by the insertion of the deltoid, in front by the biceps and brachialis-anticus muscle, and behind by the triceps muscle, inasmuch as the cellular tissue at this point is sufficiently abundant to supply a good suppuration, and that the muscles cannot effect any disturbance or change in the artificial ulceration.

The cautery to the *thigh* should be placed at three or four fingers' breadth above the inner condyle of the femur, in the hollow which separates the vastus internus from the adductor magnus, or internal border of the ham.

In the *leg*, it must be placed under the garter, (*jarretière*,) three fingers' width below the inner condyle of the tibia, and in the hollow bounded behind by the gastrocnemius internus, above by the tendons of the pes anserinus,* and in front by the inner edge of the tibia.

In fine, cauteries should be applied opposite to muscular interstices, and on points that are the most abundantly supplied with fatty cellular tissue.

Whatever may be the locality where the issue is established, we should, nevertheless, recollect that surgery possesses many methods by which this operation is effected. The three methods still in use at present, are incision, blistering, and caustic.

Issues by Incision. The most ready means we possess for establishing an issue, consists in making a small incision into the integuments, and keeping it from closing by placing a foreign body in it. For that purpose, the surgeon makes a fold of the skin by means of the thumb and fore-finger of the left hand; he then divides this fold, by puncture or incision, to the extent of from four to six lines, and in such manner as to traverse the whole thickness of the cutis. Or we may limit ourselves to stretching the integuments with one hand, whilst we divide them by a puncture with the other, holding the bistoury in the manner of a writing pen. The convex bistoury, held like an arc, or in any other manner, would not offer the same advantages. The incision having been made, we place in it a small and very hard ball of lint of a pea shape, in order to change it into an ulcer; a perforated piece of linen, a layer (*gateau*) of lint, and compress, and then a suitable bandage, complete the operation. The dressing should not be removed but at the end of three or four days, that is, at the period when the suppuration appears to have become established; we then insert an issue-pea (*pois à cautère*) in the place of the ball of lint, and the same dressing is afterwards renewed daily.

Issues by Blistering. When a blister, which we desire should be kept open, constantly tends to dry up, it sometimes happens that the patient or surgeon may wish to change it into an issue. In such cases, we should cover the whole surface of the blister with a piece of linen spread with cerate, and provided with a small hole in its centre; after having arranged this linen in its place, the opening is filled up with a pea, which should rest bare on the suppurating surface; we then apply to this pea a compress several times folded, and a suitable bandage; thus pressed, the pea gradually excavates a hole in the skin, and ultimately excites a suppuration there, more or less abundant, while the linen, spread with cerate, and renewed every morning, rapidly dries up the remainder of the suppurating surface.

This kind of cautery is decidedly bad. The skin, not being divided, and only depressed, tends continually to rise upward, so that,

* [*Patte d'oie*, or *pes anserinus*, is a phrase applied to the tendons of the sartorius, the gracilis, and the semi-tendinosus, near their insertions into the upper part of the inner surface of the tibia.—*T.*]

without a sufficiently strong pressure, carefully watched, the issue would disappear from one day to the next. It should not be preferred, therefore, except in patients who are exceedingly timid or unreasonable.

In timid persons, who have an extreme dread of every kind of pain, we establish sometimes a small blister, by means of ammonia, boiling water, or cantharides, in order that we may proceed, at the end of some days, or almost immediately, in the manner I have just pointed out. But we have the same objections to make to this kind of issue as to that which precedes it.

Issue with Caustic. The caustic most generally used for making issues is potash prepared by alcohol. We begin by placing on the skin a piece of sparadrap or diachylon plaster, of the diameter of from twelve to fifteen lines, and pierced in its centre with an aperture of one to two lines in width. It is this aperture which must correspond exactly to the point upon the skin that we wish to ulcerate; we then place in this opening a small particle of very dry potash, of the size of a large pin's head, or a grain of hemp-seed; a second piece of diachylon plaster, as large again as the first, is applied over this; the whole is covered with a compress three or four times folded, and then we apply a suitable containing bandage. Some time after the potash liquefies, by combining with the tissues; a pain somewhat acute is then soon experienced by the patient, but it rarely continues over four to eight hours. At the end of six hours the caustic has generally produced its effect; what then remains of it is changed and almost entirely neutralized. We might, therefore, without danger, defer removing the dressing until at the expiration of twenty-four hours. In the fear, however, that the potash, now become liquid, might spread itself to a greater distance than is proper, we are in the practice of removing it from the skin at the end of from six to eight hours. This unavoidable liquefaction of the caustic, in fact, requires that we should calculate upon it, and apply to the skin a particle of potash only one half or one fourth the size of the eschar that we wish to produce. Thus, for an issue of from four to six lines, we use a piece of potash of the diameter of from one to two lines.

Employed in this way, the caustic produces an eschar which includes the entire thickness of the skin, and requires from ten to twenty days to become detached. When the eliminatory inflammation has expelled it, we place a pea in the ulcer and the issue is established. If we wish to proceed more expeditiously, we may, on the very first days, make a crucial incision upon the eschar, (*le point escarrifié,*) raise the four angles of the division, and adjust the pea immediately. If, as sometimes happens, the eschar should continue to dry up gradually, and to favor cicatrization in the tissue beneath, it will be necessary to dress it with some irritating ointment, as, for example, basilican or epispastic ointment. In the contrary case, that is, when it is surrounded with a florid (*sanguine*) inflammation, we must have recourse to emollients in general, and particularly to flaxseed poultices. If every thing goes on regularly,

and we neither wish to hasten nor retard the separation of the eschar, we may limit ourselves to dressing it every morning with linen spread with cerate.

Once established, the issue may be kept running by the ordinary pea, that of the iris root, (*pois d'iris,*) or of wax, or the different kinds of medicinal peas.

Those who are interested in the manufacture have, naturally, maintained that such or such a description of pea offers more advantages than any others; but practice demonstrates that it is a matter of very little moment whether we use this or that kind. If the issue is to have more than four to six lines of diameter, as is seen in issues employed as counter-irritants, it is often advisable to place in it, at the same time, two, three, or four peas. [The common garden pea Dr. Mott considers as good as any thing.—*T.*]

The derivative issue is, however, kept open very well by the presence of only one of these peas. The issue peas, perforated and attached by a thread, have the advantage of being more easily retained in the ulcer, and of allowing of their removal without difficulty. They are, also, so much the more preferable, because vegetable peas, increasing in size under the action of the humidity of the parts, sometimes become confined within the ulcer; and wax peas, or the different sorts of medicinal peas, permit themselves to be partially covered over, during the interval between the dressings, by the contraction of the small purulent cavity.

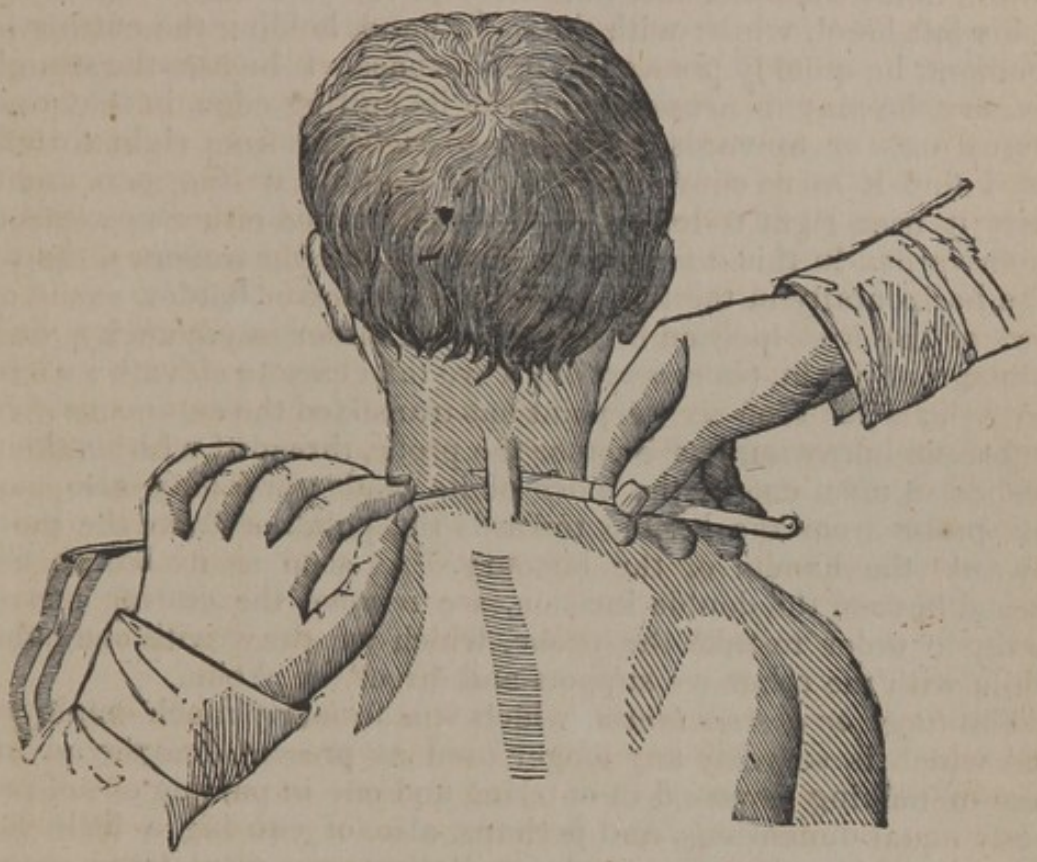
The dressing of issues is also a very simple affair; after having washed and cleansed the ulcer, we place the pea in it, taking care to raise up its thread and fasten it outside by a small slip of adhesive plaster, (*diachylon.*) We then place over this either an ivy, cabbage, or beet leaf, which has been previously wilted at the fire, (*ramollie par la chaleur,*) and had the ridges upon it removed, or a small plaster of diachylon, or taffetas, (*taffetas gommé;*) linen, spread with cerate, would not sufficiently promote the suppuration, and plasters of the mother ointment (*onguent de la mère*) have the disadvantage of soiling the skin too much. A compress, many times folded, is placed over the whole, and the rest of the dressing is, in every respect, similar to that for a blister. An issue in the suboccipital fossa, concealed by a plaster, and then by the hair, may be very neatly adjusted with the aid of the upper edge of the cravat; but it is better to support it by means of a plaster, or a band, the two extremities of which are attached to the front part of the head, or brought back upon the nape, and then around the neck. For the arm, the issue bandage is exactly similar to that for a blister. For the thigh, or leg, we use only a simple circular bandage; we may add, that the issue, also, should not be dressed but once in twenty-four hours, unless there is too abundant a suppuration, or some special indications.

§ II.—*Seton*, (Fig. 167.)

In surgery, the word seton signifies three things: 1. A linen band which we pass through certain cavities, where we wish to promote

suppuration, or retain the principal openings; 2. A drain, formed by a kind of sub-cutaneous fistula, which is kept up artificially by the presence of a skein (*mèche*) of linen, (*linge,*) or cotton; 3. The operation which is performed to establish this drain.

(Fig. 167.)



As a drain, the seton has some analogy with the issue. In the place of effecting a purulent exudation upon the surface of the skin, it exerts its action on the sub-cutaneous cellular tissue. So also is it more powerful and effective than the blister, properly so called, and even than the simple issue in deep-seated affections.

The seton may be applied upon all the regions of the body—on the head, face, or neck; on the chest, for diseases of this cavity; on the hypochondrium, in affections of the liver; above the pubis, in some affections of the bladder; to the perinæum, for diseases of the prostate; on the joints, affected with white swellings; everywhere, in fact, where it may be useful to establish an irritation and a derivative suppuration. Nevertheless, we rarely employ a seton as a drain, except on the back part of the neck. Thus, also, many authors speak only of the seton to the nape.

To perform this operation upon the nape, we must have—1. A straight bistoury, an abscess lancet, or the instrument known under the name of the *seton needle;* 2. An eyed probe, (*stylet-aiguille,*) threaded with a narrow strip of band, or a skein of cotton; 3. A perforated piece of linen, besmeared with cerate, a gateau of lint, a long compress, and a band of two to three yards in length; 4. A napkin, (*alèze,*) hot water, and sponge.

The patient, being seated on a chair, or lying down upon his side, inclines his head forward. The napkin is placed on his shoulders, in order to attach its two upper angles to the forepart of the chest. The surgeon then makes a longitudinal fold in the middle of the nape, gives one of the extremities of this fold to an assistant, holds the other fast himself with the fore-finger and thumb of his left hand, whilst with the right hand, holding the cutting instrument, he quickly passes through its base. If he uses the straight bistoury, he may, if necessary, direct its cutting edge, in that case, downwards or upwards, from left to right, or from right to left; but I find it more convenient to hold it like a writing pen, and to carry it from right to left, with the back turned either upwards or downwards. In this manner, the bistoury, having traversed the tissues horizontally in the line of its upper or lower border, easily allows of the first incision being enlarged, either in advancing or in coming out again, (*en ressortant*,) if we take care to elevate its handle a little as soon as its point has transfixed the cutaneous fold. Before withdrawing it, we cause the probe, threaded with its skein, to slide in upon one of the sides of its blade; we may also pass this probe from the handle towards the point, or from the point towards the handle of the bistoury. As soon as its button has passed beyond the double incision, we remove the cutting instrument, in order to take the probe, which we draw with one hand, while with the other we support and direct the skein.

The *large or abscess lancet*, which was formerly much employed, and which is scarcely any longer used at present, has the advantage of making a wound in entering and one in passing out of perfectly equal dimensions, and perhaps, also, of causing a little less pain; but, by means of a gentle oscillating movement, (*léger mouvement de bascule*,) the bistoury easily gives the same result as the lancet; and as it allows of our making an incision sometimes narrow and at other times wide, according to the desire of the surgeon, and as, in taking care, when we withdraw it, to press with its back against the tissues, it causes no more suffering after the incision is made, it is very natural that the abscess lancet should have been generally laid aside.

The seton needle, a kind of abscess lancet, a little curved on its flat part, very thick, and also with a transverse eye near its heel, in order to receive the skein, has the advantage of easily piercing through the parts, and, at the same time, of drawing along after it the skein or band which is to remain in the wound.

The only objection that can be urged against this needle, the invention of Boyer, is that of not being indispensable, and of not giving to the incisions, as the bistoury does, sometimes a greater and sometimes a less diameter. [The seton needle is used and preferred by Dr. Mott, who, when he has none at hand, has recourse to an ordinary lancet and eyed probe.—*T.*]

Meanwhile, the skein, once passed through, should be detached from its conductor. As it had had its shorter extremity doubled upon its longer one, and been besmeared with butter or cerate, it

suffices to undouble it to have an opportunity of detaching, also, the needle and probe from it. The wounds and all the parts soiled with blood are now wiped; then the perforated linen is adjusted; we fold the short head of the skein over this and a little to the upper side; to this succeeds the layer (*plumasseau*) of lint and the compress. This being done, we must roll up, (*pelotonner*,) or fold upon itself a sufficient number of times, the long portion of the seton skein, in order to raise it, in the form of a pacquet, upon the exterior fold of the compress, to the point where it would be least liable to become soiled. The band serves to fasten the whole by means of some circulars. In the neck, as everywhere else, we ought to pierce only through the skin and the sub-cutaneous fascia. If the enveloping aponeuroses were comprised in the incision, it would run the risk of wounding the muscles, arteries, and nerves, or, at least, of producing deep-seated suppurations. The two wounds of the seton should be separated at least an inch apart, and even an inch and a half when we have no fear of exciting too abundant a suppuration. It is, moreover, easy, in measuring the fold of the skin, to know very nearly what will be the length of the perforation, since the skin of this fold, when once left to resume its place, will be one half wider. In the place of a narrow linen band, we employ, in some cases, a roll of cotton thread; we have thus a less irritating skein, one generally easier to move, and much extolled by Dupuytren. But for that reason alone, that this skein is less irritating, (*plus douce*,) it is far from being suitable in all cases. At any rate, we should be wrong in conceding to the one any very superior efficacy over the other. We do not generally dress the seton for the first time till at the end of three or four days; that is to say, at the period when the suppuration shall have been established, the same as with wounds in any other operation.

Subsequent dressings. The bandage being removed, we take care to separate the two portions of the seton both from the compress and from the layer of lint, and from the perforated linen, which are detached with care; we remove or cleanse off, with a sponge dipped in hot water, the matters or incrustations in the neighborhood; we moisten, in the same manner, the middle portion of the skein, (*le côté du plein de la mèche*,) if it is hardened by its contact with the blood or pus. We besmear this portion of the skein, to the extent of four to five inches, with cerate or some other ointment; we then seize its free extremity and draw it to the other side, in order to bring the fresh and newly anointed part into the wound. The soiled end of the skein is immediately removed by a cut of the scissors, and the surgeon has nothing farther than to proceed to the dressing, as in the first instance. These dressings are afterwards renewed every day, or even more frequently, the same as in treating an issue or a blister. The skein first applied will answer for a longer or shorter time, according as it has greater or less length. When it is nearly exhausted, it is unnecessary to recur to instruments to introduce a new one. All we have to do is to attach the latter through a slit in the old one, which thus answers the purpose

of a probe or needle for the new one. Nevertheless, we might stitch their ends together with a needle. The skein (*mèche*) of cotton would require that the filaments of the extremity of the old one should be intertwined with those of the extremity of the new one, and that they should be fastened together by some circular turns of thread. It is unnecessary to add, that this union should be freely anointed with cerate and smoothed down regularly with the fingers in both cases, before forcing the new skein to follow the old one through the opening. If, however, either by accident or inadvertence, we should have entirely withdrawn the exhausted skein, the probe would easily suffice for introducing the new one. It is to be remarked, that this last method causes, in reality, much less pain than the others, and that, if it is not employed, it is because of the fear which patients have of it, from the idea they attach in their minds to every thing which bears the name of an instrument.

When the seton is applied to children, or intractable persons, we guard ourselves against any displacement of the skein, by taking care to tie the two ends into a knot to make a large circle of it, which should be folded and collected together into a pacquet upon the most elevated part of the bandage.

§ III.—*Accidents from Drains.*

Blisters, issues, and setons, are liable to various accidents. They often cause, for example, simple erysipelas, and this accident belongs more particularly to blisters than to the other drains. Often, also, these artificial ulcerations produce either angioleucitis, properly so called, and all its consequences, or engorgement and inflammation of the lymphatic ganglions in the neighborhood. It is also possible, and this is to be remarked more particularly of the seton, that drains might produce phlegmonous engorgements, and even true abscesses. We may indeed suppose that they may become a point of departure for purulent infections, either by phlebitis or resorption; but this last accident must necessarily be very rare. One of the most common results is the affection of the lymphatic system. If all practitioners were aware how many patients there are who have kernels in the neck and under the jaws, and are afterwards labelled with the title of scrofulous subjects, merely in consequence of drains they have worn, for a longer or shorter time previous, either on the nape or cranium, we should see fewer of those emunctories established permanently in patients who cannot, in reality, derive any advantage from them. In fact, the different diseases of which I have just spoken are liable to the same dangers, and require the same kind of treatment, when caused by drains as when originating from any other source. On the supposition that the accident has yet but just commenced, or presents itself under a mild form, it is possible that we may arrest it by means of simple emollient compresses, or mild topical applications, even though the drain be continued. In the contrary case, unless there shall be

urgent necessity of keeping up the artificial ulceration, we should remove from it every foreign substance and source of irritation.

Drains also cause irritation when they are not attended to with all the care which is required to keep them clean. In such cases, by means of better-arranged dressings, they soon resume their natural course. When a drain is covered with fungous growths, or cellular granulations too prominent, we repress their surface by powdered alum, or nitrate of silver. If the blister tends to spread too much, or more on one side than another, we can easily circumscribe it by leaving a single aperture only open in the cerated linen, or blotting paper, intended to cover all the rest of the surface.

The issue, which also sometimes tends to eat in, or to become displaced by progressive ulcerations, either owing to the weight of the peas, or in consequence of pressure improperly applied, cannot be restrained in its natural limits but by pressure in a contrary direction, and by a carefully adjusted dressing. We prevent the track of the seton from cutting itself through, and its incisions from becoming extended in a vertical direction, by taking care to fold the skein, at every dressing, in such manner that, by placing it rather towards the occiput than in the direction of the shoulders, it shall exercise no traction upon the wound. If the seton, from lack of irritation, should no longer incline to suppurate, we may re-excite it by substituting for the cerate, with which the skein is besmeared, either basilican, balsam of Arcæus, or any other drawing (*epispastic*) ointment; so, also, if it should happen to excite the parts too much, we should cover it morning and evening, for some days, with emollient cataplasms.

§ IV.—*Suppression of Drains.*

Patients who wear a drain for a long time are generally fearful of drying them up. Regarding this artificial ulceration as an emunctory intended to draw off the noxious humors of the body, they generally imagine that, if suppressed, the matters which had issued from them would ultimately produce some serious affection. Physicians are divided on this question into two classes. Some, indeed, treat the fears of common people, relative to the suppression of drains, as chimerical, and class among the tales of old women every thing that our ancestors have said on this subject. Others concede that there may be sometimes danger in too suddenly arresting an old drain, but they explain it on the principle of the influence of habit, by saying that the sudden disappearance of such an irritation may well cause disturbance in some of the functions. It is a subject which has been, in my opinion, treated of too lightly. Modern researches on the condition of the humors and the state of the blood in certain patients, authorize us in believing that an issue, seton, or blister, might, in truth, abstract from the natural fluids some elements or principles that it would not be well to leave there; that these emunctories might, in fact, have, to a certain extent, the property of *purifying the humors*, as was believed in ages past. From

whence, therefore, it is reasonable that, when we wish to suppress a drain that has existed for some time, we should do it only by degrees, or, in fact, temporarily substitute another for it, and reinforce our hygienic precautions, by administering internally some tisan and depurative drinks, such as the decoction of dock, burdock, chicory, and the juice of herbs, together with purgatives.

CHAPTER III.

CAUTERIZATION.

In surgery, we give the name of cauterization to an operation which has the effect to destroy the vitality and organization of the tissues to a certain depth. We obtain this result by two kinds of agents: 1. By certain chemical substances which, on that account, take the name of *potential cauteries;* 2. By inert bodies charged with caloric, and which are known in this state under the title of *actual cauteries.*

Article I.—Potential Cauteries.

We use potential cauteries, or *chemical caustics,* to change the surface of certain wounds and ulcers, to destroy tumors, or establish artificial ulcers or issues. It is thus we daily put into use the nitrate of silver and nitrate of mercury, caustic potash, butter of antimony, Vienna powder, the paste of Frère Come, or that of zinc, and many of the concentrated acids. All these substances cause, for their first effect, the formation of an eschar; but, as they do not all act in the same manner, nor with the same energy, there are some of them that are much used, and others that are scarcely ever employed.

§ I.—*Nitrate of Silver, or Lapis Infernalis.*

The caustic most used is, unquestionably, the nitrate of silver. I do not speak of its employment here under the form of solution or ointment, but solely as nitrate of silver liquefied or crystallized. It is in this solid state that it is used to touch strictures in the urethra, the interior of the nasal canal, the pustules of small pox, the vesicles of zona, and other cutaneous eruptions; the swardy (*couenneuses*) inflammations in the interior of the mouth and pharynx, erysipelas, cysts that we wish to inflame, the interior of certain abscesses, the track of certain fistulas, and the surface of wounds and ulcers in general. When the lapis infernalis is to be applied to an ulcer, with the view of repressing its cellulo-vascular surface, the surgeon should use it gently by rubbing a little upon all the exuberant veg-

etations, with the precaution, however, of leaving untouched about a line's breadth of the outer pellicle which generally occupies the periphery of the wound. The ulcerous surface whitens thus in a few moments, and is converted into a thin inorganic lamella, which is detached and falls off in the space of twenty-four or forty-eight hours, and allows of our repeating the same operation at the expiration of this time, if all the prominences upon the wound have not been sufficiently reduced.

In abscesses, cysts, and fistulas, we apply the nitrate of silver crayon to the interior of the cavity, so as to touch with a certain degree of force the whole extent of its walls. In the mouth and pharynx we proceed as in wounds; it is the same in certain cases of fungous or purulent ophthalmias, with certain degenerations in the neck of the uterus, certain varieties of eczema, erysipelas, &c. If, on the other hand, it is proposed to cauterize ulcers of the cornea, or cutaneous vesicles or pustules, it is important to have a straight crayon, sometimes slender, or cut into a shelving edge, or tapered into a point, and to appply it rather quickly upon the point to be touched and to withdraw it as soon as possible. Around the nails, where we often find the tourniolle, or that purulent condition known under the name of *onglade*, the crayon of nitrate of silver, shaped in a wedge form, should be inserted as deeply as possible between the cutaneous fold and the horny plate. We proceed in the same manner in cauterizing the inner side of the gum when there should take place between it and the teeth any diphtheritic (*diphthéritique*) inflammation, or actual ulcerations.

The pupil ought not to forget that the nitrate of silver blackens the skin; that the skin, thus spotted, retains from six to ten days the appearance of being stained with ink; that it is the same with linen we use for wiping it; and that if, after having used it, we do not take care to dry it well, it will liquefy and be decomposed in the case. It is, in fact, owing to this very property that nitrate of silver has of causing black spots upon linen and the skin, that it is sometimes used to mark the places where we wish to use the bistoury, and to note the changes which are effected in the size or length of certain parts.

In conclusion, the nitrate of silver, which rather modifies the surface of the tissues than really cauterizes them, and which is incapable at most of producing a deep eschar, has the advantage of being exceedingly convenient for handling, and of favoring the cleansing and desiccation of surfaces at the same time that it represses or destroys (*mortifie*) them.

§ II.—*Nitrate of Mercury*, (*Nitrate Acide de Mercure.*)

The most valuable caustic after the nitrate of silver, is unquestionably the nitrate of mercury with excess of acid. I have myself used it for a great many years, with marked advantages, in an infinity of diseases, in all kinds of ulceration resulting from syphilis, for example, in many varieties of scrofulous ulcers, in scorbutic

ulcers, ulcerations of the neck of the womb, and for all growths, (*plaques,*) whether ulcerous or incrusted, or with vegetations of the integuments, which threaten to take on, or have already assumed, a cancerous aspect. This caustic, being liquid, is enclosed in a vial, which must be stopped with emery, since it rapidly acts upon cork, or any other vegetable substance. We dip into this liquid a small pencil of lint, fine linen, or sponge, firmly attached to the extremity of a rod of wood or whalebone, then gently touch with it the surface to be cleansed, taking care to protect the neighboring tissues by means of linen, lint, or a piece of diachylon plaster. If we have under treatment ulcerations whose surface alone has need of being modified, we only touch the parts lightly with the pencil moistened with the nitrate. We proceed in the same manner, also, at the bottom of fistulas, and of openings and different kinds of burrowings of parts, (*décollement.*) It is only in cases of cutaneous exuberance, and of parts that are actually to be destroyed, that we should bear on with a certain degree of force. We might also here replace the pencil or sponge by a glass tube, which is easily charged with a drop of caustic, and which would conduct it without difficulty to the diseased part.

Moreover, if we wish to make use of the same pencil again, we must stir it briskly in water immediately after using it, in order to clean it and separate from it every remaining particle of the acid. The eschar that the nitrate of mercury makes does not generally disappear so soon on wounds, but sooner on the skin, than that from the nitrate of silver. The applications, also, of the former should only take place every four or five days, while we may repeat those of the latter every second day. After cauterization with the nitrate of silver, we dress either with the perforated linen and lint, or with cataplasms, as in simple cases. The nitrate of mercury allows us to proceed in the same way when the cauterization is superficial and of little extent; but in the contrary case it may be necessary to cover the part either with compresses or emollient cataplasms, at least during the first twelve to twenty-four hours. Like the nitrate of silver, the nitrate of mercury employed in this manner, it is said, does not appear to be susceptible of absorption. This last fact, however, is not placed entirely beyond dispute. I have seen some accidents, which seem unquestionably to prove that the nitrate of mercury, to a certain extent, passes sometimes from the cauterized surface into the mass of the circulation. I have seen, for example, two or three women who had undergone only a gentle application of this caustic upon the neck of the uterus, and who, on the day after, or the day after that, were seized with a profuse mercurial salivation. I have observed the same thing in another woman, in whom I had very slightly cauterized a simple cutaneous ulceration a little above the right knee. I have even seen accidents much more serious supervene after the employment of nitrate acid of mercury, but I would not venture to affirm that they were really the effect of this caustic, rather than of some of those coincidences that so often surprise us in practice. It is enough, however,

to show that we should not use this nitrate but with caution, and that we should closely watch its effects.

§ III.—*Other Caustics.*

A. *Butter of antimony, nitric, sulphuric,* and *hydrochloric acids,* and *ammonia,* are attended with such difficulties in their employment, that we generally substitute for them the potash, or some one of the compositions of which I am about to speak. Having shown the mode of applying caustic potash to the skin when treating of cauteries and issues, I do not think it necessary to recur to it here. If we desired to make use of butter of antimony, or the concentrated acids, as is still sometimes done to circumscribe malignant (*charbonneuses*) affections, the malignant pustule, or hospital gangrene, we should moisten a pencil of linen or lint with them, or conduct them through a glass tube, as has been described in speaking of the nitrate of mercury.

B. The *paste of Frère Come,* which is composed of arsenic, old burnt shoes, and spider's web, like the powder of Rousselot, and all arsenical compounds, for a long time in vogue, has the advantage of cauterizing only within the limits that we trace for it, though it does so to a sufficient depth, and of allowing, also, the cicatrix to be formed under the eschar; but it has the inconvenience of being susceptible of partial absorption, and of hazarding, therefore, the poisoning of the patient. I shall return to it in speaking of the destruction of tumors.

C. *Vienna Paste.* There has been in use for some time a paste composed of five parts of potash and six parts of lime, triturated, and reduced to a paste by adding thereto a small quantity of alcohol. This composition, known under the name of *Vienna caustic,* applied in the manner of caustic potash, produces its effect in less than a quarter of an hour, and appears to cause, perceptibly, less pain than the caustic potash or concentrated acids. It may, therefore, be used for making issues.

D. *Zinc Paste.* M. Canquoin has introduced into practice a paste, which, when prepared, presents in some degree a resemblance to the color, elasticity, and consistence of caoutchouc. This paste, which may be preserved for a great length of time, and carried in the pocket like taffeta, [court-plaster—vid. English Taffetas, *supra,*] is composed of chloride of zinc, meal, and a little water. The inventor recommends the addition of a small proportion of the butter of antimony; but I have made some with the hydrochlorate of zinc, flour, and a small quantity of water, which appears to be endowed with all the properties of the paste of M. Canquoin.

To apply it, it should be cut into pieces of greater or less size and thickness—to produce eschars, from two lines even to an inch in thickness—destroying the tissues as if they were separated by a cutting instrument; with this provision, however, that we should have previously removed the cuticle from the skin. for without that the zinc paste has absolutely no action. It is, however, a caustic

which has scarcely any use but for cancerous affections, and of which I shall speak when treating of the extirpation of tumors.

[*Caustics.* Sir Benjamin Brodie, in some late practical remarks on caustics, says, when you wish to keep open the edges of an orifice to a sinus, &c., lest matter should form within, it is better to use caustic potash than nitrate of silver, as he has seen the latter close it. In the bite of a dog, as in the hand, where you cannot be sure of completely excising the complex tissues, melt the alkali in a platinum cup, and dip in a blunt-pointed probe, which latter, becoming thus incrusted with the caustic, may be made with certainty to penetrate beyond the deepest part that the saliva of the dog has reached. The alkali is equally efficient in destroying the bottom of a diseased lymphatic gland that has suppurated. For warts on the penis or pudenda, nitric acid is often better than the nitrate of silver, which is in those cases too weak. Or the nitric acid, ʒj., may be used in combination with ʒij. of muriated tincture of iron. And for these warts a good escharotic, also, is powdered savine and ærugo æris sprinkled upon them, as it causes sloughing. To avoid destroying the surrounding skin, have along with you some vinegar when you use the alkali, and bicarbonate of potash when you use chloride of zinc, and so with other caustics. Little vascular spots in children's faces, formed from a large-sized vessel with several branches, may be treated thus. Touch the principal vessel with some nitric acid in a glass pen, or insert into a puncture in the vessel a fine point of potassa-fusa, and you destroy the vessel, and by a little vinegar outside prevent the skin being injured. You thus obliterate the vessel without leaving a scar. He recommends, also, nitric acid to small mulberry-colored superficial congenital nævi (agglomeration or meshes of blood-vessels) on the skin, but the insertion of *red-hot needles*, (not named by Sir B. Brodie,) we may remark, have superseded every thing by their admirable efficiency in completely and harmlessly eradicating the worst description of these nævi, even in infants of a few months old. In sub-cutaneous and purple-colored nævi, Sir B. Brodie recommends caustic as far preferable to ligature. Puncture them, he says, with a finely-pointed lancet, and introduce a probe which has been dipped into fused nitrate of silver. Sloughing ensues, and then obliteration of the vessels. If the tumor is large, repeat the application. You save the skin by using a narrow instrument for dividing it. Use olive oil in the vicinity, to prevent excoriation from the nitrate of silver. But in these nævi, also, Dr. Mott has used the red-hot needles with the happiest results. Sir B. Brodie recommends, also, for certain purposes, pastes containing mercurial compounds; but as a general rule, we think all mercurial applications are to be avoided where other caustics will answer equally well or better.—(Vide *Medical Times*, 1840; *Medical Gazette*, 1841.) Dr. Roe, of New York, greatly extols the use of concentrated nitric acid, as for the formation of a large eschar upon the præcordia in chronic inveterate affections of the digestive organs, &c.—*T.*]

Article II.—Actual Cauteries.

If all substances charged with caloric, and which when applied to the tissues would produce an eschar, merited the title of actual cautery, boiling water, inflammable oils, and the different substances employed for making moxas, would take this name, as well as metals heated red-hot in the fire ; but usage has decided otherwise, and obliges me to reserve the title of actual cautery for instruments of iron, steel, brass, &c., which, after surcharging them with more or less caloric, are used for the purpose of destroying the tissues.

I must, however, speak of the moxa before examining metallic cauterization, properly so called.

§ I.—*Moxa.*

Much employed in China and Egypt for many ages past, the *moxa* rarely entered into the practice of European surgeons until at the close of the last century. Its form and nature, since then, have been singularly varied. That which is most frequently used, is made of cotton, strongly pressed in the form of a cylinder in a piece of linen or old compress.

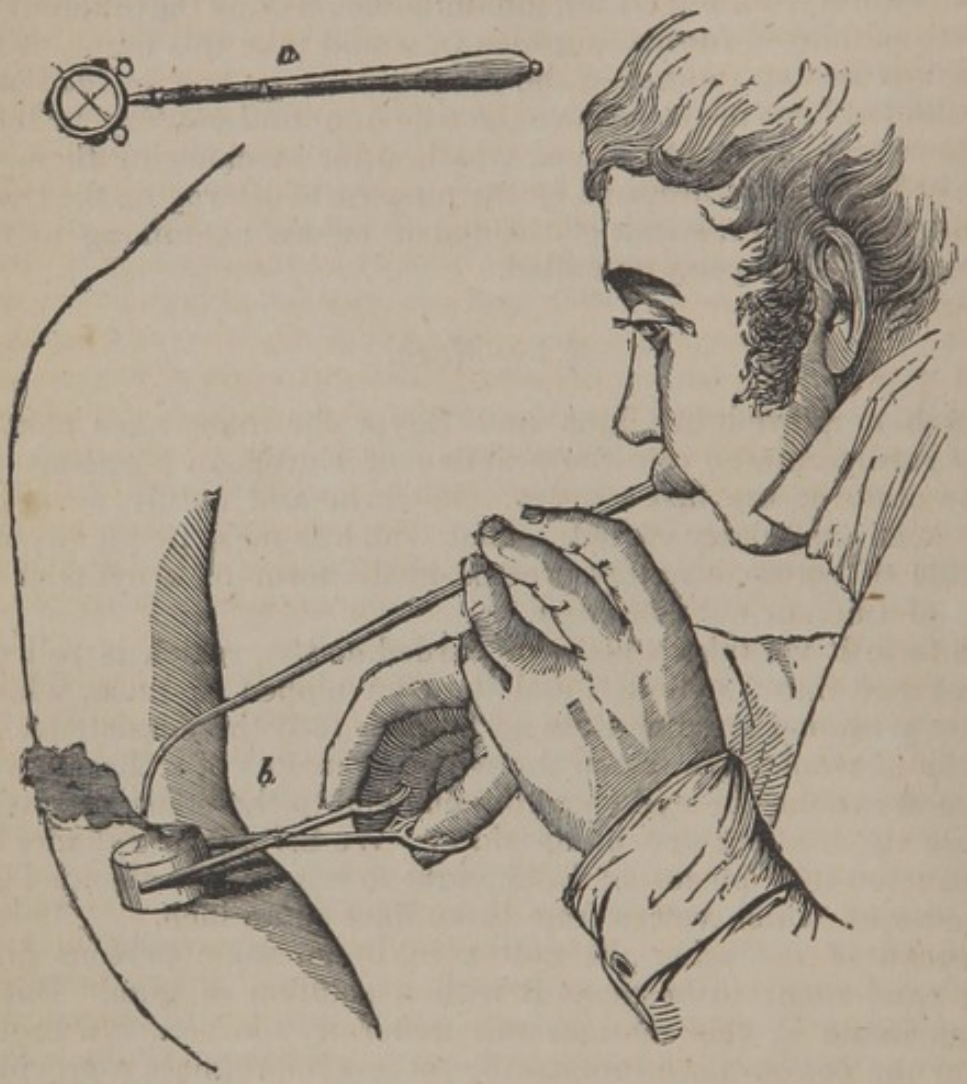
To form it we take a piece of carded cotton, which is rolled up and shaped into a cylinder, and then enveloped in linen, which is tightly wrapped around it, so as to give to it the consistence of a peloton of wool. We fasten the whole by means of a thread, which is bound around the cylinder from one end to the other, or sewn by a close stitch along one of its sides. We divide the cylinder thus constructed into pieces of from eight to ten lines in thickness, the diameter of which varies from three lines to an inch.

Instead of enclosing the cotton in linen, some persons find it more convenient to besmear it with a solution of gum. But the moxas made in this manner are generally too soft. In order to render the cotton more combustible, others impregnate it previously with a concentrated solution of nitrate of potash. This last modification is worthy of being preserved.

To apply the moxa, we seize it with a dressing forceps, or with the *porte-moxa*, (Fig. 168, *a*,) a kind of ring with three feet placed at the end of a long handle, or by adjusting it in an aperture in a piece of pasteboard ; it is applied bare by one of its extremities to the part we wish to cauterize. We then apply the fire, unless we should have preferred to ignite its free extremity before applying it. To keep up the combustion, we are obliged to blow it. For this purpose we do not use the mouth, because of the smoke and sparks which would be thrown on the face, and the fatigue which would necessarily result from it, but the tube constructed by M. Larrey, (Fig. 168, *b*,) or a simple bellows. The surgeon, provided with forceps, holds the moxa in one hand, and with the other fixes the mouth of the bellows, or the point of the tube, in order to be enabled to regulate it conveniently, while an assistant puts the instrument into

action. If the current of air should fall constantly upon the same point of the moxa, the burn would be made in an irregular manner. We must proceed, therefore, in such way that the beak of the

(Fig. 168.)



bellows corresponds successively to all the points on the burning surface.

When the fire reaches to about three lines from the skin, it begins to occasion a little pain. This pain afterwards becomes more and more acute, until the eschar is formed; that is, until the cylinder of cotton is entirely burnt. At the moment when the fire comes in contact with the teguments, there is heard a snapping noise, (*pétillement,*) or a species of crackling, (*craquement,*) altogether peculiar, and caused by the skin becoming crisped and split, (*se fendille.*) It is proper, during this operation, that the neighborhood of the parts should be covered by linen, to protect them from the sparks and particles of fire scattered about by the action of the bellows.

The pain which results from the application of the moxa, generally less acute than the patients expect from it, does not cause

them to cry out, until the burning approximates the layer of the moxa next to the skin.

If it be desirable to apply several moxas to the same region, we proceed with the second, and then with the third, in the manner already described.

We obtain by this operation a blackish colored eschar, a little crisped, and which penetrates to greater or less depth, according to the thickness of the moxa and the time it has taken to burn. Ordinarily, however, it includes only a part of the thickness of the integuments, and does not reach, but with few exceptions, or by accident, to the aponeuroses or tendons. As it is necessary that the eschar should fall off from the effect of the inflammation, it is covered, if not during the first days, at least at the moment when the separation commences, either with a plaster of diachylon, or of mother ointment, (*onguent de la mère,*) or some other unctuous material. When it is once detached, the moxa resembles an ulcer, which it would be very easy to convert, and which is, in fact, sometimes converted, into an issue.

Under the title of simple moxa, we dress this solution of continuity like a wound or simple ulcer; the cicatrization is generally effected between the fifteenth and thirtieth days; the eschar falls from the eighth to the fifteenth; which makes from three to six weeks for the whole duration of the moxa.

In place of proceeding thus, several surgeons have proposed to ignite a piece of camphor, or phosphorus, and to let it burn upon the skin; but, in this way, we obtain eschars either too superficial or too deep, too narrow or too wide, and the pain is still more acute than in the preceding. [Dr. Mott, however, prefers camphor when a powerful effect is not wanted, as it is the cleanest substance of this class, and the quickest in its action.] Others, and particularly M. Jacobson, make use of small cylinders of linen previously impregnated with chromate of potash, and which thus burn without the necessity of blowing. I have made use of the moxas of M. Jacobson, and have had every reason to approve of them. Nevertheless, the others are so easy to make, that it would be difficult to dispense with them.

The down of the mugwort, (*armoise,*) proposed by Sarlandière, in example of the Chinese, has equally failed of coming into general use. The same may be said of the pith of the turnsol, extolled by Percy, and the moxas that Regnault kept separate from the skin by a circular piece (*disc*) of linen, of greater or less thickness. The ordinary moxa is still the only one, at the present time, which offers security and all the facilities of application desirable.

I will add, moreover, that the efficacy of moxas, in the opinion of practitioners, has singularly diminished within the last ten years. In fact, it is nothing but a burning which could easily be replaced by the red-hot iron, or the hammer dipped in boiling water. In conclusion, they can only be useful when we wish to irritate actively some region in the neighborhood of the disease, and upon points that are exceedingly circumscribed.

We apply the moxa to the temple, to the mastoid process, and below or around the articulations, upon the course of the bones, and along the spine. We may, also, apply it anywhere else, taking care to avoid the course of the nerves, arteries, veins, and tendons, and all the organs which it would be dangerous to burn.

[*Lime Moxa.*—Dr. Osborne, of Dublin, has availed himself of the high temperature produced by lime in the act of slaking, for the purpose of a moxa. About an inch depth of the powder is placed on the skin, inside a porte-moxa, or a strip of card bent so as to form the section of a hollow cylinder. Some water is dropped on and mixed with it. In about two minutes, the mixture swells and becomes dry, producing a high degree of heat, amounting, according to some experiments, to 500° F. Dr. Osborne deems it the best of all moxas, from its being very capable of being made equal in power to the potential cautery by increasing the bulk of lime, also from its convenience, and its emitting no sparks or smoke. When less lime than the quantity above mentioned is used, and when left on but a short time, a thick crust is formed, as after the application of acetic acid, which crust separates in proportion as the new skin is perfected underneath. When the quantity of lime is large, and kept on while the heat continues, a complete destruction of the skin ensues, and thus deeper issues may be made, and in shorter time than by the usual escharotics. He ingeniously determines its strength beforehand, by ascertaining to what depth it will coagulate the albumen of an egg when applied on the shell. Dr. Osborne says its advantages consist in producing a contraction and change in the action of the vessels beneath, with great excitement of the absorbents, enabling them to return to a state of health after the failure of other means, as noticed by Larrey, and as is familiarly known in the practice of veterinary surgeons. In a case of ulcerations in the upper part of the rectum and in the sigmoid flexure, with purulent and bloody discharges, this moxa, applied over the latter externally, effected a complete cure before the ulcer of the moxa (about the size of a crown) had filled up. Similar success followed in a case of softening of the tubercles, and in another of purulent infiltration after pneumonia; also, it was used with benefit in two cases of severe hip-joint disease, in one of which the joint had become destroyed, and was extensively enlarged. Lime from the lime-kiln, if *fresh*, answers well for ordinary purposes. The cheapness of this moxa is another recommendation. The ulcer made, it must be recollected, is always twice the diameter of the lime applied.—*Dublin Journal of Med. Science, January*, 1842.—*T.*]

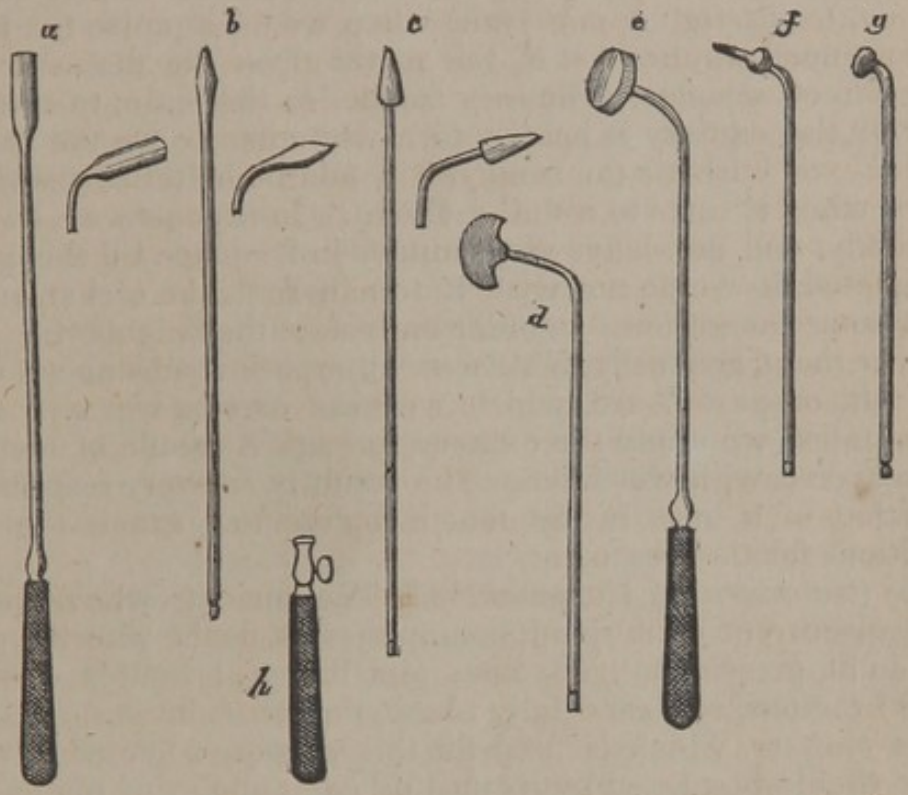
§ II.—*Metallic Cauteries*, (Fig. 169.)

The actual cautery, properly so called, is understood of metallic rods of various forms, and which are heated to different degrees before being applied to the skin. We may make use of rods of gold, silver, or platina, instead of steel. M. Gondret, indeed, pretends that copper acts four or five times more quickly, and, consequently,

causes less pain, than iron or steel; but the infusibility and capacity for caloric of these last are so well known, and they are so easy to be obtained, that all surgeons continue to prefer them.

We have cauteries of a *reed shape*, (*en roseau—a,*) a sort of cylin-

(Fig. 169.)



drical rods that may be applied to the deepest passages; the *olive-shaped*, (*en olive—b,*) which serve for burning the interior of certain cavities and cysts, and the bottom of small excavations. The *conical* (*c*) cautery is more particularly designed to penetrate through a certain quantity of tissues. The *hastile* or *cultelaire* cautery is a species of shield, (*rondache—d,*) or sapeur's hatchet, designed for making burnt lines (*des raies de feu*) upon the integuments. When we wish to cauterize flatwise and upon a large surface, we employ the *nummulary* (*nummulaire*) cautery, (*e.*) That which Percy has described under the name of the *annular* cautery is not used; but we sometimes employ the *bird-beaked*, (*bec d'oiseau—f,*) and the *haricot* (*g*) cautery.

All these cauteries, which are sometimes straight and sometimes curved, terminate in a rod which is furnished with a handle at the time of being used. The tail of the cauteries, moreover, is so arranged, that the same handle (*h*) may be applied to all. For that purpose, it is only necessary to turn a small screw, placed on the side of this handle, to enable us to fasten or withdraw the cautery. When we desire to apply these instruments, we place them upon a chafing-dish in the midst of burning charcoals, which are kept in a state of active combustion by the bellows; the degree of heat

we wish to obtain is determined by the color the metal assumes in becoming heated. Thus, the *gray* is the lowest degree chosen; and the *dark red*, the *cherry red*, the *yellow red*, and the *white red*, follow in succession. It is necessary to recollect, that the pain in this operation is in an inverse ratio to the degree of heat employed.

The cauterization by the hot iron takes the name of *inherent cauterization*, (*cautérisation inhérente*,) when we disorganize the tissues by a continued application of the metal upon the diseased part; ten to fifteen seconds ordinarily suffice, in this case, to obtain an eschar, if the cautery is heated to a white heat. On the supposition that we wish to go deeply, it would be better to change the cautery when it sinks to a dull red heat. In all cases we ought to act quickly, and not leave the cautery in its place till the cooling is completed, if we do not wish it to adhere to the eschar and endanger some laceration. In order to protect the neighboring parts, we cover them, generally, with some interposing substances, either linen, felt, or pasteboard, which we take care to wet with saline liquids, unless we apply the cautery through a canula of metal, or wood, covered with wet linen. The result is, in every respect, similar to that of a burn in the fourth degree, and exacts the same precautions for the treatment.

Cross (*transcurrent*) *Cauterization.* The ancients, who frequently used transcurrent cauterization, employed it, as the veterinary surgeons do at present, to trace lines and different figures upon the diseased regions, and especially about the articulations. It is the hatchet cautery which is used for this purpose; heated to whiteness, it should be passed by its cutting edge upon the region to be cauterized, so as to burn about half the thickness of the skin. We thus make a certain number of grooves, which should not approach nearer than half an inch, and may be made parallel, though it is sometimes better to arrange them in the shape of fern-leaves, (*en feuilles de fougère.*) The consequences of this kind of cauterization are very similar to those of moxa.

Objective Cauterization. We mean by this last epithet something analogous to insolation. In fact, the objective cauterization is made by means of burning charcoal, or a metallic body heated to a red heat, and which is held at a certain distance from the part. Eulogized by Fabre in the last century, objective cauterization, which I have sometimes thought it advisable to make trial of, is rarely any longer advised at present, and appears to me to merit the disuse into which it has fallen.

We see, by these few details, that the actual cautery which is employed in venomous or poisoned wounds, to arrest certain hemorrhages, to prevent hydrophobia, to limit and destroy the malignant pustule and carbuncle, (*le charbon*,) cancerous growths, and various tumors, requires the *reed* or *olive-shaped*, the *conical*, *bird-beaked*, *haricot*, or *nummulary* cautery, when we desire inherent cauterization; that the *hatchet* cautery is, in fact, for cross-cauterization only, and that pieces of metal would suit much better for objective

cauterization. Every thing shows, that if the ancients, especially Severinus, made a singular abuse of the actual cautery, modern surgeons have neglected its employment too much, and that they do not attend sufficiently to the reasons urged by Percy in favor of this therapeutic means. We must, however, acknowledge that the actual cautery runs the risk of never recovering its ancient popularity, either because art now possesses means which, to a certain degree, take the place of it, or that it inspires a great degree of dread in most patients, because, before using it, we have to be very sure that we can demonstrate its efficacy.

After the employment of the actual cautery, the treatment is the same as after the application of moxas.

CHAPTER VI.

VACCINATION.

The small-pox, a disease so often formidable, and always loathsome, has found in the vaccine virus an almost constant preventive. To maintain to-day that the vaccine does not destroy the principle of the small-pox, would be absurd; it would scarcely be less so, to persist in saying that no vaccinated individual can be attacked with small-pox. I have not in this place to consider how far it is useful to revaccinate those who have been vaccinated in their youth; nor can the subject of the necessity or inutility, at the present day, of retaking the vaccine fluid at its natural source in the cow-pock, now occupy my attention; but vaccination, of itself, is of a utility too indisputable to permit me to dispense with pointing out to pupils the manner of performing it.

There are in vaccination three principal circumstances: the operation, the development of the vaccine, and its preservation.

Article I.—Operation.

We may vaccinate in many different ways. Some have thought that after having made friction on the part with a piece of linen, to the point of excoriating the cuticle, it would be sufficient, in order to attain the end proposed, to apply upon the surface thus prepared another piece of linen impregnated with the vaccine. Others, after the example of Osiander, have advised to destroy the cutis by means of a blister. There were others, also, who made a slight incision into the integuments, and insinuated between the lips of the small wound a thread imbued with vaccine; but they have now, everywhere, substituted for these three processes the simple puncture.

To effect this, we use either the vaccine-needle (Fig. 170) or an ordinary lancet, whose point is slightly charged with the preventive fluid. Holding the instrument in the right hand, after the manner of a writing pen, or as for bleeding, the surgeon inserts it very obliquely (Fig. 171) between the epidermis and the rete mu-

(Fig. 170.)

(Fig. 171.)

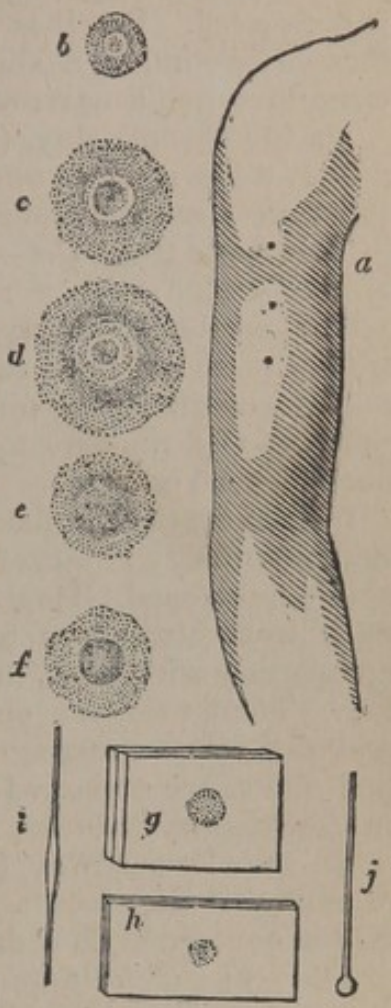
cosum, to about one line in depth, so as to cause at most only a very small drop of blood. Before withdrawing the lancet it is well to move it a little within the puncture, then to wipe its two sides, one after the other, upon the surface of the little wound. We proceed in this way on four to six different points, and the operation is terminated. This is done with so much rapidity and so little pain, that infants asleep are not awakened by it, and the most intractable have scarcely time to cry. The skin should afterwards remain exposed to the air from five to six minutes, in order to give time for each puncture to dry. It is sufficient, after that, to cover the part with a piece of fine linen, and to dress the infant as usual.

The number of vaccine punctures is altogether arbitrary. We are in the habit of making six; some, however, make but four, and every thing shows that it would be sufficient, in truth, if we had only one good one; but it is better, in reality, to have too many than too few, seeing that they rarely all take.

The region of the body has little in reality to do with the success of the vaccine; we could succeed in vaccinating the foot, leg, thigh, breech, abdomen, chest, head, and neck, quite as well as on the thoracic members; but we prefer the arm, as the most convenient for all the circumstances of the operation. It is generally on the middle third of the humerus that the vaccine is applied, taking care to make three punctures on each side; one on the outer side of the deltoid, the other opposite the insertion of this muscle,

and the third under it, (Fig. 172, *a*.) In this way they are separated an inch at least from one another, are easy to watch, and protected from all friction. Instead of placing them in this manner, some surgeons prefer arranging them in a triangle, one in front, the other behind, and the third below on the point of the deltoid, and this with the view of keeping their cicatrices afterwards more easily covered. In either mode it is necessary that the child should be undressed, and that his limb be entirely free. Embracing it below with the left hand, the surgeon stretches the outer surface of it, while with the right hand he performs the punctures spoken of above.

(Fig. 172.)



The age which suits best for vaccination, is that of the last six months of the first year, and throughout the whole second year. It is not that in a more advanced age children have less to hope from the vaccine; but as in waiting they are exposed to the occurrence of the small-pox, it is very natural that many families prefer having them vaccinated as soon as possible, that is to say, in the first months after the birth. Experience seems to have proved, moreover, that at the second month, and even in the first weeks, this operation is as effective as at a later period. It results from this, that in seasons of epidemics infants should be vaccinated at a very early period, while if the small-pox is nowhere prevailing, we may wait till the middle or end of the first year.

Article II.—Progress of the Vaccine.

The wounds of the vaccine are not ordinarily the seat of much action, and remain in the state of a simple puncture, (*a*,) or of a prurigo pimple, (*papule de prurigo*,) to the end of the third day. This lapse of time is known under the name of the period of incubation.

At the moment even of the operation the punctures are surrounded with a large areola of some lines, and of a pale rosy color, and then a little tumefaction, which all disappear at the end of a quarter or half an hour.

On the fourth day, the small wound seems to rest on a hard base, and its apex strikingly assumes the appearance of the bite of an insect.

On the fifth day, the whole presents a conical vesicle, whose apex begins to be depressed. Quite a severe itching sometimes accompanies this first stage.

On the sixth day, the base of the vesicle is enlarged and its apex is depressed. But it is not until on the seventh day that we see formed around it a slight swelling, this latter also having at its circumference a narrow inflamed areola.

On the seventh day, (*b*,) the vaccine pock is still more depressed, and of a fawn color, and is surrounded with a silver-colored ridge, (*bourrelet*,) evidently distended by a fluid.

This ridge (*bourrelet—c*) increases sensibly on the eighth day, and is surrounded with a rose-colored zone and with a tumefaction, which, on the ninth day, is extended from one puncture to another, if they have not been separated more than an inch apart.

It is not till on the ninth day (*d*) that the vesicle is the most developed, and that its apex begins to assume the form of a small dark-colored crust.

On the tenth day, the vaccine pock, more flattened, less shining, and manifestly enlarged, rests upon a general tumefaction extensively developed. Then the whole outer side of the arm is swollen, as if from clusters of furuncles, (*furoncles rapprochés.*) It is accompanied with heat, and the patient complains of a severe itching. Then, also, the child sometimes becomes fretful (*maussade*) and difficult to manage; he feels restless, and has a slight fever and chills, accompanied with paleness of the visage, and swellings in the axillary glands.

On the eleventh day, (*e*,) the pock is hard, flattened, and destitute of fluid; it assumes a pearl-gray or dirty yellow color, and becomes covered with a dark-colored eschar.

The stage of inflammation is thus terminated. Now comes the stage of desiccation. On the twelfth day, (*f*,) we observe a scab, which occupies the epidermis, a remnant of turbid liquid, and an areola, which is paler, harder, and of less extent, than the day before.

On the day after, and on the succeeding days, the engorgement which surrounds each pock diminishes more and more, and the liquid of the pustule becomes puriform.

Counting from the fifteenth day, the vaccine scab, changing from a fawn to a dark red color, now assumes a more or less deep-brown hue, and stands out more and more from the surface of the skin. This scab, sometimes raised up by pus, and accompanied with desquamation of the neighboring cuticle, falls from the twenty-fifth to the thirtieth day, leaving a dotted (*pointillée*) cicatrix, easily recognised, and which never disappears.

Article III.—Anomalies of the Vaccine.

Vaccination does not always proceed with as much regularity as I have just described; there are cases where the inflammatory stage is formed at the end of twenty-four or forty-eight hours, while

in other cases it will not be manifested before the expiration of a month, and in consequence of a second vaccination. It appears, also, that this stage may last from three weeks to a month, instead of being restricted between the third and twelfth days. History also makes mention of persons so repugnant to the vaccine, that it has required eight to ten successive operations before the virus would take. It is also said, that, in certain cases, the vaccine has produced only some general symptoms, leaving, however, the system protected against the small-pox.

False Vaccination. In place of a genuine vaccination, which is the only one that is protective, we sometimes obtain only a spurious one. This false vaccination takes place in individuals who have had the small-pox, or who had already been vaccinated. In other cases, it arises from having used a dull-pointed or rusty lancet; or because the vaccine was bad, too old, or decomposed—in a word, because the fluid was spurious, or that the operation has been badly performed. In such cases there is generally no stage of incubation, and the suppuration is found in the vesicle on the third or fourth day. The stage of desquamation, on the contrary, is longer, and the cicatrix has none of that dotted appearance which makes it easy to distinguish from every other mark on the skin. Sometimes, also, the scab falls on the fifth day, and is reproduced and detached anew, as with ulcers in general. [In reference to the *pointillée*, or dotted appearance of the cicatrix, it is well to add, that its shining, smooth, glossy appearance, and white or pearly white color, and its circular or ovate form, and its usually slight and sometimes greater depression below the general surface of the surrounding skin, and also the pellicle-like thinness of the new cuticle covering this depression or cicatrix, so transparent as sometimes to permit the minute veins to be seen beneath it, are all characteristic marks of the genuine vaccine, not to be overlooked.—*T.*]

Article IV.—Preservation and Transmission of the Vaccine.

Previous to the sixth day, it would be next to impossible to obtain from the vaccine vesicle the least particle of liquid, and thus to make use of it for vaccinating another child. The seventh, eighth, and ninth day, the end of the sixth, and the beginning of the tenth, only, allow us to obtain any that will prove efficacious. Later than this, the scabs being pulverulent or moistened, the pus which they contain, would rather produce a false than true vaccination. I should also add, that, from experiments made at Tours from 1816 to 1820, on a great number of patients, the preservative property of the vaccine is at its maximum of intensity at the end of the sixth to the commencement of the eighth day. We extract and preserve this liquid in various ways.

§ I.—*Vaccination from Arm to Arm.*

If the child to be vaccinated is near that which is to furnish the

vaccine, we make a few punctures on the swollen border (*le bourrelet périphérique*) of the pustule; with the point of the lancet, or a needle, we take a small drop of this liquid to transfer it immediately, as has been said, to the arm of the other child. After having made two punctures with the first drop, we return to take a second, then a third; we might even, for greater certainty, supply the lancet anew at each puncture.

§ II.

If it should become necessary to transport the vaccine to *some distance*, we should open the border of the pock, as in the preceding case, and then charge with the fluid the points of several lancets, which should be immediately shut up in their handles, from which latter they are kept separate by means of a small piece of paper. We thus arrive at the child to be vaccinated without any fear that the vaccine may have become decomposed, provided it is applied before the end of the first or second day.

§ III.

But it is often required to *preserve the vaccine* for a much *longer time*, or to transmit it to great distances; many means have been devised for this purpose. One of the oldest, and which was employed by Jenner, consisted of two small *square plates of crystal glass*, (*g*,) one of which was hollowed out in the middle into a slight depression, (*cupule.*) It is in this cavity that the vaccine is deposited, after which the plates are placed together, and the borders then luted with glue or sealing-wax. This process has the inconvenience of requiring much more vaccine than it is sometimes possible to obtain. In other respects, it is exceedingly convenient and useful. Many persons have substituted the employment of *simple plates of glass*, (*h*,) the middle part of which is applied to the vaccine pustule to receive its liquid, and then the two luted together, as with the others. In adopting this mode, it is impossible to avoid losing a very considerable quantity of the liquid, or to prevent its desiccation.

The *threads* that were formerly used, as well as the pieces of *linen*, to imbibe the vaccine fluid, are no longer employed, since the incision and *friction* have been abandoned.

§ IV.—*Bretonneau's Method.*

The most valuable mode known at present, is that which we owe to M. Bretonneau. This physician has proposed glass *tubes*, of from fifteen to eighteen lines in length. Spindle-shaped, (*fusiformes—i*,) capillary, and drawn out at the lamp of the enameller, they are applied like a writing-pen by their point, inclined at the same time more or less downward, to each drop of liquid; they

thus become filled by capillary attraction. Presented afterwards successively to the flame of a candle, the extremities of the tube are melted, shut and converted into a small bulb, (*boule*,) which for greater security may be enveloped in wax. The tubes thus prepared and put aside in the hollow of a quill or some other case, after the manner of needles, preserve the vaccine in a liquid state, and in all its energy, to an indefinite period.

To avoid breaking when they are to be transmitted to a great distance, we place them in cases or small boxes filled with bran, sawdust, or charcoal. It is within my knowledge, that vaccine sent in this manner to America, has produced at the expiration of three years as many vesicles as punctures.

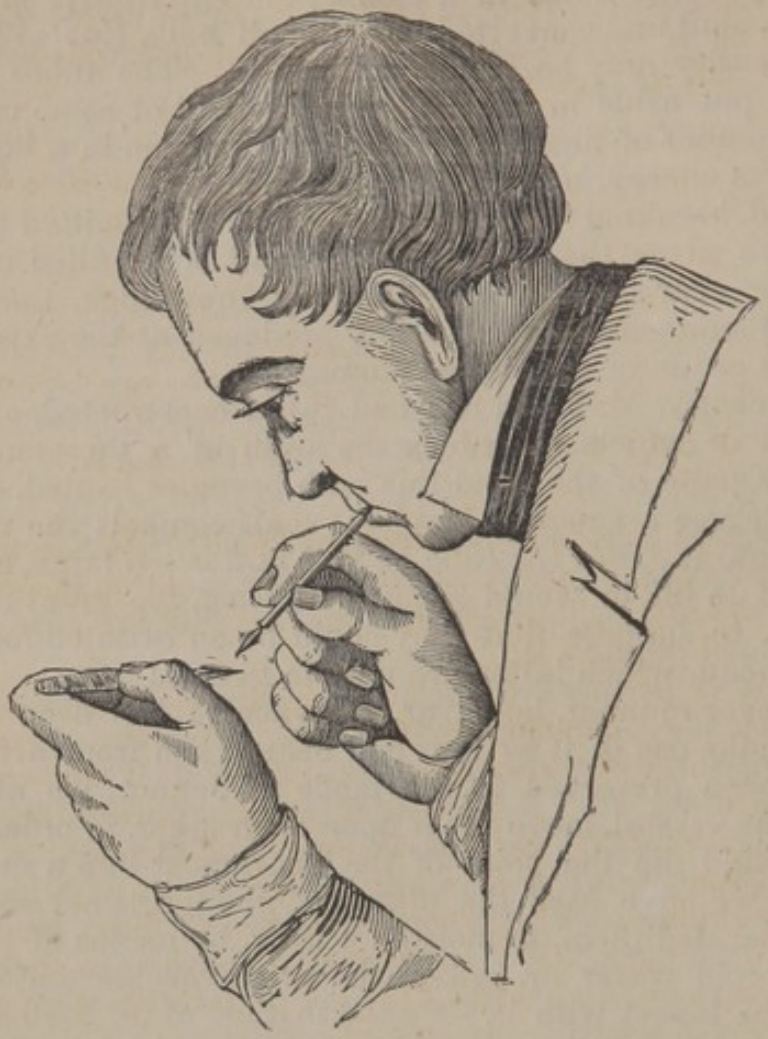
More recently, M. Fiard has had tubes constructed, one of the extremities of which resembles the bulb of a thermometer, (*j*.) Held in the palm of the hand this bulb becomes heated, creates to a certain degree a vacuum, and as it cools compels the vaccine to be forced into it. But the tube of M. Fiard is too large, and seems too difficult to fill, or would require, at least, too great a quantity of vaccine, to suppose that they could be substituted for those of M. Bretonneau, which latter are now in general use.

In whatever manner, however, the vaccine has been collected, we must make use of it as if it had been taken from arm to arm. If it has been preserved in the mode of Jenner, we unglue the plates of the crystal, move them upon each other, in order to separate them, and dip the point of the instrument into a drop of the liquid. If we have used the plates of glass, it is necessary, after having separated them, to moisten a little, by means of the finger, wet with tepid water or saliva, the dried vaccine matter, before charging the lancet with it. By the method of M. Bretonneau, we begin by breaking the two small heads of the tube ; we then adjust the largest of the two extremities into the glass tube of a blow-pipe, which latter should be two or three times longer than the vaccine tube, or we insert it merely into a stalk of straw. Raised to the mouth, the extremity of the blow-pipe, thus arranged, serves to force the vaccine upon the point of the lancet, (Fig. 173,) which is held in one hand, while the other directs the tube, and prevents it from moving. In this manner a tube which contains less than a drop of vaccine, may suffice for six and sometimes even a dozen punctures.

Though the taking away the fluid from all the vesicles of the child may have no effect in destroying the efficacy of the operation upon it, it is, however, as well to leave at least one of them untouched. It must be also confessed, that this abstraction renders the progress and changes of the vaccine evidently much more irritating, without being of any advantage to the person who submits to it. The quantity of the vaccine fluid, also, is in relation with the development of the pock from which we take it, and not with the constitution or health of the child that furnishes it.

[*Modes of Preserving ; also, the Test of Purity.* Dr. Mott thinks the best way of preserving and transmitting the virus is upon small

(Fig. 173.)



flattened ivory points, about an inch or an inch and a half in length, charged with the virus, and placed in small vials carefully sealed with wax. It is the neatest and most convenient. Points of quills are the common mode in this country. The *dried scab*, shut up in sealed vials, is a most excellent mode of transmission. When used it is powdered, and, moistened with saliva or water into a little paste, is a most efficacious mode, and may for a long time retain its virtues. Again, *scarifications*, and those crossed, and all of them restricted to a small space, is, in Dr. Mott's judgment, a much better mode of communicating than puncture or any other plan, unless when it is from arm to arm, where puncture is preferable. Next to Jenner, Brice, of England, comes in for much praise, as having introduced a great improvement in vaccination, and which improvement is the ONLY TRUE TEST of the constitutional effect of the vaccine disease. It is this: on the fourth or fifth day, on puncturing the margin of the pock, there will be obtained on the point of the lancet a particle of lymph, which, upon being inserted upon the same or the other arm, or any part of the body, will take effect, and go on and reach maturity *pari passu* with the pock from which it is procured, thus proving the constitutional effect of the vaccination.

In this curious pathological phenomenon, the stage to which the primary vesicle has advanced, imparts a proportionate maturity to the one which is reproduced by it, and they proceed on together, the original and its type and test.—*T.*]

CHAPTER V.

PERFORATION OF THE EAR.

The rings and jewels which women usually wear in their ears, and which many men also formerly wore, cannot be inserted without a small operation, known under the name of the perforation of the lobe (*lobule*) of the ear.

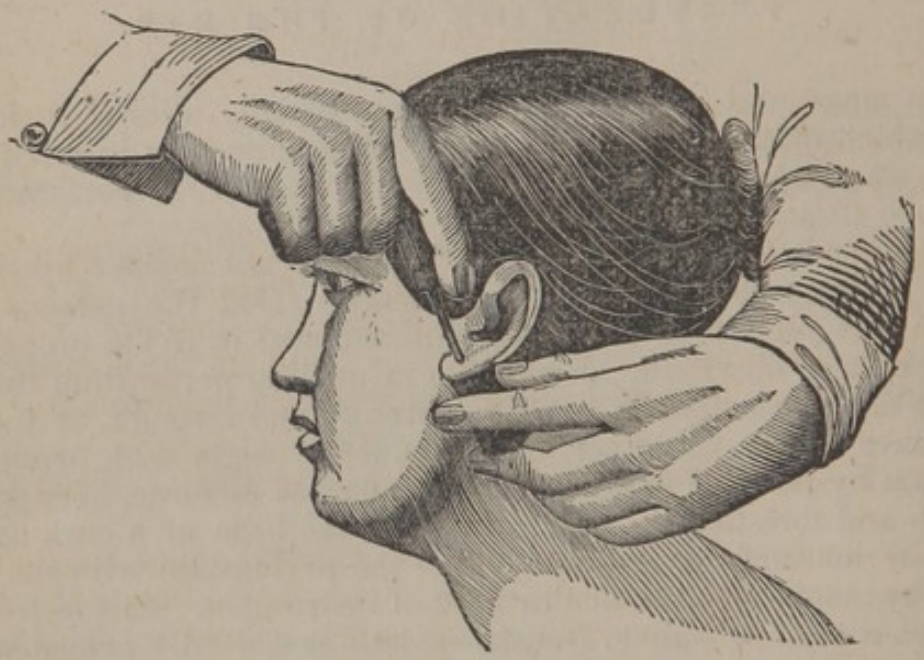
Whether it is performed when young, or not decided upon until after puberty, the operation is so simple, that the persons upon whom it is performed are scarcely sensible of it, if the proper precautions are observed. It consists in quickly perforating the lobe of the ear, in its middle portion, through and through, at three to four lines above its lower extremity. We begin with benumbing the part by rubbing it, with a certain degree of force, between the thumb and fore-finger. We now press the base of a cork against its posterior surface, and then effect the perforation with the other hand by means of a particular kind of instrument. This instrument may be a kind of punch, (*emporte-pièce*,) or a needle armed with a canula, that is to say, a very small hydrocele trochar. The punch, perforating the lobe, separates a small fragment of it, which it carries with it into the cork, (Fig. 174.) As soon as it has completely perforated the part, and that we have disengaged it from the cork, we remove from its cavity, by means of a pin, the fragment of tissue which it has cut, in order to attach to the punch the extremity of a leaden wire, which is drawn through the perforation by means of the punch, which thus serves the purpose of a larding-pin, (*lardoire.*) When the trochar is preferred, which is in fact more convenient, we force it in the same manner to a certain depth into the cork. After having withdrawn its punch we introduce the leaden wire into its canula, which latter is immediately withdrawn, and the operation is finished.

In place of a leaden wire, whose ends must be united and twisted to prevent displacement, some persons make use of a skein of thread or cotton, and sometimes, also, of the ring itself, so as to make the operation complete at once. But as these foreign bodies are to act at first in the manner of a seton, their object being to force the wound to convert itself into a fistula or passage, by means of the cicatrization on the surface of its cavity, the lead, for those

reasons, is in reality the one to be preferred. When the interior of the perforation has undergone this cutaneous transformation, that is, at the end of fifteen, twenty, or thirty days, sometimes more, rarely less, we may substitute the ring itself for the temporary contrivance of which I have just spoken.

This small operation, relating to a homogeneous tissue, which includes neither vessels, large nerves, nor muscles, nor tendons, does not endanger any serious wound; thus, therefore, is it daily performed by jewellers, and even by common people. It is well to know, however, that, like any other puncture, it may cause an erysipelas, or even a phlegmonous inflammation, in the lobe of

(Fig. 174.)



the ear. I have frequently seen small abscesses form around the aperture, and it not unfrequently happens that the puncture ulcerates and cuts its way out by means of the seton. In this respect the punch, effecting a loss of substance, offers some advantage over the trochar. It is because of the tendency of the wire to cut the parts, that it is better to puncture a little higher up, rather than lower down. In order to avoid all inflammation and suppuration, it is better to move the temporary ring, generally every day, taking care to besmear it with a little ointment or fatty substance. It is proper to know, also, that if by chance the seton should cut through from the perforation before the definitive formation of the fistula, the hole would shut up very quickly, and that it would then be necessary to recommence upon another point, or to repass a new seton through the first wound by means of a blunt probe. On the supposition that inflammation or purulent collections should manifest themselves about the foreign body, it would be better to withdraw it, to reapply it at a later period, than to persist in keeping it in its place.

CHAPTER VI.

OPERATIONS THAT ARE PERFORMED ON THE TEETH.

Like all other parts of the human body, the teeth require various special operations, which consist—

1. In favoring their egress;
2. In giving them a proper direction;
3. In maintaining them in a state of proper cleanliness;
4. In filing them to arrest the progress of caries;
5. In filling them;
6. In cauterizing them;
7. In effecting their extraction.

For this chapter I have not wished to rely upon my own proper experience; I have desired my friend, Dr. Toirac, one of the most skilful and capable dentists of the capital, to prepare it for me. The reader, therefore, must expect to find here the doctrines and precepts of this distinguished practitioner, rather than mine.

Article I.—Incision of the Gum to favor the Egress of the Teeth.

If the acute pains and convulsions, which the infant sometimes experiences in pushing forth its first teeth, depend upon the resistance of the gum, the incision of this part is indicated. This operation, which is effected with a lancet or bistoury, does not succeed well, except it is performed sufficiently deep, and so that the division (*débridement*) is complete. The incision for the incisor and canine teeth should be simple, and for the molar, crucial.

The last or wisdom tooth, in the lower jaw, may also require the use of a cutting instrument: this is when it appears to be arrested, in part, by a thick border (*bourrelet*) of gum. This border inflames and ulcerates, and causes sometimes intolerable pains, which extend to the ears, to the parotid and sub-maxillary glands, and to the neck, and, by sympathy, to the teeth of the upper jaw. A simple deep incision, and, better yet, an excision in form of a V, with its apex forward, suffices in most of the cases; we take the precaution of introducing under the loosened portion of the gum a small dossil of cotton or lint, to retard the too prompt cicatrization of the wound. If it should be judged proper to make a complete removal of the flap, (*lambeau,*) a bistoury, or good pair of scissors, and a dissecting forceps, would suffice. If we should desire to effect the same result by cauterization, the small curved cauteries, heated to whiteness, should be preferred to the potential cauteries, which are ordinarily insufficient.

Article II.—Straightening the Teeth.

Nature, which makes every sacrifice for the arrangement of the first teeth, has often need of the assistance of art for that of the second dentition. If the dental arches are well developed; if the arch of the palate is wide and rounded; if, at the age of five or six years, the milk teeth are separated, leaving certain intervals between them, it is to be presumed that those which are to succeed them will be placed regularly upon the alveolar border. But if, on the contrary, the curve which the jaws make is narrow and protrudes forward; if the milk teeth are small and wedged together; if, in fine, the vault of the palate is contracted and elevated into a cone, these signs of an unfavorable aspect announce an irregular dentition, which it will be essential to watch.

As a general rule, it is important not to remove the milk teeth too soon, that is, before nature has indicated by their looseness the presence of those that are to succeed them. This method is injurious, because the jaws, by contracting themselves, cause the alveolar border to be diminished, by which means osseous cicatrices are formed, which render the egress of the second tooth more difficult. There are, however, cases where the premature extraction of the first teeth, as well as the sacrifice of one or two of the second dentition, are necessary; but it is easy, from what we have just said, to foresee the moment for this a long time in advance.

When the dentition has not been properly directed, or that it has been impossible to effect a regular arrangement of it; when some are out of the arc that they ought to form, and some are *snags*,* (*sur-dents*,) or cross each other, or are of unequal length, we must recur to the different mechanical expedients used for such cases, and which consist of threads of silk or metal, plates of different forms, inclined planes, &c. The younger the subject is, the more promptly will the means we employ succeed.

When a tooth projects too much, supposing that it is, in this case, a large or small incisor, it can be brought into the circle by passing a cord of the proper size on the outer surface of its neck; we then conduct this cord so that it may pass on the posterior face of the neighboring teeth; afterwards it is brought forward by passing it between the canine and first bicuspid, and finally tied upon one of them. If we wish to bring the same tooth forward, in the case that it should be found too far back, instead of placing the cord on its anterior face, we should pass it behind, and we should in the same way make our points d'appui upon the canine teeth, or upon those more remote.

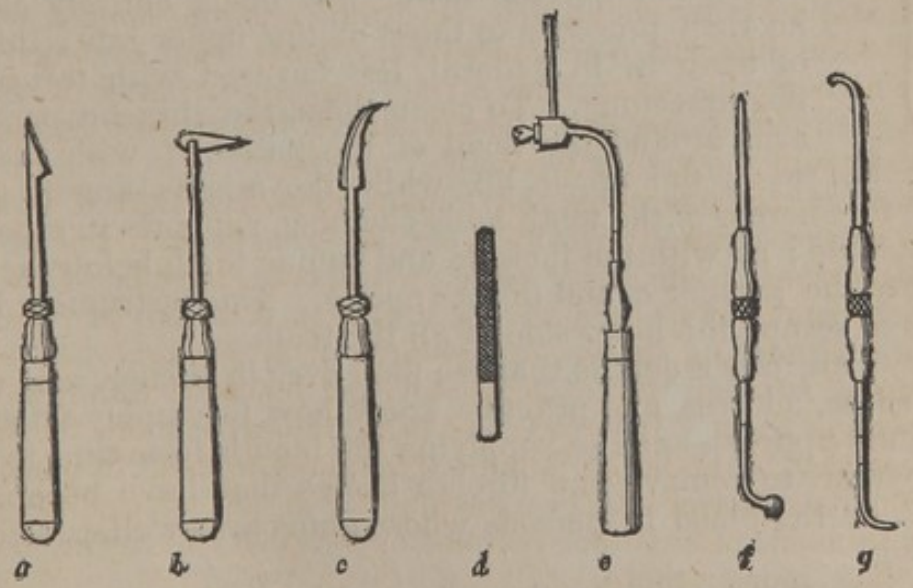
If the teeth that we would wish to bring forward should be found imprisoned by those of the lower jaw, as sometimes happens to individuals with prominent chins, it is easy to be conceived that the action of the threads would be almost nothing, since the movement,

* [Sometimes called *wolves' teeth.—T.*]

which we should have the intention of producing on the teeth above, would be neutralized by the obstacles which would be constantly opposed to it by the teeth below. It would be necessary, then, to dispense with the cords, and have recourse to the inclined plane. With the cords and the inclined plane, which are used together or separately, we may effect all the results desired for restoring and adjusting the position of the teeth. [A very efficient and easy mode, which I have practised, when one of the large incisors, for example, of the second dentition in the upper jaw, has emerged only one half from the gum, and, as often happens in such cases, takes an abrupt direction backwards, or within the mouth, is this: Cut out a portion of the gum in front, of the shape of a narrow perpendicular Λ inverted, of the length, say, of the part of the tooth that has emerged, and the two branches of which should, at their base, be at the distance from each other of about one half or two thirds the breadth of the tooth. This excision is very conveniently made on the superior half of the anterior surface of the tooth which is yet covered by the gum, and causes little or no pain, while the effect of it is perfect in unbridling the tooth, and, in a few weeks, enabling it to resume, by the pressure of the gum behind, which now has no antagonist force, its proper position in the arc. When the tooth is entirely protruded, no traces are to be seen of the excision.—*T.*]

Article III.—Cleaning the Teeth, (Fig. 175.)

(Fig. 175.)



When the daily use made of the brush does not prevent the teeth from becoming covered with tartar, we should have recourse, from time to time, to the employment of an instrument. Before commencing the operation, we should have at hand a glass of tepid

water, if it is in winter, a wash-basin for the person operated upon to spit in, and a napkin to wipe the instruments.

The patient being placed on a suitable seat, so that his head is supported behind, and the operator, having at hand all the instruments which he considers necessary, places himself on the right; then taking the simple scraper, (*grattoir—a*,) in the manner of a writing-pen, the mouth being slightly open, he uncovers the teeth of the lower jaw, and keeps the lip depressed by means of the fore-finger, while with the thumb he supports the tooth upon which he is acting with the instrument, the point of which he forces below the tartar, in order to break it into fragments, which must be displaced from below upwards, in order not to wound the gum; he proceeds thus with each tooth, until he finds no more foreign matters to remove. The same instrument, by having the point almost square, is more convenient for scraping the small and large molars, and is attended with less risk of wounding the cheek, which is kept aside by the fore-finger. Then taking the curved scraper, (*b*,) he effects the removal of the tartar which is found on the opposite side of the same teeth: for this purpose, the operator places himself sometimes in front and sometimes behind the patient, according to his convenience, taking care to guide his instrument so as not to wound the gum. All the tartar discoverable having been removed, he introduces between the teeth the extremity of the blade of the instrument, (*c*,) in order to complete the cleaning. In order to be certain that no more remains, he makes use of the small mirror, (Fig. 176,) which is so placed in the mouth as to enable him to examine each tooth successively.

(Fig. 176.)

The teeth of the lower jaw being entirely cleaned, he then proceeds to those of the upper jaw; this row of teeth is, in general, less covered with tartar than the preceding. To clean them, the surgeon passes his arm around the head of the patient; with the fore-finger he raises the upper lip, while the middle finger, placed on the free border of the tooth he is cleaning, supports it, especially if it is loose; as with the incisors and canine teeth below, he must here use the scraper *a* and the scraper *b*. The instrument Fig. c. serves to scrape the inner side of all the teeth.

There are other details that we pass over in silence, and which good sense, address, and practice know how to employ when the occasion requires—such as supplying the mouth, from time to time, with water, to remove the foreign bodies that have become detached, or the blood in persons whose gums are swollen, soft, and bleeding.

We sometimes meet on the crown of the teeth with deep spots, which are very difficult to remove with the instrument; they then require the use of an acid, more or less diluted (*étendu*) with water,

which is gently applied with the end of a match, (*allumette*,) and which we must immediately wipe off, that it may not extend to the neighboring teeth; we use, also, for this purpose a piece of pumice-stone, shaped in form of a cone; the extremity of it is dipped in water before using it. It is very seldom, however, that we have to recur to these means, which are not to be used but with much circumspection, for fear we should destroy too much of the enamel portion of the tooth.

Article IV.—Filing the Teeth.

The file (*d*) is chiefly employed to level those teeth which have too much length, to separate them when they are too much crowded, to remove the caries that attacks them, and to free them of inequalities of every description; internal diseases and fractures produce, occasionally, a roughness which would wound the cheek, lips, or tongue, if the file were not used to destroy it.

The small flat files, cut sometimes on one side, sometimes on both, serve to separate the teeth. They are usually held in the hand; it is only when we wish to separate the large molars that we have recourse to a file-handle, (*porte-lime.*) The round and half-round files are only used when we wish to file the teeth to a level with the gum, when their crown is nearly destroyed, or we wish to fit in an artificial tooth. The triangular file, which is called also *tire-point*, serves to file down the teeth which rise above each other. It is made to act flatwise on one of its sides, or one of its angles; we thus make a groove of greater or less depth, in order to obtain a hold for the clench (*mors*) of a pair of cutting-pincers, to remove by a single stroke the portion of the tooth which is in excess.

The manner of handling the file is simple; it requires, however, some address and delicacy on the part of the person that uses it, especially when it is applied to the teeth in front. As a general rule, while we are removing the diseased part, we must manage the external table of the tooth in such a way as to prevent it from having a disagreeable appearance. The incisors and canines are those that most frequently require attention to this precept; it is also necessary that the file should be placed obliquely from before behind, so that it may cut much more behind than in front. We must take care to leave at the neck a small projection, (*talon,*) which resists the approximation of the teeth. This precept might be neglected, if the space between the teeth which have been separated should be thought too great. As to the lateral teeth, it is sufficient to separate them more or less, according to the progress the disease has made.

Operative Process. Whatever may be the object we have in view in filing a tooth, the patient should be conveniently seated. The operator, placed on the right, holds the file between the thumb and fore-finger of the right hand. He dips it in hot water, if it is in

winter, and passes the left arm, as in cleaning the teeth, around the neck of the patient; then raising the lip with the middle finger of the same hand, he files the tooth steadily, (*sans secousse*,) and without employing force. If the file sticks, (*s'engage*,) he stops, draws it out, and dips it in hot water, in order to remove the matters it has become covered with. Teeth, properly filed, should not appear to have been touched; it is proper, also, in order to complete the operation, to round off the angles and the sharp edge which the instrument leaves. In this manner we cause all the roughnesses to disappear, and try to give to the tooth its original form.

Article V.—Filling the Teeth.

We give this name to the operation by which we introduce lead into the cavities which the teeth present, in consequence of caries or particular alterations of the enamel. They formerly used for this purpose only sheet-lead in very thin laminæ, (*en feuille très mince*;) since that, recourse has been had to tin, which oxydizes less; to gold, silver, or platina leaf; finally, to the metal of Darcet, rendered more fusible by the addition of a sixteenth or twentieth of *mercury*; by means of the actual cautery, we melt this last composition in the cavity we wish to obliterate.

The operation of filling is one of the most simple and easy. Nevertheless, it should not be done without taking into consideration certain conditions, which relate as much to the choice of the metal to be employed as to some particular cases where we must abstain from practising it. Gold, silver, and platina are employed, by preference, to fill (*obturer*) the cavities which may present themselves in the incisor, canine, and all the other teeth, which, by their position, are seen between the lips. The other metals may be reserved indiscriminately for the other teeth, [excepting all mercurial alloys, amalgams, &c., which cannot be too strongly condemned and proscribed, as producing the most disastrous consequences, salivation, destruction of parts, &c.—*T.*]

Operative Process. The patient being seated, and the head supported against the back of an arm-chair, it is necessary, first of all, to remove carefully, by means of a rasp, (*rugine*,) or a small probe, whatever there is of foreign matter in the dental cavity. We gently scrape the walls of this cavity; then pass into it, successively a number of times, small balls of cotton, and continue this operation till the cleaning is complete; we satisfy ourselves, also, that there is no ichorous exudation going on through the canal of the tooth; for, in checking it by the filling, we should bring on pains and abscesses, the pus of which might extend sometimes to remote parts, giving rise to fistulas, the cure of which could not be effected without taking out the filling, or, perhaps, extracting the tooth. If the dental pulp should be exposed, it would be necessary to endeavor to destroy it by the processes we have pointed out, for,

unless that is done, the operation would be impracticable, or would produce insufferable pain.

Every thing having been done properly, the operator rolls between his fingers, without compressing it, a small ball of the metallic leaf which he wishes to use, and the size of which is nearly three times larger than the cavity he wishes to fill; he places it on the opening, and forces it gently, at first, in the centre; he then successively brings together the surrounding parts, until they are all introduced. If the metal should bulge out too much, or interfere with the shutting of the jaws, we should take care to remove the excess with a scraper. Then making use of the blunt extremity of a probe, (*f*,) we should polish the metal and burnish it, so as to leave no roughness.

When we desire to make use of the fusible filling, (*du plomb fondant*,) we proceed, at first, as with the ordinary filling: we clean, then scrape, the cavity of the tooth; then, passing cotton several times into it, to free it from moisture, insert a small piece of fusible metal, and then apply to it the extremity of a probe, (*e*,) heated at a fire, or by a lamp or candle. When we perceive that the composition is melted, we press it with the finger to make it take the exact form of the cavity, then level with a scraper the parts which are found in excess.

At different epochs, and also in our own times, they have greatly extolled various kinds of paste, as capable of replacing the different metals we have mentioned; but they are far from effecting in an advantageous manner the results that have been attributed to them; and experience unfortunately daily proves, that those self-styled discoveries, up to the present moment, have turned only to the profit of charlatanism.

Article VI.—Cauterization of the Teeth.

The object of cauterizing the teeth is to destroy the sensibility which exists in them. Hot iron and caustics of different kinds are, by turns, used for this purpose The preference should be accorded to the hot iron, which acts with more celerity and certainty, though it may often prove insufficient.

The cases in which we may resort to cauterization are—1. When we have filed a tooth, to relieve the sensation which is produced upon the part we have operated upon by water, cold air, and substances of a greater or less degree of acidity; 2. When a tooth has experienced a shock which has broken a portion of it, or when the teeth have been much worn down by mastication; 3. When caries has made sufficient progress to lay the dental pulp bare.

This operation is performed by small cauteries, made of different forms and thicknesses, according to the place where we wish to apply them. The flame of a candle, or of a small spirit lamp, ordinarily suffices for heating them. We apply them carefully to the part we wish to cauterize, taking care, if it is a tooth which

has been filed, to touch only the part laid bare, (*partie eburnée,*) and avoiding any action on the enamelled portion.

When we have to destroy the dental pulp, which is done with sufficient facility on the teeth that have but one root, as in the incisors and the canine teeth, we make use of a small pin, or a needle heated to a white heat, which is held by a forceps, or, better still, by a needle-holder, (*porte-pointe ;*) [that is, a handle, into which a needle, or any thing similar, may be firmly fixed.—*T.*] The point of this instrument is quickly introduced into the opening which communicates with the pulp, taking care to enlarge it, if the passage is too small.

If we wish to use potential cauteries, which are applied more especially to the molar teeth, because of the number of their roots, we must begin by carefully cleansing off the caries by means of the scoop and by rinsing the mouth with tepid water. We then take a small ball of cotton, slightly moistened, upon which we scrape a small quantity of lunar caustic, and then introduce it into the dental cavity. Creosote, chloride of zinc, the nitric and hydrochloric acids, the essential oil of cloves, cinnamon, and mint, are also used upon a small ball of cotton, which is renewed once or twice in twenty-four hours; this dressing is to be repeated until the insensibility is complete, which will then allow us to proceed to the filling, of which we have already spoken.

Destruction of the pulp by bruising it, (*par le broiement.*) We have given this name to an operation by which the dental pulp is destroyed without having recourse to cauterization; this operation, which is attended with considerable pain, consists in introducing into the dental canal a hog's bristle, or very small probe, which is moved about by turning it around between the thumb and index finger. It is a means which succeeds very well, but is more painful than cauterization.

Article VII.—Of Extraction of the Teeth, and the Instruments that are used in this Operation.

(Fig. 177.)

There are few operations in surgery for which more instruments have been invented than for extracting teeth. Of all those that have been contrived, there are a very small number that have been retained in practice. I will describe those only that enter into this list, and which are sufficient for all the operations.

§ I.—*The Key of Garengeot,* (Fig. 177.)

Without entering into a description of all the modifications which this key has undergone since its invention, I will remark, that the most secure and commodious form appears to me to be the following: The

keybit (*panneton*) is of a medium length, and it may take its point d'appui at a convenient distance from the tooth to be extracted. When it is too long, the alveolar process is readily broken; when it is too short, we may fracture the tooth. Upon this keybit are two notches for receiving the bifurcated heel of the hook, the divisions of which adapt themselves to it, and are fastened by means of the pin, which has at the end some threads of a screw to prevent its falling out. The advantage of this arrangement is, to give us the power of applying the hook close up to the termination of the keybit, for the extraction of the last molar teeth. We may easily change the hook to either side, and make use of different sized hooks, according as they may be required. The curve in the stem (*tige*) of the turnkey, where it joins the keybit, is also essential, that we may not be incommoded by the teeth in front when we are operating at the bottom of the mouth. The handle, which is removeable, may, by that means, be adapted to other instruments. Separated from the stem, it may also be better adjusted to the pocket-case.

Operative Process. After having carefully examined the tooth we wish to extract, and adjusted the hook to the key, and wrapped around the keybit a small piece of bandage, or the corner of a napkin, we firmly grasp the handle of the instrument in the right hand, the stem passing between the fore and middle finger. The patient having his head supported against the back of an arm-chair, and holding the mouth sufficiently open, enables the surgeon to introduce the stem of the key, which he guides with the fore-finger of the left hand to the tooth he wishes to extract; the same finger serves to push aside the cheek or the tongue, as the case may be, and to adjust the keybit in a proper manner upon the gum; in applying the finger afterwards upon the hook, it holds this last firmly fixed upon the neck of the tooth, as near as possible to the edge of the alveolar process. This being done, we give to the instrument a twisting movement, tending to turn the tooth in the direction of the keybit; this movement should be made gently and without any violence, in order that we may give to the surrounding parts the opportunity of yielding to the elasticity which is proper to them, and that we may wound them as little as possible. As soon as we perceive that the tooth is completely loosened, (*luxée,*) we give to the instrument an upward movement, and thus effectually extract it, or we finish its extraction by seizing it with a straight or curved forceps, according as we operate above or below, especially if we find that a small portion of the alveolar process has been carried off with the tooth, or the gum is adherent to it to a considerable extent. It is then proper to make use of a curved bistoury, or scissors, to disengage it completely. In all cases, we should endeavor to avoid this inconvenience, by properly separating the gum from the tooth before the operation.

In operating with the key, it is almost always the practice to grasp the tooth from within outwards; but there are cases where it is indispensable to act in an opposite direction. They are—1.

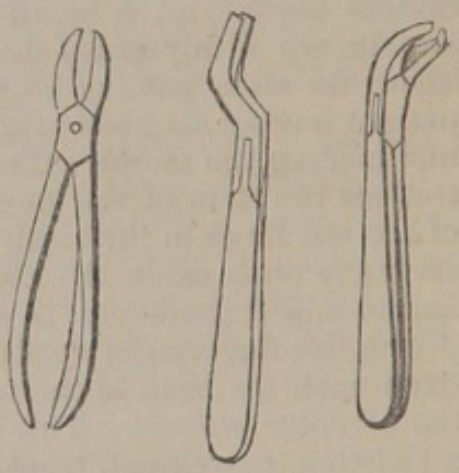
When the crown of the tooth presents a manifest inclination in the direction towards the tongue: in thus forcing the tooth to move in the arc of the circle that it naturally describes, we run much less risk of breaking it; 2. When the crown of the tooth, undermined by caries, offers on its inner side no point d'appui to sustain the hook; 3. When the gum, in fine, on the side of the cheek, is the seat of an active inflammation, or an abscess.

§ II.—*The Straight Tooth Forceps* (*Davier droit*) *and Straight Pincers.*

These two instruments, which are always confounded together, differ from each other in this, that in the davier the clipping branches are arched in the direction of their articulation; its upper branch is longer by a line or two than the other, and goes beyond it, which gives them a resemblance to a parrot's bill. It is necessary to have acquired a certain degree of tact in the use of it, or we incur the risk of breaking the tooth that we wish to extract, should the latter offer any considerable degree of resistance.

The *straight pincers*, (Fig. 178,) has the clipping branches separated laterally. It is used like the davier, to remove the front teeth when they are not too much decayed, and when they offer a hold sufficiently firm to resist a certain degree of pressure. The Z shaped pincers (Fig. 179) of Dr. Toirac is one of the most convenient for reaching the bottom of the mouth in operating upon the teeth of the upper jaw.

(Fig. 178.) (Fig. 179.) (Fig. 180.)



The Operative Process. The patient being placed as above, with his mouth open, we raise the upper lip with the fore-finger of the left hand, the thumb being placed upon the border of the teeth; the instrument being held in the right hand, we grasp between the bite of the pincers the tooth we wish to extract as high as possible under the gum; this being done, we make half rotatory movements, and on loosening the tooth we draw it towards us in the direction of the external border of the alveolar process.

§ III.—*The Curved Davier* (Fig. 180) *and Curved Pincers.*

There is the same difference between these two instruments as between the straight davier and straight pincers. The pincers should have the preference, and it is advantageous to have them of different sizes. They are particularly useful in removing teeth that have not much solidity, and the milk teeth, from both jaws.

We seize the tooth, without giving to it the twisting movement, as in using the straight pincers, and endeavor to detach it gently

forwards, drawing it at the same time towards us, or out of the socket.

§ IV.—*The Elevator, or Carp-Tongue.*

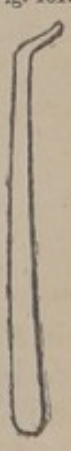
The instrument thus named is composed of a stem, which is adapted like the key to a handle, and the bent extremity of which is terminated by a quadrangular flattened and truncated pyramid. This is one of the most valuable of instruments, and which no other can supersede, for the extraction of the last molars, or wisdom teeth.

Operative Process. The patient being seated, with the head firmly supported upon a resisting body, we grasp the handle of the instrument with the whole hand, the fore-finger and the thumb being separated upon the stem, and holding it firmly; the operator stations himself on the right, if it is a tooth on the right side, and on the left, if the tooth belong to the left side. He then introduces the point of the elevator flatwise between the tooth he wishes to extract and the next molar, which serves as a point d'appui; then, by an oscillating movement, drawing towards himself and downward, he pries out the tooth, pushing it upward and at the same time backward. It is proper to remark, that during the operation it is advisable to place the fore-finger, wrapped in linen, on the inner side of the crown of the tooth we wish to extract, in order to arrest the point of the instrument, which might slip and wound the base of the tongue at the moment when the tooth, forced with too much violence, should suddenly give way. It is necessary, also, in order to facilitate the operation, to loosen the tooth laterally by means of a bistoury or gum-lancet, (*déchaussoir,*) and its posterior part with the myrtle-leaved curved gum-lancet; this form of instrument is very convenient in such cases.

§ V.—*The Dog's-Foot,* (*Pied de Biche.*)

This name is generally given to a steel instrument terminating in one end in a pear-shaped handle, and in the other in a slight bifurcation in form of a forked foot. The most convenient and effectual dog's-foot for removing all the roots of a tooth, is the following, (Fig. 181.) We are indebted for it to Dr. Toirac, and it may be applied to all the points of the mouth. Consisting of steel moderately tempered, it represents a Z, the terminating branch of which should not be over half a line in length.

(Fig. 181.)



Operative Process. The handle of the dog's-foot being wrapped in a napkin, we grasp its stem with the whole hand; then, supporting its smaller extremity upon the root we wish to extract, we push it forcibly from below upward when we are operating on the lower jaw, and from above downward when on the upper jaw. The operator places himself upon the side upon which he operates. As in the preceding case, we

must pass the finger, wrapped in linen, upon the side opposed to the action of the instrument, for fear of wounding the cheek if it should too suddenly slip.

Article VIII.—The Straight and Curved Cutting Pincers.

These instruments may be, to a certain degree, replaced by the straight and curved pincers of which we have spoken, with this difference, however, that their cutting branches, when approximated, have the form of a ring, in order that the crown of the tooth that we cut may be embraced by it. We employ them to remove fragments of teeth that wound the tongue, crowns of teeth in great part destroyed by caries, or when we wish to preserve some roots of teeth to aid mastication, or to insert there the pivot of an artificial tooth.

Article IX.—General Remarks.

The surgeon, when called upon to operate upon the mouth of a child, ought to have instruments much smaller than those which are in common use for adults.

It is necessary that he should know, also, that in daily practice we sometimes meet with teeth and roots that present difficulties in extraction impossible to be overcome by ordinary instruments; and that it is then better to abstain from vainly attempting a painful operation, which may lead to serious consequences, such as contusions, wounds of the gum, fracture of the tooth, or of a portion of the alveolar arch, nervous symptoms difficult to subdue, or even to a general disturbance of the whole system, as in timid females, especially during the period of utero-gestation, lactation, or the menstrual flux.

TITLE III.

GENERAL OR COMMON OPERATIONS.

Those operations that are performed after the same rules, upon certain regions of the body, have appeared to me to merit the title of common or general operations; only, as there are those among them which form, to a certain degree, the point of departure for others, I will subdivide this grand class into two families, the one for simple, the other for complex operations.

The greatest number of operations are composed of several different stages, which are often in themselves so many distinct operations. Everywhere, in fact, in operative surgery, we find incisions, dilatations, extractions, and reunions, alone, or in various ways associated. To dilate and to extract being the province of some operations in particular, and each time requiring, so to speak, different instruments or processes, nevertheless constitute two indications, whose examination in this place would be superfluous; but as there are few operations that do not commence with a *division* and terminate with a *reunion*, it appears proper to say a few words at first of diæresis and synthesis.

PART FIRST.

SIMPLE OR ELEMENTARY OPERATIONS.

CHAPTER I.

DIVISIONS.

Section I.—Cutting Instruments.

Leaving out of consideration the laceration (*déchirure*) and tearing (*l'arrachement*) of parts, and ruptures, which are also divisions, diæresis has no other agents than the bistoury, scissors, and some particular instruments.

Article I.—Manner of holding the Bistoury.

In itself the bistoury is a complete arsenal to surgery. If it were absolutely necessary, it could *supply the place* of all other cutting instruments; for that reason, the surgeon should study, before all other things, to use it scientifically. There are three principal ways of holding it: 1. As a table or carving knife; 2. As a pen in writing; 3. As a drill-bow, (*archet.*) As each of these three modes also have several modifications, I shall briefly point them out, giving to each the title of *position.*

§ I.—*First Position—the Bistoury held as a knife, the edge downward.*

In this position, which is the most common, the handle of the instrument, enclosed in the palm of the hand, and supported by the ring and little fingers, is grasped between the thumb and middle finger at the point of junction of the handle with the blade, while the fore-finger rests on the back of the blade. Thus held, it offers all the firmness and security desirable; we may thus move it in any manner, and give to it any particular direction we may wish. If it should be necessary to employ much force, to cut into solid tissue, excise large flaps, or vast and very hard tumors, or to pare off certain dense excrescences, nothing would be easier than to bring the fore and middle fingers back and in front of the others upon the open border of the handle, and thus to grasp it with the full hand.

§ II.—*Second Position—the Bistoury held as a knife, with the edge upwards.*

In place of being directed towards the tissues, as in the preceding position, the edge of the bistoury should sometimes be turned in an opposite direction. It is the belly, then, of the handle, and not its back, which presses against the palm of the hand, and the thumb and fore-finger which grasp its sides, while the middle finger passes under it as well as the ring and little finger. Thus turned upwards and in the direction of the back of the hand, this position is preferred for some incisions from within outward that require more force than grace in their motions.

§ III.—*Third Position—the Bistoury held as a pen, the edge downward, the point forward.*

Emerging from the back of the hand, the handle of the bistoury in this third position, as in the first, is also held between the thumb and the first two fingers. The remaining fingers are left free to find some point d'appui near the part to be divided.

§ IV.—*Fourth Position—the Bistoury held like a writing-pen, with the point backward.*

In the fourth position, the middle finger, advancing more or less upon one of the sides of the blade, turns, in the act of flexion, the point of the bistoury towards the operator, or his wrist, in such manner that its edge looks towards the palm of the hand, from which it is separated by a triangular space of greater or less extent, and having its base backward; the greater part of the delicate incisions made in dissections require the third position, the fourth being more suitable to puncturing and to incisions from deep-seated parts to the surface.

§ V.—*Fifth Position—the Bistoury held as a pen, the edge upwards.*

To dissect, or to cut from us, and to enlarge certain deep-seated openings, we are often obliged to change the relations of the edge of the bistoury, to direct it in the plane of the dorsal surface of the fingers, and to place its back on the palmar surface; apart from this circumstance, which obliges the fore-finger to be substituted for the middle finger, it is held with the point either directed forward or inclined towards the wrist, as in the third or fourth position, according as the fingers are extended or flexed, and as it may be desirable to make a continued incision, or merely to divide attachments.

§ VI.—*Sixth Position—the Bistoury held as a drill-bow.*

The sixth position holds, in some measure, the middle place between the first and second. As in one, the handle of the instrument rests in the interior of the hand, and as in the other, it is held only by the ends of the fingers; it differs from both, however, in this, that, in respect to the axis of the arm, the bistoury is situated upon a horizontal plane, and the pulp of the extended fingers supports it on one side, while the thumb is applied to the other. The three varieties of this position are easily distinguished. In the *first*, the edge of the bistoury is turned downward; in the *second*, which resembles the second position, it is turned upward; and in the *third*, it is directed from right to left, except that, in place of holding its handle by the flat faces, the fingers and the thumb, being directed upon the edges of the handle grasp it by its back and belly. The first of these modifications, allowing us to cut with great delicacy, is particularly useful in cases of scarifications in phlegmonous erysipelas, where we have decided to operate by incisions, and also for the opening of large sub-cutaneous abscesses. We rarely have recourse to the second, but to divide small lamellæ while guiding the bistoury upon the groove of a director. The utility of the third, also, is confined to a small number of cases, where, from the fear of wounding some subjacent organ, we believe it advisable to di-

vide horizontally, by successive laminæ, as in the manner of planing, (*en dédolant,*) the tissues which present themselves, as is done in front of certain arteries, for example, or in the operation for strangulated hernia.

Article II.—Manner of holding the Scissors.

The manner of holding the scissors being familiar to every one, I have no necessity of describing it. I shall confine myself to remarking, that, in place of the fore or middle finger, it is the ring, or even the little finger, and the thumb, which are to hold the rings of the instrument. The first two fingers being placed forwards, either upon the handles, or on one of their sides, increase their force and give more precision to their movements.

The use of scalpels, (*des couteaux,*) and of particular kinds of bistouries, will not be described until we come to the operations which require them.

Section II.—Incisions.

All incisions are referable to two fundamental methods: Some are made from the skin toward deep-seated organs, and are named from *without inwards;* the others, on the contrary, are made from the deep-seated organs towards the exterior, and are named from *within outwards.* The preference to be given to the first, or to the second, depends upon a thousand circumstances, which will be successively explained in the sequel, and in great part recapitulated under the head of opening of abscesses.

Whatever may be the method determined upon, the incision is performed—1. Towards the operator, (*contre soi,*) when the bistoury is brought from the commencement of the incision towards the operator; 2. From the operator, (*devant soi,*) when the case is directly the reverse; 3. *From left to right,* (*de gauche à droite,*) when, with the right hand, we direct the handle or point of the bistoury, either directly crosswise, or obliquely backwards and outwards, while flexing the fingers, wrist, or forearm, that were previously extended; 4. *From right to left,* (*droite à gauche,*) if, under the same conditions, we perform with the left hand, or even with the right, in holding the bistoury in a particular manner.

The direction from left to right, being altogether natural, is, therefore, that which one takes most willingly; so that the others, which might indeed be considered as exceptions, are not, at any rate, so often indispensable.

The single or *simple* incision is that which is made in one direction, and which may be made with a single stroke of the bistoury: almost always straight, and sometimes curved or semi-lunar, it is that which, in combining itself under a thousand forms, gives place to the *complex* and *multiplied* incisions, whose shape, formerly so varied, is reduced now to that of a V, an arcade ⌒, or a half circle ∩, a T, a cross +, an ellipse ⬭, an oval ⬯, a crescent ◠, an L, and a star ✡.

Article I.—Simple Incisions.

§ I.—*Direction.*

Unless there is a special indication, the straight incision should be parallel—1. To the great diameter of the part; 2. To the direction of the arteries, large veins, or principal nerves; 3. To the course of the fleshy fibres and muscular masses, or that of the tendons; 4. To the natural folds of the integuments; or, 5. To the great axis of the tumor.

Upon the dorsal or plantar surfaces, or on the sides of the foot, around the knee, in front, behind, and outside of the thigh, we make them, in general, correspond with the axis of the limb, because the vessels, nerves, muscles, and tendons, take nearly this direction; behind the malleoli, we make them a little concave in front, because in this place the same parts are obliged to make a slight curve to reach the sole of the foot; on the inner part of the thigh they would be oblique, and in the direction of the sartorius, the saphena vein, or the femoral artery; in the fold of the groin, we only make them in the direction of this groove when they have not to penetrate below the sub-cutaneous cellular tissue; the importance of the vessels is paramount here to every thing else. On the breech, the muscles serve as guides, as they do also on the sides of the abdomen, while in front, and behind this cavity, it is the axis of the body; the chest is exactly in the same case, except towards the hollow of the axilla, where it is better to follow the axis of the trunk than the fibres of the serratus anticus. The hand requires that we should have regard to the wrinkles on its palmar face, and the bend of the arm to the arrangement of its veins, muscles, or arteries, rather than to the direction of the limb; in the neck, the incision should be in relation with the muscles, vessels, or axis of the part; but it is rarely advisable to make them crosswise, except in the bottom of the supra-clavicular fossa; on the cranium, they follow the radius of the sphere on which they are made, and will be thus found parallel to the muscles and the principal arteries; on the eyelids, they will be in the form of an arc, because of the muscles, wrinkles, and arteries; it is the same nearly on the lips; they will be straight on the nose, and oblique, in this or that direction, on all the other regions of the face, according as they shall fall on such or such a wrinkle, or on the course of the vessels or muscles; in the ear, in fine, it is the projections of the organ which will determine their direction. The nature and the locality, superficial or deep-seated, and the form of the diseased part, can alone cause any deviation from these rules.

Stretching the Skin. There are many ways of stretching the skin, when we wish to make a simple incision—1. With the ulnar border of the left hand, the thumb acting in an opposite direction; 2. By grasping the part underneath with the whole hand; 3. With the extremities of the four fingers placed on the same line, and in

the direction which the bistoury is to take ; 4. By taking up a fold of the integuments ; 5. By drawing the tissues apart by means of assistants, in order to have both hands free ; 6. By drawing upon one side, while an assistant draws the integuments in the other direction.

Where we make tension *with the thumb and little finger*, it is necessary that the part should be held firmly; and the tension is rarely equal on all the points, unless we join with them the action of the fore-finger, and even that of the two other fingers. The *grasping the organ itself* (*empoigner l'organe*) is a mode that is not applicable but to the limbs and to some tumors that are exceedingly salient, or very much isolated.

With the ends of the fingers only the skin is held firmly secure, and the nails furnish a point d'appui for the instrument, but the tension is incomplete and acts only on one side. *The taking up of a fold* of the integuments suits but in a very small number of cases, and is not always practicable. *The hands of the assistants, or of an assistant*, are never as secure as that of the operator, and can scarcely ever be called into requisition, except in incising around or upon the surface of tumors or voluminous masses. The first mode, then, is the best, and it is for the surgeon to determine under what circumstances he should have recourse to the others. The important part of it is, that the tension should be alike on both sides. Otherwise, the wound in the integuments would, after the operation, be no longer in correspondence with the division of the deep-seated parts.

§ II.—*Incision from without inwards.*

If we wish to cut from without inwards, the bistoury may be held in the first, third, or sixth position, according to the degree of force to be employed, the situation of the disease, and the extent we intend to give to the wound. The convex bistoury, which, all other things being equal, cuts better and causes less pain, has the inconvenience of leaving, more readily than the others, a queue* (*traînée*) at the extremities of the incision, and of not being adapted to those more minute dissections that go below the depth of the cutis, nor to those which are made on excavated parts, and which require that the instrument should act especially on its point. The straight bistoury, though it is less rapid in its action in the beginning, is incomparably more convenient afterwards, and could, if necessary, be substituted in all cases for the preceding.

In the first position, the convex bistoury is applied, by the most salient point on its blade, to the middle of the space stretched by the thumb and fore-finger, then drawn from left to right to the place where the incision is to terminate, so as to divide the whole thickness of the cutis in the first cut, and more deeply still, if there

* [Meaning the small superficial cut—a sort of queue or tail—which, from the shape of the bistoury at its point, it almost unavoidably makes in entering and leaving the incision.—*T.*]

exists underneath no important organ to avoid. In order that it may leave as little of a queue as possible, we take care to make it with firmness in the beginning, and to elevate the wrist in finishing it. In holding it in the third position, it will cut more with its point than with the swell of the blade, and will run less risk of wounding the subjacent parts and of leaving long queues; but it will lose some of its facility (*légèreté*) of movement and other advantages. In the sixth position it cuts after the manner of a razor, and divides with equal ease the most delicate and soft tissues and those that are the thickest and most tense, (*tendues;*) only that it is not firm, and seems like cutting in the air.

The straight bistoury, held in the first position, and applied as in the preceding case, and making the cut and withdrawn in the same manner, acts especially upon its point, penetrates to much less depth, but in a more uniform manner, and leaves scarcely any queue. In the third position, it is necessary to plunge in its point by puncture by raising the handle a little, and then gradually depressing its heel as we draw the instrument, and to terminate by elevating the wrist, so that the point may be placed almost perpendicularly; in conclusion, if used in this way, the instrument commences by an oscillating movement from above downwards, and finishes by an oscillatory movement from below upwards. Being satisfied by experience that the queue of the incisions is a matter of no great inconvenience, I think it immaterial, in commencing and terminating them, whether it be by puncture or by drawing with the straight bistoury. In this position, the little finger, fixed to the right of the incision, serves as a support to the rest of the hand, and gives every security to the steps of the operation; lastly, in the sixth, the action of the instrument is, in every respect, similar to that of the preceding, and held in the same manner, with this difference, that it does not penetrate as well nor as quickly.

§ III.—*The incision from within outwards.*

To cut from within outwards, we operate either with or without a director, or with the bistoury or the scissors, and sometimes on a part that has not been operated upon; at other times through another division.

§ IV.

Without a director, and when there is no previous opening, the incision is made either from or towards the operator, and with the straight bistoury.

From the operator, (*devant soi,*) the instrument, held in the second position, is introduced by puncture; after which the wrist is quickly elevated, that the bistoury may divide the tissues, from its heel to its point, and be converted into a lever of the second kind; or we raise the point by depressing the handle, so as to pass through the skin a second time by puncture, and terminate by bringing the bistoury back to us, with the cutting edge upward, so as to divide the tissue (*la bride*) by making it act as a lever of the third kind.

Towards the operator, (*contre soi*,) we hold it, with the ring finger fixed on the side of its blade, at such distance from the point as may limit its progression. We then introduce it by puncture; when it has entered far enough, we quickly elevate it perpendicularly, in the manner of a lever of the second kind, by drawing its heel towards us, as if to convert the fourth position into the third, in such manner, in fact, that, by extending the fingers, its point when withdrawn is found entirely free, and directed forward like the point of a pen, in place of being turned towards the upper part of the wrist, as it was in entering.

§ V.

On a director, when there exists a previous opening, we guide the instrument into it, either from or towards us; without a director, when the thing appears easy; and in the contrary case, flatwise upon the fore-finger, or upon a grooved sound if the finger is too large; we afterwards proceed as above. The sound is held in the left hand, like a swing, or lever of the first kind, to which the index finger placed below forms the fulcrum, the thumb fixed on its handle the power, and the tissue to be divided, which its point tends to raise, the resistance; to glide upon it with facility, the bistoury must be guided in the second, fourth, or sixth position, with the edge upward. The grooves which have no terminating crest, present no obstacle to the point of the instrument, which may thus emerge from within outward, traversing through the tissues; with this crest, it is necessary, on the contrary, to raise the bistoury up, as a lever of the second kind. The narrower the bistoury is, the better it advances; the convex bistoury does not answer in such cases, because its extremity is too wide, and that its point, by being thrown too much backward, buts (*arc-boute*) readily against the groove of the director. However little convex the back of the bistoury may be, it tends, in escaping, to leave some lamellæ between its point and the director.

After having arranged the director, we may also proceed in another manner, viz: endeavor to feel its point through the skin, for example, then, with a cut of the bistoury, to lay it bare by a small transverse incision, as in making a counter-opening; the point of the instrument, placed in the groove of the director, is then glided along towards the handle of the sound, or from right to left; or, what is as well, without taking the trouble to make a previous incision, the bistoury being held in the fourth position, we fix by puncture the point of the bistoury on the director near its beak, to make it glide quickly as we bring it towards us.

With scissors, it would be necessary to slide one branch of it along the finger or director, leaving the other outside, and cutting from us, and as quickly as possible, all that we wish to divide.

§ VI.—*With a Fold of the Integuments.*

In timid and intractable patients, if the skin is very flexible, or it is not desirable to go deeper than that tissue, it is sometimes

necessary to take up a fold of it before cutting it. This fold, whose thickness varies, according as we wish to give greater or less extent to the wound, ought to be held on one side by the assistant, placed in front, and on the other by the operator. We then divide it on its free part, down to its base, as in incisions from without inward, or in the opposite direction, that is to say, by puncturing it and cutting through it, from its adherent border towards the free border, as with incisions from within outward. The pressure made upon the integuments blunts their sensibility, and consequently renders the pain less acute; moreover, as the bistoury only perforates through the parts, in the manner of an arrow, the operator runs no risk of failing, or of being embarrassed by the movements of the patient; only that we are not so sure in this, as in following the other method, of giving the incision the precise extent and neatness requisite.

§ VII.—*Raising Layer after Layer, (en dédolant.)*

The incision in a horizontal direction, or *en dédolant*, is that which is least frequently had recourse to, and only when we wish to separate, layer after layer, on the same point, the different tissues which cover an organ which it is important to avoid; the bistoury is held in the sixth position, the edge sidewise; the left hand, provided with a good forceps, raises up each layer of the tissue, while the right hand divides the detached layer by carrying the bistoury under the point of the forceps. Almost exclusively reserved for the operation of hernia, this kind of excision, however, is sometimes met with in other operations, those, for example, for aneurisms.

Article II.—Compound Incisions.

Complex incisions being only a combination of simple incisions, are necessarily subject to the same rules of practice, and may be made from without inward, or from within outward, and with or without a director.

§ I.

The *V incision* is composed of two straight incisions, which, though setting out from the same point, terminate at so much the greater distance from each other, in proportion to the greater length we desire to give to the triangular flap which they include. Its point, unless there are particular counter-indications, should be turned towards the most depending part, and we commence the incision by its base. The reason for this rule, which at first sight seems little in accordance with the object in view, is, nevertheless, easy to comprehend: if the bistoury was placed in the upper extremity of the first incision, in order to commence the second, the instrument, before dividing it, would roll up, displace, and wrinkle

its border, which is necessarily badly supported, and would cause more pain than usual, and make an irregular and contused incision; the convex bistoury would, in addition, have the inconvenience of leaving a queue beyond the external border of the first wound, or of not separating the second from it at its angle but very imperfectly. In commencing by the base of the flap, nothing of this kind happens. The skin is not more difficult to extend for the second incision than for the first. The bistoury itself, in some degree, stretches it in approaching the apex of the triangle, which it isolates and completes without the least difficulty, should the surgeon understand the proper manner of elevating the wrist as he finishes the incision.

To detach the flap thus limited, it is seized by its point with the forceps, for which it is well to substitute the fore-finger and thumb as soon as that is practicable. The right hand, armed with the straight or convex bistoury, held in the third position if we wish to cut towards us, or by flexion of the fingers; in the fifth, on the contrary, if we wish to cut from us, or by extension of the fingers, dissects it from below upward, or from its apex towards its base, taking care to raise with it as thick a layer of cellular tissue as possible. Formerly the incision in V was confined to the trephining of the temporal bone; at present it is not necessarily limited to any part, but is used in the removal of certain tumors, and in the operation for some disarticulations.

§ II.

The *oval-shaped incision*, which will be considered under the head of amputations, differs from the V incision in being continued from one branch to the other, as it passes around the base of the flap, which is thus completely detached; it is, in fact, constituted of the V incision and that of the semicircle.

§ III.—*The Crucial Incision.*

The *crucial incision*, as its name imports, results from two simple incisions, which cross each other at right angles. It is only the second of these incisions which requires to be described. We commence it on the left side of the division, with the same precautions as for every other straight incision; but in the place of carrying it to the other side without stopping, we terminate it by raising the wrist at the moment when we reach the wound, whose left lip only we must confine ourselves to cutting. To complete it, the operator must change his position, unless he prefers changing the bistoury to the other hand, and does on the right what he has just finished doing on the left; in a word, it is an incision of two stages, (*en deux temps*,) whose two halves meet, and have their point of junction in the first wound, which prevents the instrument from rolling up and folding under its edge the second lip of the primitive incision, as it would almost inevitably do in passing from left

to right, to finish with a single stroke. The dissection of the four triangles which result from this double section, being only the repetition, four times renewed, of that described in speaking of the V incision, requires no other details.

§ IV.

The T incision differs from the crucial incision only in one point: it is, that, in place of passing from the two sides, its transverse branch rests upon the straight primitive incision. It is thus reduced to two stages, instead of comprising three, as the crucial incision does. In other respects, the same steps are to be taken in the division of the tissues, in the dissection of the flaps, and even in the manner of holding the bistoury, in both cases. One being a simple modification of the other, the crucial incision and the T incision are indicated wherever the straight incision is not sufficient to lay open the parts which we wish to isolate or remove; the relative value of either is to be determined by the size of the body to be detached, and the crucial incision is not, in reality, necessary, unless the T incision, with its two flaps, does not give the surgeon all the facility and freedom required for going through with the operation.

The bistoury, carried flatwise between the teguments and such tissues as are to be avoided, then turned again to cut from within outwards, or conducted upon a grooved sound, would convert the straight, simple incision into a complex one, as effectually as if it was directed upon the integuments from without inwards. This method, in fact, is sometimes followed or preferred.

§ V.

The elliptical incision, which becomes almost indispensable whenever it is believed necessary to remove with a tumor a certain portion of its coverings, is composed of two curvilinear incisions, with the concavities looking towards each other. The marking out of its direction with ink is an absurdity which has no other inconvenience than its inutility, except, however, in certain rare cases, where the least deviation of the bistoury might incur the risk of serious consequences. It is then that the hand of an assistant becomes useful in stretching the skin upon one side, while the surgeon draws upon the other. The rule requires that the most depending incision should be made first, that the blood which it causes to flow may, in no respect, interfere with the execution of the other. It is made by cutting towards us from left to right, and in such manner that an assistant may raise the tumor, while the operator, with his left hand, stretches the integuments below. The reverse of this is practised for the second: here the surgeon himself ordinarily performs the part of drawing upon or depressing, with the ends of his fingers, the mass to be excised or extracted, while his assistant stretches the skin above, taking care that this tension shall act at the same time in the transverse and longitudinal directions, in such

manner, that the instrument, placed upon the left or upper extremity of the lower incision, may effect an incision as neat in its commencement as in the middle part of its track, and, also, that it may not roll up the skin in terminating. We should not forget, moreover, that this upper incision, acting upon a depressed part, has need only of a slight curvature for the course of the knife, to render it quite concave when the parts are left to themselves.

§ VI.—*The Crescent-Shaped Incision.*

Some persons, in these latter times, have supposed that a double-curved incision, with the convexities concentric, might, in certain cases, be substituted advantageously for the elliptic incision. The semi-lunar flap which it circumscribes leaves a wound with loss of substance, the convex border of which is easy to dissect and to reverse upon its base, so as to enable it afterwards to be brought back into the concavity of the other, and upon the bottom of the solution of continuity. Perhaps, in fact, we should employ it for the extirpation of those massive tumors where we have it in our power to preserve almost all of the skin, and where a straight incision would not expose them sufficiently. It would procure the same advantages as the elliptical incision, without interfering so much with immediate union. The dissection of the inner lip of a simple semi-lunar or arched incision, when we do not wish to make any excision of the skin, may be considered in the same point of view, relatively to the V, T, and crucial incisions, which latter, in such cases, it would frequently render unnecessary.

I will add, that, in detaching by dissection the lips of any incision whatever from the subjacent parts, to the extent of one or many inches, according to the nature or situation of the wound, we may cover over a very considerable loss of substance; and that the integuments thus detached become elongated, and thus allow of our bringing into immediate contact the edges of a great number of wounds that we would have scarcely supposed susceptible of it.

§ VII.—*The L Incision.*

Employed in laying bare some large arteries, the carotid and subclavian among others, the L incision has no need of being described in this place.

Article III.—Incisions Applicable to Deposites.

We may say boldly, that the bistoury is pre-eminently the remedy for abscesses, whether they be hot or cold, diffused or circumscribed, massive or diminutive. The pain is nothing in comparison with the dangers that it prevents, and I cannot easily understand how its use has been so often dispensed with, unless it be that the fluctuation which results from phlegmonous inflammations remains

obscure. A heroic remedy as it is, in sub-cutaneous inflammations themselves, supposing that it opens no abscess, what harm can result from its application?—a wound altogether simple, which disgorges the tissues and is never an obstacle to the termination of the principal disease, the progress of which, on the contrary, it almost always favors. When we have been witness to the havoc insidiously made by the presence of pus, infiltrated or effused into the midst of the organs by the resorption of this fluid, or its burrowing along the cellular tracks and tissues, it is truly impossible to hesitate between such dangers and the fear of an unnecessary incision.

All kinds of straight incisions are applicable to abscesses, whose treatment, however, I do not intend to speak of here. The large lancet, called the *abscess lancet*, formerly employed for this purpose, has completely fallen into disuse since the last half century. The ordinary lancet, sometimes still used in its stead, does not suffice but for a small number of cases, when, for example, the skin is very thin and the abscess very superficial or small; and even in these the bistoury would still be constantly preferred to it, were it not that we sometimes meet with persons who, though terrified with the mere name of bistoury, will submit readily to the puncture of a lancet.

§ I.—*Opening of Abscesses from within outwards.*

There is no circumscribed abscess that cannot be opened from within outwards. The operation is rapid and but little painful; the instrument enters by puncture; its point plunges into the interior of the abscess, and its edge, raised from the heel towards the point, stretches the cutaneous wall in proportion as it divides it, in place of causing its depression. In this case, the straight bistoury is the only one which is proper; it is only held in the fifth position when we wish to cut from us at the bottom of certain cavities—among others, for certain abscesses in the mouth. In the second position, on the contrary, it is in very general use; in holding it thus, we have all the power and freedom required; it easily cuts from us, and as obliquely as we may desire, and nothing is more simple, in order to convert it into a lever of the second kind, than to elevate the wrist at the moment of terminating the incision. The fourth position is yet more convenient: the point d'appui, which it allows us to have with the last fingers, is an advantage which the second does not offer in the same degree. The puncture is made towards us; the hand and the fingers being flexed, it is sufficient, if we bring them to their natural direction by drawing upon the handle of the bistoury, to assimilate it to a lever of the second kind, as in the preceding, to cut from the heel towards the point, and to divide the entire wall of the abscess, throughout its whole extent, with great force and celerity. It is the position in which there is least danger from the inconsiderate movements and intractableness of the patient; and I have for a long time been in the habit of em-

ploying no other, except when there is some special counter-indication. The puncture having been made, the rest of the incision is completed, as it were, spontaneously. If it were necessary, this position would not hinder us any more than the second from piercing entirely through a hard and superficial abscess, as it is proper sometimes to do in furuncles, or carbuncles, and some other prominent abscesses with thin walls, upon the limbs. The best bistoury in such cases, as in the opening of abscesses in general, when from within outwards, is the bistoury with a straight blade, regularly tapering, and with a keen edge; we hold it more or less obliquely, according as the deep wall of the abscess is more or less remote from the surface; if it should touch, or plunge into the first with its point, the inconvenience, in ordinary cases, would scarcely be thought worthy of arresting the attention; but the danger would be so great, when the abscess lies in front of a large artery, or an important viscus, that the very idea of it is frightful. For prudence' sake, then, if not from necessity, as soon as from feeling no resistance, or in any other manner, we are assured that it has entered the abscess, we should cause it to pass much more in a parallel line than in one perpendicular to the axis of the limb or the diseased part, and not prolong the incision but in raising up the instrument.

In this mode of incision, the stretching of the parts with the left hand, while the right hand is directing the bistoury, though useful, is not always indispensable. If the abscess is vast and superficial, or situated at a great distance from every delicate part, we may even dispense with taking any point d'appui for the fingers, and look only to the movements of our hand, as if we were cutting in the air. However familiar one may be with the habit of handling instruments, one of the fingers, detached as it were from the others, and placed on the corresponding side of the blade, gives us confidence, puts us on our guard against the danger of plunging the point of the instrument to too great a depth, and in most cases is the only precaution required.

§ II.—*Opening of Abscesses from without inward.*

Abscesses *en nappe*, or diffused abscesses, those that are deep-seated and those that are formed about the joints, upon the track of vessels, and upon the surface of organs which it would be dangerous to come in contact with or to penetrate, render it desirable that in most cases the opening should be made from without inward. The first require large incisions, either with the straight bistoury in the first or third position, or with the convex bistoury held in the same manner. With the straight bistoury, in the first position, we incise by applying the whole length of the cutting edge (*en plein*) on the skin, as for deep scarifications, and we draw it rapidly while passing from the heel to the point; in the third position, its point is first plunged by puncture into the abscess; the incision is afterwards continued by depressing its heel and the rest

of its blade; the bistoury thus again becomes a lever of the second kind, but acting from above downward, in the manner of a straw-cutter, (*coupe-paille.*) With the convex bistoury, held in the first position, we cut quickly and deep; it generally suits better than any other for such occasions, since it is admirably adapted by its form for the numerous incisions that we are sometimes obliged to make, at certain distances from each other, upon different points of a purulent collection.

Deep-seated abscesses are naturally divided into two orders: 1. Those which, being covered over with a thick and dense layer, repose on no region (*foyer*) which it is important to avoid; 2. Those whose depth prevents our ascertaining their precise positions, or which it is not prudent to approach but by degrees. There is no objection to operating upon the first by puncture with the straight bistoury held in the third position, as for those on the eminences of the hand, for example, the palmar face of the fingers, the outer side of the limbs, the breech, cranium, and posterior region of the trunk. The incision by puncture does not do for the second: if we open them with the straight bistoury, it is necessary to carry it from without inward with the right hand, which holds it in the first or third position, and to divide, layer by layer, all the parts which conceal the abscess, making use of our left forefinger, applied from time to time to the bottom of the wound, in order that we may ascertain to a certainty the fluctuation or presumed depth of the abscess. It is thus that we proceed for abscesses under the aponeuroses, between the crural muscles and the femur, in the hollow of the ham, about the humerus, in the thickness of the walls of the abdomen or chest, and on the forepart of the neck.

If we did not observe the same caution in the neighborhood of the articulations, we should run the risk of opening into the synovial membrane, and of exposing the surfaces of the bone to the contact of the atmosphere, while the incisions, layer by layer, do not deprive us of the option of reaching there ultimately, when we may deem it indispensable so to do. If the abscess is extensive, and the integuments are sufficiently thin, the convex bistoury makes a neater incision, and causes less pain. When its situation is less clearly defined, we have recourse to the straight bistoury, which is better adapted to delicate dissections.

We should proceed upon the same principles in the vicinity of an artery, aneurism, or hernia, and near the pleura or peritoneum, because we are then sure of not going beyond the anterior wall of the abscess before encountering the pus, and can stop when we think it advisable, also identify the pulsations of the vessels, and ascertain with the finger on what tissue we are acting; while in the incisions by puncture, and from within outward, nothing can protect us against the dangers from the bistoury when we have once begun. Who does not know that the instrument has been often plunged into an aneurism, a large and healthy artery, the

intestine of the hernial sac, &c., even by celebrated practitioners, from having neglected to attend to these rules?

[Surgeons cannot, says Dr. Mott, be too careful how they proceed under the circumstances above specified with so much ability and precision by the author of this inestimable work. All prudent surgeons had better look on before they take a step where the life of the patient may possibly be hazarded. It is a golden rule, where there is any doubt, to give the patient the benefit of it by withholding all unnecessary interference. If surgeons were to proceed in this way under all such circumstances, we should not have to lament the mistakes which ignorance of relative anatomy, and rashness of conduct, have in all countries too often occasioned, and by which a severe and just reproach has been cast on our noble profession.—*T.*]

One of the principal objections to these incisions from without inward, is their pressing upon the abscess in opening it; and that the abscess is no sooner opened a few lines, than this pressure drives out the pus, depresses the walls, and makes it almost absolutely impossible to continue the incision with the same stroke. That, however, should be understood only of slow or gradual incisions. Those which can be made rapidly with the entire edge (*le plein*) of a straight bistoury, or, better still, with a convex bistoury, held in the first or sixth position, as in deposites of a vast extent situated immediately under the skin, have not the same inconvenience, and are, in reality, the least painful of all.

With a Director. To enlarge the opening of an abscess, the finger or a grooved sound serves as a conductor to the instrument, and the bistoury or the scissors are guided, as has been said in speaking of incisions from without inward, by means of a director, after a previous opening in the skin.

§ III.—*Opening Abscesses by Complex Incisions.*

It is thus, also, that the operator should proceed, if, in place of a simple incision, he should wish to open the abscess by the V, T, or crucial incision. Such modifications, more often useful than most practitioners seem willing to admit them to be, are of great benefit in sub-cutaneous abscesses with diseased condition of the skin. The first opening being made from the left and upward, for example, and the sound effecting a separation to the right, a second opening is made in this direction, and the abscess, thus disclosed to view, presents a V incision. When the cul-de-sac is upon one side, we immediately make a T incision, and in those collections in which we wish to lay the bottom entirely bare, the crucial incision is also used. From whence it follows, that, with the exception of the elliptical or semi-lunar incisions, all the different kinds of divisions may be called to our aid in the treatment of purulent collections, but that the simple incision is, nevertheless, almost the only one required for them.

Article IV.—Incisions applicable to the Dissection of Tumors and Cysts.

The contrary of what takes place for abscesses is observed in relation to cysts and tumors; for these the complex incision is most generally indicated. When all the skin, however, is to be preserved, the simple incision is often quite sufficient. Rolling, or very moveable tumors, covered with a pliant and sound skin, do not always require an incision with many branches. The testicle, the breast, and various degenerated ganglions, have often been extracted through a straight and simple incision, though they had acquired considerable development.

§ I.—*Form of the Incision.*

A. *The straight incision*, forming a single *slit*, (*boutonnière*,) should exceed, by half an inch or an inch, or even more, in its two extremities, the limits of the tumor, and should go through the entire thickness of the adipose tissue. There are, then, many modes of continuing the operation: to seize with a forceps, or the first fingers of the left hand, each lip of the wound, and to dissect them one after the other, and from within outwards, with the right hand, while an assistant draws the tumor in an opposite direction with his fingers, or with a hook or an erigne, is one of the modes most frequently adopted. Others prefer, when the pliableness (*souplesse*) of the parts allows of it, to press with the thumb and first fingers of one hand through the skin, as deep as possible upon the sides of the mass to be extirpated, as if to expel it through the wound, while with the other hand they cut perpendicularly the adhesions of the cellular tissue, in proportion as the edges of the incision recede outwardly or retract backwards. If the tumor is pendent, we arrive at the same result by embracing it underneath with the palmar face of the entire hand spread out. By this last method the pain is generally less, and the operation is at the same time quick, easy, and secure, but, unfortunately, it is not applicable everywhere. Some find it more convenient to hold the tumor themselves, and to cause the lips of the incision to be kept apart by an assistant, while they dissect and isolate it. It is thus, in fact, that it is proper to proceed in all cases, as soon as the anterior face of the tumor is free. In adopting another course to separate it from the deep-seated tissues, the surgeon would run the risk of going too deep, or of not removing all the diseased parts; in this matter he can depend only on the evidence of his fingers, which have, also, the inappreciable advantage of being enabled to perceive the arterial pulsations, if they should present themselves there, and with the action of the other hand of regulating their movements without difficulty, as also the tractions which they exercise.

B. *The V Incision.*

It would be an error to suppose that the elliptical and crescentic incisions were the only ones which allow of our taking away a portion of the substance of the cutaneous tissue ; the V incision has frequently fulfilled the same indications. In cutting many V's, or triangular flaps, connected at their base, and upon the contour of very large sized tumors, we remove with the disease a *stellated* piece of integument, which does not afterwards prevent us from covering the entire wounded surface with the preserved triangles. Delpech and M. Clot have had recourse to something similar in the removal of enormous (*éléphantiasiques*) tumors that they have described, and I have proceeded in the same manner for the removal of bloody (*hématiques*) masses on the fore part of the knee, and with tumors of all kinds.

C. *The T and Crucial Incisions,*

Which are only used when the skin which we do not wish to trench upon is not sufficiently pliable to allow a straight incision, to lay bare the tumor in a proper manner, are also indicated in certain cases in conjunction with the elliptical or with the crescent-shaped incision; for example, when the base of a cyst is extended too much beyond the flap of integuments which we have just circumscribed, or when it appears difficult to dissect alternately each lip of the wound, or that we do not wish to have the flaps too large. The T and crucial incisions, in fine, resolve themselves into a transverse incision, on one of the edges of the wound for the T incision, or on both successively for the crucial incision.

§ II.—*Dissection of the Flaps.*

Whatever may be their form and extent, these different incisions give rise to flaps which it is necessary to dissect off from their apex to their base. This is generally the most delicate part of the operation, and is not performed exactly after the same rules for all kinds of tumors.

A. *Concrete Tumors.*

In all cases of lipoma, or any other solid mass destitute of malignancy, the edge of the bistoury should be more inclined towards the tumor or the deep-seated parts than towards the skin, since the more thickness we give to the flap by the preservation of the cellular or adipose tissue that lines its inner surface, the more highly organized (*vivace*) is it, and the more disposed to reagglutinate itself (*se recoller*) to the subjacent tissues. If the contrary mode should be adopted, the instrument would leave nothing but the mere skin, and might perforate it and render its preservation or re-

union impossible; while, though we should even go too far on the inner side, we do not see, in truth, what evil would result from it.

B. *Cancers.*

Carcinomatous tumors require a little more attention; the skin undoubtedly should not be too much attenuated, but it is important at the same time not to turn over (*renverser*) with it any portion of morbid tissue.

C. *Cysts*, (*Kystes.*)

The dissection of encysted tumors, and of sacs full of liquid or semi-fluid matters, which we wish to remove without opening the cysts, or to extirpate entire, demand still greater care; the walls of the cyst are sometimes so thin that the least deviation of the bistoury inwards divides them; the sac is immediately voided; the tissues cease to be capable of distension, and the operation which, without this accident, would have been easy and one of the most simple, becomes one of the most laborious and, in a great number of cases, even impossible to complete. It is necessary, then, while we endeavor to preserve as much as possible of cellular tissue when we are dissecting out a cyst, that we should turn the edge of the knife a little more towards the integuments than in the direction of the tumor, as often as the walls of the sac to be avoided are so superficial, or appear so thin as to be easily perforated.

It is also proper to remark, that certain cysts do not demand so many precautions, and that we may confine ourselves to slitting up their whole anterior wall by a simple incision, or a T or crucial incision, as if we were opening an abscess; deep-seated and adherent hydatid tumors, whose interior we wish to cauterize, or whose entire cavity we would desire to place in contact with the air, to cause them to suppurate, also come under this exception. We shall see, farther on, that it may be the same with encysted tumors of the cranium, &c.

D. *Abdominal Cysts*,

Collections of fluids in the neighborhood of the splanchnic cavities, and the adhesions of which with the adjoining serous membranes do not appear to be definitively established, (*bien assurées*,) very often justify a mode of incision much eulogized by some persons in these latter times. It is a simple incision, straight or curved, and layer for layer, with a straight rather than a convex bistoury held in the first or in the third position, and directed from without inwards. If the cyst is in the abdomen, we cut gradually to the peritoneum, which we lay open to the tumor, in the event of its non-adhesion, but leave untouched, if it appears to be merged into the wall of the greatly attenuated morbid sac. The operation is there arrested for the moment; a roll of lint is placed lengthwise

in the wound to keep its lips apart, and renewed, for the space of several days, as often as there shall be need of it. Protected from the pressure of the divided tissues, the cyst has a tendency to protrude into the incision, approaches the outer surface, and finally often bursts by opening spontaneously, sometimes on the morrow, more frequently after the lapse of some days. If it was left free, this preliminary incision would cause an adhesive inflammation, which would not be long in reuniting the anterior wall to the layers which cover it, and then we might perform a puncture, or an incision, without the least danger of causing an effusion into the belly.

Section III.—Punctures

Whenever a surgeon plunges the point of an instrument with a single stroke through the tissues, he performs a puncture, (*ponction.*) Punctures from within outwards are almost all made with the bistoury and suture needles, or with instruments having springs; the others, that is, those that are made from without inwards, are performed sometimes with a straight bistoury or a lancet, as has been seen in the preceding articles; sometimes with a needle, or with particular instruments, the trochar, &c.; with a *straight* or *round* needle, or one furnished with an eye near its heel, like a sewing-needle, as in certain sutures; with a *longer* needle, surmounted by a *head*, a *handle*, or a *ring*, as in acupuncture; with a needle having a *cutting point* on one or both its sides, or straight or curved, when we wish to explore certain tumors and collections of a doubtful nature, as many practitioners have recommended since Hey, and as has been still more recently done by M. Pacini (*Discors. del Dott. Pacini*, etc., 1836, broch. in 8vo) in a work expressly written upon this subject; with needles with cutting edges, and of the shape of *arcs of a circle*, and furnished with an eye for thread, as, for example, in most sutures; with different kinds of trochars, when we wish to convey a canula to the bottom of some reservoir or cyst, to draw off its liquid only, and not to leave behind a cicatrizing wound, properly so called.

Article I.—Acupuncture.

By acupuncture is understood a puncture which traverses the tissues without breaking the continuity of their fibres. The needle to be used for performing acupuncture should have the form of a regular cone, and in general be exceedingly fine. This needle, being three or four inches in length, and terminating in a small many-sided handle, or by a ring, should always be surmounted by a metallic eye when we wish to change the acupuncture into electro-puncture. We insert it while rolling it between the fingers of one hand, which hold it like a writing-pen, and press it gently upon the skin, which latter the other hand is employed in keeping stretched. Some persons make it enter by making taps upon its head with a small hammer; for myself, I prefer, when the rotation does not suffice, to press perpendicularly upon its upper extremity with the fore-finger, while the thumb and other fingers hold the

needle in the manner already described. Thus conducted, its point, separating and not dividing the organic fibres, may traverse the arteries, even the heart itself, and the most important organs, as I have myself often made it do, (*Journal Hebdom. Univ.*, 1831, t. ii., p. 57,) without giving rise to any effusion of liquid, and without leaving the least trace of its passage. In pushing it more rapidly by a simple effort of pressure, as some persons among us do it, there is in general a little more pain produced, but prudence forbids that we should apply it upon these principles along the track of the great vessels.

Electro-puncture is performed like acupuncture, only that it is not always necessary to insert the needle as deep, and that, being once in its place, it should be put in communication with a galvanic pile, or a Leyden jar, by means of some description of conductor, whatever that may be.

Article II.—Exploring Punctures.

2. The needle preferred for *ordinary punctures* is more easy to guide, and should not be as fine as the acupuncture needle. Though the round needle may have been advised for opening a passage to gas pent up in a strangulated intestine, it is, nevertheless, to the spear-shaped needle, (*aiguille en fer de lance,*) with a straight or curved point, that we always have recourse as an *explorative* means in such cases. A tumor shows itself in a complex region of the body; we are not sure that it contains a liquid, or do not know if this liquid is blood, pus, or serum, or whether the tumor is an abscess, cyst, or aneurism. Puncture with an appropriate needle immediately removes all doubts. If there is fluid within the mass, it causes some drops to issue from it, and enables us to determine its nature; the small wound it makes immediately closes, even in the case of an arterial cyst, and the surgeon then makes up his mind with a full knowledge of the cause. Its insertion is regulated by the same rules as that of the bistoury introduced by puncture, that is to say, that the right hand seizes it sometimes as a writing-pen, and sometimes as a knife, by its handle or head, in order to push it in, while the left hand stretches the parts. As it is a little wider at the point than at the stem, the liquid passes along this last, and enables us to make up our judgment before withdrawing it, and to determine also the moment of its entrance into the cavity. I have no need of adding, that, in order to have only a simple puncture, we should, in withdrawing it, bring it back with care through the same track which has opened a passage for it.

The spear-shaped needle, which I make use of for exploring punctures, is nothing else than a straight cataract-needle, like that which was in use before the time of Scarpa. With this needle we distinguish without difficulty the different kinds of deposites of every solid tumor; but it is not always sufficient to indicate the nature of the matters contained in a cyst. Unless, in fact, the matter is very fluid, nothing issues out by the puncture, and the

surgeon may remain in a state of uncertainty. If there is neither a large-sized artery nor an aneurism to fear, we then substitute for it the point of a lancet, or of a bistoury with a straight keen blade.

In place of holding the lancet as in bleeding, I hold it as a writing-pen, and insert it in the manner of a needle. The bistoury should be inserted in the same manner. If there still remains any doubt, we may glide in a fine probe upon one of the sides of the instrument, in order to dilate a little the lips of the wound. If we should desire to avoid all parallelism between the puncture of the skin and that of the subjacent tissues, it would answer to penetrate very obliquely into the tumor, or, after having forcibly drawn its coverings in one direction only at the moment of puncture, to allow them to return to their position.

Article III.—Puncture with Trochars, (*Trois-Quarts.**)

The use of the trochar is especially distinguished from that of the needle, lancet, or bistoury, by the canula which the instrument carries with it, and which becomes the conducting-tube of the fluids we wish to evacuate. Whether its point be flattened, like that of a lancet, or pyramidal, with three cutting edges, and the rest of the shaft smooth, as it generally is, it requires a certain force to make it enter; from this results the necessity of embracing the trochar with the full grasp of the hand. We place its handle between the thenar and hypothenar eminences, or between the hollow of the palm and the last two fingers flexed. The thumb and middle finger, a little more advanced, hold it near its termination, whilst the fore-finger, extended, holds the instrument at a greater or less distance from the point, in order to limit the depth to which it is to penetrate. In a case of necessity we might, for greater security, detach the middle finger from it, and select a point d'appui for this finger upon one side of the place that is to be punctured. In general I prefer holding the handle with my full hand, and of limiting the entrance by the nail of the thumb, which I keep fixed at a proper distance from the point. When it has entered, the thumb and fore-finger of the left hand adjust its canula, the spoon-beak (*bec de cuiller*) being directed downward, while the right hand draws upon the handle, and removes the punch. The sac is emptied, and the liquid received in a vessel. To remove the tube, it is sufficient to draw a little briskly upon its head, while the fingers, which till this moment have held it, are applied upon the sides of the puncture, in order to hold back the skin, or the walls of the cavity, by giving them a point d'appui.

This instrument, called *trocart*, or trois-quarts, presents also numerous varieties, relative to its calibre, length, or form. In punc-

* [The word *trochar*, though undoubtedly a corruption of the French *trois-quarts*, has obtained such universal currency that it would be next to impossible to attempt, with the author, the restitution of its primitive orthography.—*T.*]

tures in general, it is sufficient to have two of them; one small, called the *hydrocele* trochar, for tumors of moderate size containing liquids of great tenuity; the other almost as large as a goose-quill, called the paracentesis trochar, for large tumors or liquids of some degree of consistence.

The groove which is upon the canula of some trochars, and the openings with which some authors prefer to have them perforated in their lower third, allow, in the first arrangement, the bistoury to be introduced upon it, if it should be necessary to incise the sac, and in the other, the liquids to run into it from all the sides of the cavity at once; but as they at the same time permit certain matters to infiltrate themselves between the canula and the tissues, which it distends, it is better to dispense with them.

The employment of the trochar demands certain precautions. It is important, first, that the extremity of the canula should not reach entirely to the base of the pyramid of the punch, that it does not form any elevation or border, and that its other end remains firmly clasped to the handle at the time of the puncture. It is afterwards necessary to bear in mind, that a button-headed probe is required to clear it out and remove from it the flakes or other solid substances which might interrupt the flow of the liquid during the operation. I will add, that if the opposite walls of the cyst are not separated but by a few lines, the instrument, tending inevitably to approximate them more while entering, may perforate through them at one stroke, and lead to serious accidents. The error being once committed, we remedy it by removing the punch from the canula, and then withdraw that also by a gentle rotatory movement. At the moment when the deeper wall of the sac is disengaged from it, it naturally falls into the cyst, and the liquid immediately runs out. We then push it back again a little, and nothing is easier than to adjust it afterwards as we wish. It is necessary, in fact, to obtain previously as exact an idea as possible of the thickness of the walls of the cavity. I shall return to all these subjects in speaking of operations, and particularly of hydrocele.

CHAPTER II.

REUNION.

The reunion of divided parts is obtained by the position of the patient, or of the wound, and by means of bandages and plasters, and especially by the suture.

Article I.—Sutures.

The approximation of the lips of a wound by means of threads or metallic pins, (*tiges métalliques*,) being the only one among the

means of union that is entitled to the appellation of a bloody operation, is the only one which I shall at present examine. The suture, evidently borrowed from the art of the tailor, formerly enjoyed a reputation which, to judge by the practice of most operators at the present day, could scarcely be credited. Since the time of Pibrac, who has censured it so much, and who, in a memoir in other respects but little conclusive, wished, to a certain extent, to reject it from the domain of surgery, the suture has been constantly losing its former importance in the eyes of practitioners; so that it is no longer in fact recommended in classical works but for a small number of cases. The partisans for and against it have both exceeded the limits of truth. If the suture does not merit the praises which were formerly bestowed upon it, it merits still less, perhaps, the disuse into which it has in our days fallen. The only well-founded objections that can be urged against it, are that of augmenting the pain, and prolonging the operation; but it is only necessary to have been witness to what takes place in hare-lip, staphyloraphy, rhinoplasty, genoplasty, cheiloplasty, and enteroraphy, to be convinced that these inconveniences have been much exaggerated. In those kinds of unions, neither the pain nor the inflammation are the objections; and the practitioner would be too fortunate if he had no other difficulties to overcome or combat. As to the greater duration of the operation, who would venture to make a serious objection on that account, if the suture had the advantages that were attributed to it before the time of Pibrac and Louis?

To speak emphatically, it is requisite that we should remark, that *the suture is not in reality dangerous, as the ancient Academy of Surgery pretended, but only that it is useless in an infinity of circumstances, and scarcely ever indispensable.* It is only indicated in wounds in which we desire immediate union; there are, also, in these kinds of lesion a great number of cases in which it might be dispensed with, without inconvenience, as there are also others where it is totally impracticable. Preferable to all kinds of bandages or plasters, where we wish to keep in coaptation large flaps, moveable or badly supported integuments, membranous or very delicate organs, it would give but little assistance in wounds with firm lips (*lèvres fixes*) abundantly supplied with cellular tissue, and which penetrate to the thick muscles of the limbs or trunk, and the edges of which follow only the movements of the subjacent parts.

With the suture no pressure is necessary; we may dress lightly, (*mollement,*) and afterwards dispense with any traction upon the teguments in the neighborhood; the coaptation, which runs no risk of being displaced, is effected through the whole thickness of the bleeding borders. With adhesive straps, or bandages, we produce more or less irritation upon the skin; the contact is rarely perfect; and should the cutaneous tissue be somewhat flabby and detached, the lips of the wound constantly tend to roll up inwards, and do not touch but upon that part of their line which is nearest approximated to the epidermis; the least effort, the least imprudence causes them to be displaced, and all the regions of the body do not permit of

their application ; we do not see, in fact, how, in case of strangulation, it would be at all more difficult to relax or divide a stitch of the suture than an adhesive strap or piece of linen. Without, therefore, conceding as much favor to this remedy as Delpech, M. Gensoul, and the greater part of our surgeons in the principal towns in the south of France do, whose views M. Serre (*Traité de la Réunion Immédiate*, etc., Paris, 1830) has so correctly embodied, I think, with this last author, that it deserves to be reinstated to a certain degree of consideration in surgery.

Of all the sutures that have been described, science has scarcely retained any other than the *interrupted* (*entrecoupée*) suture, or that with separate stitches ; the whip-seamed, (*à surjet*,) or glover's, (*du pelletier ;*) the zig-zag, or suture with alternate side-stitches, (*à points passés ;*) the noose, [or loop,] (*à anse*,) or Le Dran's ; the twisted, (*entortillée ;*) and the quilled (*emplumée ou enchevillée*) suture.

§ I.—*The Interrupted Suture.*

To apply the suture with separate stitches, we procure as much thread, simple, doubled, tripled, or quadrupled, and well waxed, as we intend to use in the different stitches ; also, a certain number of needles.

The *needles* that were still in use in the last century, and which were curved and flattened in their anterior half only, and straight, round, or a little depressed laterally, and pierced in the same direction with a long eye behind, are entirely abandoned at present ; for these, we now everywhere prefer needles that are curved into a regular arc of a circle, of the same width and thickness from one end to the other to within a few lines of their point, and having a square opening made in the posterior part transversely through their thickness. These last, generally adopted since the time of Boyer, (*Mém. de la Soc. Méd. D'Emul.*, t. iii, p. 79,) are, notwithstanding, very inconvenient. The arc which they form renders their passage through the tissues difficult ; and, being almost as thin at the heel as at the point they are apt to break. I am more disposed to make use of spear-shaped (*en fer de lance*) needles, with cylindrical stem and lateral eye, (*chas latéral*,) and which, like the ancient needles, are but slightly, or not at all, curved in their posterior half. The others are indispensable only for sutures that we are obliged to make at the bottom of certain cavities or excavations, and the advantages that Boyer attributes to them have not appeared to me to be confirmed by experience. A needle, attached to each extremity of the thread, is required only when we wish to pass both of them through the internal or cellular surface of the wound ; otherwise, one is sufficient for each stitch. Other things being equal, it is better to perforate one of the edges of the wound from without inwards, and the other from within outwards ; the operation, conducted in this manner, is more prompt and less painful ; the instrument draws less upon the skin from without inwards than in the

opposite direction, and is not attended with the inconvenience of changing the needle or hand in passing from one lip to the other. We should begin upon the straight or upper lip of the wound. The surgeon pinches this lip by placing his left thumb (the hand being turned in pronation) on its inner side, and the fore-finger of the same hand upon its outer part; then he raises the lip and reverses it slightly outwards. Having seized the needle, armed with its thread, with his right hand, placing his thumb in its concavity, and the fore-finger and middle finger, and even sometimes the ring finger, upon its convexity, where the needle is rather large, in order to convert it into a lever of the third kind, he inserts the point of it into the skin at two, three, or four lines from the division, pushes it in with a circular movement, and brings it out of the wound where the left thumb guides its progress and direction. After having relaxed his hold on the heel, as soon as it is sufficiently advanced, the operator seizes its point, by placing his thumb upon its convexity, and continues to draw upon it, bringing the thread with it by a movement of supination; he then takes it as he did at first, and proceeds immediately to the second step of the operation, which differs from the first only in this, that the needle should perforate the second lip of the wound by beginning upon its deep-seated border, (*sa face profonde*,) [within the wound.—*T.*,] and that, instead of the fore-finger, we place the thumb upon the skin, in order to hold it firm.

The other stitches are but the repetition of the first; and when many are to be inserted, we usually begin with that on the right, or the lowest one.

The rule which directs the first stitch to be placed upon the middle of the wound, is not applicable but to a very small number of cases. It is suitable only after the removal of certain tumors, and for wounds with flabby flaps, (*lambeaux flasques*,) or simple wounds with very moveable teguments; otherwise, it is almost always better to begin on one of the extremities, or one of the angles of the division. The more the stitches are approximated, the more they favor immediate union, and the less distant are we obliged to make them from the line of the wound; it is also important, in most anaplasties, to leave only two or three lines between them. As a general rule, the more they are approximated the better the operation succeeds. It is the same, also, with all other kinds of sutures.

If any reasons should incline us to use the ancient method, and place a needle on each end of the thread, the upper or straight border of the wound, being raised up as before, should be perforated the first, from its adherent [or internal] surface to its free [*i. e.*, its outer] surface, while the right hand should be turned in supination, in order to place the thumb on the concavity of the needle, which is pressed by a movement of pronation; the perforation of the other border should be made with the second needle, exactly as in the first method.

When we have to act upon tissues that are exceedingly resisting, we avoid wounding the fingers, and acquire a greater degree of

force, by covering the whole heel of the needle with a thick piece of linen. In such a case, it is advisable, also, in order to obtain a point d'appui, to place the two points of a forceps, slightly opened, under each side of the bleeding surface, where the point of the needle is about to penetrate.

Instead of using separate threads, we may also, as I have often done, and have seen M. Dieffenbach do, insert all the stitches of a suture with the same thread. The first stitch is immediately tied into a knot, and the thread cut near the knot. We proceed in the same manner, and without stopping to insert the other stitches, unless it should be necessary to change the needle. The preparations for the operation, and the operation itself, are both thereby somewhat expedited.

Another mode, which I have found very successful upon the eyelids and anus, and especially upon the vagina, consists in inserting with the same needle, and with one thread only, all the stitches, and without tying or cutting any of them. For that purpose we have a very long thread, and at each insertion of the needle leave outside a loop (*anse*) of several inches in length; afterwards, by dividing all the loops, the surgeon obtains as many distinct ligatures, which he has only to tie separately.

De La Faye, who used this kind of suture, first placed the lips of the wound in contact, or caused them to be held so by an assistant, so that he might perforate them with one and the same plunge of the needle.

These, however, are only slight and unimportant varieties of a process, which each one may modify according to his own views, or the special indications he wishes to fulfil.

To terminate, the operator cleanses the parts, seizes each ligature by its two extremities, adjusts the coaptation, and ties the different threads, one after the other, upon the least dependent side of the wound, where he fastens them by a bow-knot. In placing them even upon the track of the wound, we have, nevertheless, the advantage of exerting a more uniform degree of tension and compression upon each side. I generally adopt this, and find it does well. The placing of a little lint between them and the wound, so that they may not press naked upon the skin, as some persons have recommended, is a practice which would only be justified by the necessity of loosening the suture the next or second day after its application. In all other cases they should remain in their place without any thing intervening. A layer (*gateau*) of lint, or a perforated piece of linen, spread with cerate, and then dry lint, and compresses, and a few turns of bandage over them, serve to support them, when covering the parts with simple compresses, wet with cold water, or even leaving the suture open to the free air, might not seem to be sufficient. It is well, also, in some cases, to aid their action by adhesive straps of diachylon.

If nothing of particular moment should supervene, we do not take away the threads until the third, fourth, or even the fifth day; if the tissues, placed in contact, should be thick and very dense, it

might even be advantageous not to remove the suture until at the end of six, ten, or twelve days; and it can only be by inadvertence that some have advised to leave it on for a month, for ulceration is far from requiring as long a time as that for cutting through the parts. To remove them, we divide them with the scissors at the lower extremity of the loop; the right hand afterwards seizes the knot, or upper extremity, either with the fingers or with a forceps, and gently removes them one after the other, while with some of the fingers of the left hand, or with another open forceps, we support the skin and corresponding lip of the wound.

§ II.—*The Loop Suture*, (*Suture à Anse.*)

Le Dran proposed, especially for enteroraphy, after having introduced the threads with the straight needle, as in the interrupted suture, to unite all their extremities in one group, and to leave them collected in this manner outside without tying them. His object was, to have it in his power to separate them at a later period, and to withdraw them one after the other, without being obliged to divide any thing. The evil of this process of Le Dran consists in the puckering (*plissement*) of the sutured part, a puckering which results from the tendency to approximation of the stitches (*anses*) of the suture, caused by the tail-shaped cord which groups them outside the wound. The plan, in consequence, has not been retained, except in cases where a single thread suffices, or when, after having inserted several, we may retain them separately outside, as is still done for certain intestinal sutures. I will recur to this again.

§ III.—*The Continuous Whip* (*à surjet*) [*or Glover's*] *Suture.*

The glover's (*du pelletier*) suture, so called, is that which is generally employed after the opening of dead bodies and in veterinary surgery. Not less frequently employed in human surgery formerly, it is at present, and improperly, as it seems to me, almost entirely excluded from it. Wounds of considerable length, or that involve hollow organs, are not less conveniently adapted to it in the living than in the dead; and the strangulation, which it is accused of so easily producing, is so much the less a reason for rejecting it, that it does not follow this any more frequently than it does the others.

The whip suture, moreover, is so well known in the glover's and tailor's art, that its name alone is sufficient to describe it; we begin it like the interrupted suture, except that a straight needle is more suitable than a crooked one, and that, in place of perforating the lips of the division one after another, we endeavor to bring them face to face, and to include them in the same fold, in order to pierce them at one puncture, (*du même trait.*) The assistant then stretches and keeps extended the two extremities of this fold; the surgeon pinches it above with the thumb and fore-finger of the left hand turned in pronation, carries the needle to the straight or upper lip, a little above and at a suitable distance from the wound, pierces

the fold, draws the thread through, and causes the assistant to hold its extremity, or ties a knot in it to hold it, brings back the needle obliquely crosswise over the wound to the same part of the skin, at three, four, or five lines from the first puncture, and continues on in this manner, so that the last stitch passes a little beyond the other extremity of the fold, and that the whole suture represents a certain number of spiral turns; if it does not appear to be sufficiently tightened, we draw upon the two ends before fastening them; in the contrary case, we widen (*étaler*) a little the fold of the wound. In order that it should be well done, it is necessary that the two lips of the wound, without being strangulated, should touch each other throughout their whole surface, and that the fold should be perfectly effaced. We finally terminate the suture by making each of its extremities pass, as in a running knot, around the spiral turn next to it. When we wish to remove it, we cut, with the aid of the scissors, each oblique bridle that it forms, then draw out all its stitches separately; or we confine ourselves to untying its upper extremity, in order to disengage successively the different turns of the spiral, and draw the thread out entire by its lower end.

When we cannot include the two sides of the wound in the same puncture of the needle, each stitch of the glover's suture should be made precisely as in the interrupted suture, from which, in reality, it differs, as is seen, but very little.

§ IV.—*The Zigzag Suture, that is, with alternate Side-Stitches, or as in Basting*, (*Suture à Points Passés ou en Faufil.*)

This suture, the suggestion of which is attributed to Bertrandi, and which De Courcelles had already spoken of, (*Man. des Opér. les Plus Ordin. de la Chir.*, 1756,) is in a continuous thread, like the preceding, and also commences and terminates like that; but, in place of passing spirally in front of the wound, to go from one side to the other, the thread perforates its fold each time, first from right to left, then from left to right, and so on to the end, so as, in reality, to form zigzags, which leave the anterior edges of the wound free and uncovered. Consequently, the needle perforates the tissues by beginning on the right border; drawn back through the left border, it perforates them anew, but in an opposite direction and a little above, to come out again upon the right border; it is returned through this last at some lines above; drawn out again upon the other, it is reinserted a little farther on, as at first; in such manner that it creeps along, as it were, (*marche en serpentant,*) and not in spirals, (*ambages,*) like the glover's suture. Some surgeons attach to it the advantage of not tearing out or cutting through as easily, because of the lateral stitches which it everywhere makes between two punctures, and of not strangulating like the other by passing over the wound. M. Champion also thinks that it favors, more than the glover's suture, the adhesion of the wound with the neighboring parts, as, for example, of a divided intestine with the peritoneum of the abdominal walls. In admitting

that this may be so, we must allow, at least, on the other hand, that it has the inconvenience of drawing unequally upon the two halves of the division, and of not supporting its anterior surface. Though slightly improved by Lombard, (*Plaies Récentes An.* VIII. p. 19,) and imitated by Béclard, who proposed that we should make use of two threads of different colors, and by M. Champion, who, with the same object, had confined himself to making a knot at the two extremities of one of these threads, the zigzag (*à points passés*) suture is scarcely ever used, and may nearly always be replaced without any danger by the interrupted or by the glover's suture.

§ V.—*The Twisted Suture*, (*Suture Entortillée.*)

One of the sutures the most frequently employed, is that which is made by means of threads (*cordonnets*) passed in various ways (*diversement*) around metallic pins, (*tiges métalliques,*) which are left remaining in the thickness of the tissues. Needles of iron, steel, gold, silver, lead, copper, brass, &c., straight, curved, thick, fine, long, short, round, and flat, have been employed for this purpose; but it has resulted in this, that ordinary pins, which are found everywhere, and which, in truth, answer the purpose full as well as metal of the most precious kind, or that which has been the most laboriously wrought, have now been almost universally substituted for them. They are prepared by sharpening and flattening their points in any way we choose, as upon some vessel of freestone, or a fixed piece of stone, and in covering them with cerate or tallow. If they are fine, or if the parts they are to perforate have but little density, even these slight preparations are not required. If the wound occupies a moveable part, the lips or eyelids, for example, and is vertical, the pin that is to be applied first is that which is nearest to the free border of the organ; the others follow afterwards in succession. When the two extremities of the wound hold firm, (*se tiennent,*) or we wish to fasten cutaneous flaps, the placing of the needles is no longer subjected to the same rules. The operator then begins at the middle, point, sides, or base of the parts he wishes to bring into coaptation, according to the difficulties he supposes he has to overcome. Under this point of view, he must be left to his own particular judgment. The right lip of the wound being held by the fingers of the left hand, as in the interrupted suture, or with the forceps, erigne, or any other appropriate instrument, he inserts the needle or pin from without inwards, makes it appear at the interior of the wound, and continues to force it towards the other lip, which he seizes in its turn and perforates from within outwards, so that the needle comes out on the skin at the same distance; the needle is then immediately embraced by a turn of thread, which passes under its head and point, at the same time that it crosses the forepart of the wound and tends to force its two halves against each other; an assistant holds fast the two ends of the thread and keeps them a little tense, while the surgeon proceeds to the application of the other pins. As soon as

they are all placed, we occupy ourselves with arranging them and surrounding them with threads. The middle part of a long ligature is placed on the last pin, then passed and crossed many times in figure of 8 on its two extremities, conducted by a figure of X to the next needle, and crossed in the same manner on the head and point of that, before going to the third to return upon the second and first by additional figures of X. We terminate with a knot, or by rolling its two ends into a cord, which is turned back under the head of the metallic pin. In order that the needles may not wound the teguments, a small piece of lint or adhesive plaster is placed under each one of their extremities; there is nothing then to do but to cover them with a suitable dressing, if it should be judged necessary to use any.

Their removal is made at the same periods as those of any other suture. We begin by removing the pin which supports the least traction, in order not to take away the others until the day after, or the day after that, should the reunion not be found sufficiently firm. Should we have any apprehensions on this subject, it is better to take away the needles only at first, and to leave on for a day or two the pacquet of thread, which, adhering to the parts and becoming more or less hard, does the office of adhesive plasters; there is no objection, moreover, to our substituting some strips of adhesive plaster for two or three days in the place of each needle that has been removed. It is necessary, also, that the straight lip of the wound should be carefully supported by the fingers of the left hand, or, better still, by the extremities of a dissecting forceps, while with the other hand, or with another forceps, we draw on the head of the pins in a straight line, turning them around upon their own axis by small movements of rotation. The punctures that they leave in the place exude and suppurate for a day or two, and cicatrize like every other wound of the same nature.

§ VI.—*Quilled* (*Enchevillée*) *Suture.*

The infibulation which is still practised by some of the orientals, and which for a long time has been in no other way employed in Europe except to protect the female of some animals, the horse, for example, from the furious passions of the males, is a kind of quilled suture, in fact a grillage; but in the place of metallic rods, used on the mare for the particular purpose for which they are intended, this suture in the human species is made with threads, and two small lateral stems, which should be more solid. It is applied like the interrupted suture, but with double threads, leaving a loop at their free ends. When they are all adjusted, we insert in a parallel direction with the wound, and into each of the loops, a stem (*tige*) of wood, a piece of hollow quill, or the end of a sound or of a gum-elastic bougie, a roll of adhesive plaster, a small metallic rod, or any cylindrical body whatever of suitable length and thickness; the loops at the other extremity of the threads are then opened, that a similar stem may be inserted in them, and upon

which they are successively tied into a knot, after having effected the coaptation of the borders which are to be united, without making too great a constrictive force, but in such manner, nevertheless, as not to leave a void between the two sides of the wound.

The quilled suture, though rarely indispensable, has, nevertheless, the advantage of making an equal pressure upon all the points which the threads tend to approximate, of being more solid than any other, of not tearing out the parts as easily, and of being specially adapted to straight, long, and deep wounds of the walls of the abdomen and those of the limbs. Ravaton, who used it also in transverse wounds, fastened it upon plasters cut and rolled into cylinders. These small rolls have the advantage of moulding themselves easily and without any effort to all the irregularities of the wound. In order to have the loops as small as possible, Ravaton proposes, moreover, that all the threads should perforate each of the cylinders, instead of surrounding them entire. Thus modified, the quilled suture is applicable to all wounds of any considerable length, or those whose union cannot be maintained without the aid of a certain degree of resisting power. It is used frequently in place of numerously multiplied stitches, and is the only one that tends to approximate the parts from the bottom towards the surface. This last advantage is attended with an inconvenience which it is proper to recollect, namely, a perceptible gaping open, often, of the cutaneous edges of the wound. This, however, is remedied either by means of adhesive plasters, or by passing afterwards under the cylinders a certain number of threads, which are each tied in a knot as in the interrupted suture. The only objection, then, that can be urged against this suture, is that of exacting a little more care and time than the continuous suture, and of never, in fact, being in any case imperatively required. It will be spoken of again, under the head of *Suture to the Perinæum.*

§ VII.—*General Remarks on Sutures.*

In every kind of suture whatever, we must avoid multiplying their stitches, or separating them too far apart. The interval to be left between them, should vary also according to the greater or less degree of resistance to be overcome, and according as the wound is more or less distended, or the walls to be held up more or less flabby or difficult to be supported. Stitches at the distance of half an inch apart ordinarily suffice for the quilled suture, and for some cases of the twisted suture; in other cases, on the contrary, they are required to be at the distance of three lines or more apart, while an inch is sufficient in some circumstances; but this is only to be learned from particular examples, which cannot properly be given in this place. If the lips of the wound do not gape between the stitches, and if these latter are sufficiently tightened to put the living surfaces into contact, but not so much so as to interfere with the inflammatory engorgement of the parts; if they extend to the distance of a line from the angles

of the division, unless where it is requisite to leave open at the lower part an issue for the matters; if they enter and come out at an equal distance from the line of the wound; if they are left in but a short time where the tissues are exceedingly vascular or easily cut through, (*sécables,*) as in infants and upon the face; and that the contrary is observed in the opposite conditions; then will the suture be well made. The suture, moreover, is an operation which necessarily admits of but very few general rules. It is when treating of anaplasty, wounds of the intestines, lacerations of the pudenda, &c., that we shall be fully enabled to appreciate them.

PART SECOND.

COMPLEX OPERATIONS.

SECTION FIRST.

OPERATIONS WHICH ARE PERFORMED FOR DISEASES OF THE CUTICULAR SURFACE OF THE INTEGUMENTS.

ARTICLE I.—OPERATIONS REQUIRED FOR WARTS, CORNS, AND DISEASES OF THE NAIL.

§ I.—*Warts.*

THE name of warts is applied to small tumors, sometimes narrow and salient, sometimes flat and of considerable breadth, which are formed upon the surface of the skin, and principally upon the back of the hand. They are indolent vegetations of the epidermic layers and of the sanguineous tissue of the skin. A great number of methods have been proposed for their removal, but there are none of them that generally succeed, and the best thing, when these warts are very numerous, is to do nothing at all with them. No infirmity has given birth to a greater number of secret or whimsical remedies. I know a distinguished functionary of the realm, who firmly believes himself in possession of one of these secrets. He has related to me with the utmost degree of sincerity, that by means of a thread of red silk, each knot of which should be made to pass around and touch the base of the wart before being tied, and which thread he afterwards deposites and leaves to putrefy in a mass of dung, warts can be constantly cured! Without attaching any value to such absurd notions, the surgeon may make trial

at least of certain remedies, that are in reality efficacious, when the warts are few in number, and the patient desires to be relieved of them.

If the tumor is salient and pedunculated, we may strangulate it with a thread, and thus detach it by a ligature.

In that case, it would be still better to seize it with a forceps, and excise it with one stroke of the scissors, taking care to touch the small wound immediately after with the nitrate of silver.

[This mode, peculiarly adapted to and called for in syphilitic pedunculous vegetations on the glans, or præputium penis, is made more effectual, and a second sprouting of the warts, not an unusual thing, prevented, by drawing them outwardly with the forceps applied to their middle, and with such force that the root or base as it were is elevated above the plane of the skin, by which means the curved scissors, placed flatwise and close to the skin, is enabled to clip them off entirely below as it were their base, leaving no small roots or attachments behind. The only inconvenience, and that is in the eye of the patient only, is that there is in this mode of extirpating them a small hemi-spheroidal depression or pit generally left in the skin. In this method the nitrate of silver or other escharotic is not requisite, and the warts never or rarely return, which, however, they are very apt to do where they are clipped off, as they usually are, in a line only with their base, without drawing them out, so that the scissors may pass as it were under their roots, as above directed in this note.—*T.*]

If the wart has neither pedicle nor neck, it is treated in another manner: that is, sucked with the lips and then bitten off with one bite of the teeth, as was done in the time of Galen; burning it with a tooth cautery, or removing it layer by layer with a scraper, are objectionable methods, in place of which we should always substitute extirpation and free cauterization.

Extirpation, however, which consists in removing by one stroke of the bistoury or scissors, applied flatwise, the whole tumor, and the effect of which is afterwards rendered more sure by touching the surface with nitrate of silver, is not a perfect guarantee against a return. To take off with the wart an elliptic piece (*plaque*) of the skin would be infinitely more sure. [Vide note a few lines above.] With persons who dread the application of a cutting instrument, we should have recourse to cauterization. The end of a feather or a glass tube serves to conduct to the tumor a small drop of nitric acid, which we must take care not to allow to spread upon the neighboring tissues. This cauterization, which is to be repeated for several days in succession, acts better and succeeds more constantly than cauterization with the nitrate of silver. In fine, simple incision, aided by cauterization with the nitrate of silver, is the mode most frequently employed.

[*Muriate of Ammonia.* Rubbing frequently, says Dr. Mott, with a piece of this, carried in the pocket, will often cure them. Also, butter of antimony, applied with a camel's-hair pencil. So with *muriated tincture of iron*, and also *tincture of iodine*. But every other mode

should now be discarded, he says, for the effectual and certain cure by means of the *actual cautery*, especially, as in the treatment of *nævi*, by perforating the wart, perpendicularly and horizontally, in two or three places, with a *red-hot* pin, though a great degree of heat is not necessary.—*T.*]

§ II.—*Corns upon the Feet.*

The operations practised for corns on the feet, and which are alike varied, are almost all of them performed by charlatans or corn-doctors, (*pédicures.*) The pain, however, which results from this disease is often so very severe, and causes sometimes accidents of so serious a nature, as to require the aid of surgery. Corns are a production in the shape of a nail, (*clou,*) whose point depresses the skin, and are composed of epidermic substance, and not of concrete mucus, as some persons appear to suppose. Removing them layer by layer with a bistoury gives temporary relief, but does not effect a radical cure. There is no other mode to destroy them effectually, if an instrument is to be used, than by extirpation. The method which I adopt with most advantage is very simple. With the point of a straight bistoury I separate a portion of the circumference of the corn, then seize hold of this detached portion of its border with a dissecting forceps; then, continuing to separate it, I take care to hold the point of the bistoury constantly in contact with the surface of the living tissues. Proceeding by small cuts, and gently, I thus, in the space of one or two minutes, and without causing the least pain or a single drop of blood, succeed without difficulty in removing the thickest kind of corns. It is for this operation that corn-doctors have devised the instruments called *quadrilles*, *furets*, and *navettes*, and which they use with lenses, (*loupes,*) or bottles filled with water, to concentrate the light upon the part they are dissecting.

The corn thus unrooted (*déraciné*) will, nevertheless, grow out again in most cases, if the friction of the toes continues as before. It is only by cauterizing the cavity it occupied, or filling it with adhesive plaster, that we can sometimes prevent it from growing again. This, after all, is but a small operation, which patients may practise upon themselves, and which they have only to repeat every month to relieve the suffering produced by corns.

In taking the precaution to soften the corns, either by means of plasters, or by immersing them for a greater or less length of time in hot water, they are more easily separated, and in some cases they are detached by rubbing them, or simply pulling upon them with the fingers. It is in this way that certain plasters or ointments have acquired a kind of reputation in the practice of corn-doctors and among common people.

Cauterization, also, is frequently employed for the same purpose. It is performed either by applying to the centre of the corn the ignited extremity of a piece of wood, or a drop of melted sulphur, or a small roll of spider's web, which is ignited on the part, or sulphu-

ric or nitric acid. I have seen a person even, who had the singular idea of perforating with a red-hot pin a corn which he had on the back of the phalangeal articulation of the fourth finger, (*doigt annulaire.*) The corn, in fact, mortified, but produced an eschar, which exposed the joint, and led to the necessity of amputating the finger.

The treatment of corns by caustics is, in every respect, not only less certain, but more dangerous, especially in the neighborhood of the joints, than their extirpation, when well performed.

[The application of a strip of adhesive plaster, firmly embracing the toe, after the effectual extirpation of the corn by the knife, is not only an excellent preventive of the friction which has often caused the corn, but also, by its compression, prevents the new growth, and is thus frequently an effectual cure. This remark applies, also, to the treatment of some obstinate warts removed by caustic from the fingers. A general idea prevails in the world, that stockings of cotton thread, from the naturally irritating properties of that tissue, are a preventive of corns. Shoes moderately tight are certainly preferable to those that are loose, and which by friction chafe the skin and produce corns. Corns become of a more serious character when involved with tumefaction of the toe joints, which has been produced by painful gouty affections. Keeping the feet and toes thoroughly clean by daily ablutions in cold water, winter and summer, is one of the best hygeian preventives.—*T.*]

§ III.—*Callosities, (Durillons.)*

Epidermic tumors, in place of presenting themselves under the form of a nail, are sometimes seen under the aspect of scales, of greater or less thickness, upon the surface of the parts. These plates, (*plaques,*) which are most frequently seen on the outer or dorsal surface of the little toe, and upon the corresponding surface of the head and posterior extremity of the fifth metatarsal bone, and within the metatarso-phalangeal articulation of the great toe, &c., take the vulgar name of onions (*ognon*) when they are large and shelly, and of callosity (*durillon*) only when they are of little extent and of the character of a homogeneous mass.

Produced by the unequal compression and friction of the shoes, (*des chaussures,*) these different kinds of callosities, like corns, cannot be prevented or radically cured but by the removal of the causes that produce them. They are, however, temporarily cured by excision. For these, however, the bistoury must be applied flatwise, (*en dédolant,*) and the removal of the epidermis layer by layer is the mode to be preferred. Their destruction by the file, pumice-stone, (*pierre-ponce,*) or shagreen-skin, (*la peau de chagrin,*) is never as complete and prompt as by the cutting instrument. It is important, also, to know that, like corns, they very often lie upon a sort of mucous bursa, (*bourse muqueuse,*) which we must take care not to open, should they exist on the back of an articulation. I will add, that under the heel, where there is found a mucous bursa of this de-

scription, corns and callosities often inflame to such a degree as to produce suppuration, and that their cure in such cases requires that they should be completely excised. I have seen some in the sole of the foot, and under the metatarso-phalangeal articulations, which had undergone such transformation that it became necessary, also, to remove the entire thickness of the skin upon which they were situated.

§ IV.—*Diseases of the Nail.*

The nail, or the parts which surround it, are subject to a certain number of diseases, almost all of which derive their remedies from operative surgery.

A. *Runround, (Tournioles.)*

The suppuration known under the name of *mal d'aventure*, or *tourniole*, and which presents itself under the form of a purulent phlyctæna upon the contour of the nail, almost always, if left to itself, causes the destruction of this substance.

We may, however, prevent this disease in two ways—1. By opening the phlyctæna as soon as possible, then removing the whole separated portion of the cuticle, and afterwards dressing the denuded surface, either with lint covered with cerate, or with simple emollient cataplasms. In order that this first means should succeed, it is necessary that the disease should not have yet penetrated between the nail and the cutaneous fold which covers its borders or root; 2. The progress of the disease is arrested, also, by cauterization; it is also necessary that this cauterization should be performed properly. The most convenient way in such cases is by a pencil of nitrate of silver, sharpened into the form of a chisel (*ciseau*) or wedge. If we take care to make it penetrate between the nail and the cutaneous border down to the bottom of the purulent groove, so that all the morbid points may be effectually touched, it is rare that the disease continues, or that the adhesions of the under (*profonde*) surface of the nail are destroyed. It is a mode of operating in which I have always been successful.

The fungosities and vegetations which are sometimes seen on the epidermic margin (*filet*) which surrounds the nail, and which are a very common result of the tourniole, require the same treatment, and also are not effectually eradicated until they have been well cauterized. [Dr. Mott has seen these fungoid growths under the root of the nail burst through it, and occasionally he has had to make an opening through the nail to let out the blood. A poultice mixed with wood ashes is then an excellent application to complete the cure.—*T.*]

B. *Nail Imbedded in the Flesh, (Ongle Incarné.)*

The disease known under the name of the imbedded nail, (*ongle incarné,*) narrowed nail, (*ongle rétréci,*) the nail entered into the

flesh, (*ongle rentré dans les chairs,*) the *onglade*, and *onyxis*, and which the ancients describe under the name of *pterigion*, is undoubtedly, of all diseases of the nails, the one which has most attracted the attention of surgeons. To understand perfectly what I shall say of the operations it has suggested, we must bear in mind that the nail is a horny plate, the concave surface of which is continuous with the papillary surface of the cutis, and the sides of which near its root are surrounded and covered, to the extent of two lines, by a fold of the integuments. The lunula, (*lunule,*) or small white spot which is seen at the root, corresponds to a part upon its concave surface which is but slightly adherent to the rete mucosum underneath. The ridge (*filet*) which is around it is a simple fold of the epidermis, and it is almost always at the expense of this that are formed those ravellings of the skin (*éraillures*) known under the name of *hang-nails*, (*envies.*)

The portion of the integument which covers the root of the nail, and which, according to some surgeons, is considered its matrix, does not, in reality, adhere to it but to the extent of a line or a line and a half in front; farther in the nail is terminated by a thin root, free and slightly irregular, so that it is more especially by its concave surface, and by a small part of the convex surface of its root, that it is nourished or reproduced.

What I have just said of the tourniole applies sufficiently well to phlyctænæ, and the fungous growths of the tegumentary fold of the root of the nail.

The nail of the large toe often appears as if it had penetrated by one of its edges, or even by both its edges, into the thickness of the flesh; it is for this condition of things, which is very unpleasant, as well as exceedingly difficult to remedy, that an infinity of surgical means have been devised. The processes, in fact, for this purpose are so numerous that it would be easy to name almost a hundred of them, which requires that they should be treated of under different heads, if we wish to examine the principal portion of them with advantage.

All these processes have for their object—1. To destroy a portion or the whole of the nail; 2. To get rid of the fungosities (*fongosités*) [fungous growths] which surround the nail; 3. To narrow or raise the plate which wounds the flesh.

I. *Destruction of the Nail.*

Surgeons who have advised the destruction of the nail for the cure of onyxes are divided into three classes. Some, in fact, confine themselves to excising the portion of it which seems to have perforated into the tissues, whilst others recommend destroying by cauterization that part of it which is covered behind by the integuments, and others again, that we should tear it out by force, either by one of its halves or entire.

a. *Destruction of the Imbedded Part of the Nail.*

1. Paul of Ægina, (*Lib.* vi. cap. 85,) or Dalechamps, (*Chirurgie*

Française, édit. de Rouen, p. 538,) had already recommended cutting off the imbedded edge, after having raised it with a probe.

2. Fabricius ab Aquapendente (*Opera Chirurg.*, Francfort, 1620, p. 402) recommends that we should keep the edge of the nail raised by a piece of lint, and that it should then be cut off down to its root, and the detached portion removed with the forceps, and that we should do this every day, until there is no more of it left concealed in the flesh.

3. Dionis made use of a kind of knife, cut the nail lengthwise, and took away with the forceps the portion to be removed; sometimes, also, he used scissors to cut it from before backwards, and applied to the wound lint wet with lime-water, or a minium plaster, (*Opérations*, édit. de Lafaye, t. ii., p. 781.)

4. A process, which resembles very much that of Fabricius, has been published as new by M. Sommé, (*Archiv. Générales de Médec.*, t. i., p. 485.) It consists in removing the imbedded portion of the nail, and then sprinkling the fungous growths (*fongosités*) and the adjoining groove with powdered alum.

5. M. Blaquière has modified the process of Dionis in this way: Before dividing the nail, he thins (*amincit*) it by scraping it with a knife or a piece of glass; after having slit it down to its root, he tears out the diseased third of it by turning it over upon itself by means of a forceps; then dresses the wound with lint wet with alcohol, myrrh, and aloes; and takes care to insinuate some threads of lint under the new nail in proportion as it grows out, (*Jour. du Dict. des Sciences Méd.*, t. xviii., p. 208.)

6. M. Bégin, (*Jardon, Thèse*, No. 101, Paris, 1836,) who, like M. Blaquière, thins the nail before excising it, does not afterwards make use of lint to raise it up, nor of alcohol to give tone to the parts.

b. *Tearing out the Nail.*

Other processes, more rapid, but which belong to the same class, consist in quickly removing a portion of the imbedded nail.

7. M. Baudens, for example, removes from behind forward, and by a single stroke, with the cutting heel of a very strong bistoury, both the diseased border of the flesh and the entire portion of the nail which it covers. Among the processes of tearing out the nail, we have that of M. Larrey, Boyer, Dupuytren, and Néret.

The *process of Boyer* differs from the tearing out, properly so called, in this, that, in order to prevent the return, this surgeon established, after the operation, a point of compression upon the matrix of the nail, by means of a small ball of lint and some turns of bandage.

8. *Process of M. Larrey.* After having removed the inverted half of the nail from the diseased part, M. Larrey made use of the hot iron to destroy the fungous growths in the neighborhood and the whole surface of the wound.

9. *Process of Pelletan*, (*Jardon, Thès.*, No. 101, Paris, 1836,) *or of Dupuytren.* Dupuytren proceeded in two different modes for tear-

ing out the nail: if the disease was simple, and occupied but one portion of the toe, he confined himself merely to tearing it out, and adopted the following mode: The diseased toe being held in a proper manner by the thumb and fore-finger, while an assistant presses his hand upon the dorsum of the foot, the surgeon immediately inserts from before backwards one of the blades of a narrow-bladed and very keen-edged pair of scissors between the nail and the dorsum of the phalanx which supports it. The instrument should penetrate in this manner to at least two lines beyond the visible portion of the nail, which is then divided with a single cut by approximating the blades of the scissors. A strong dissecting forceps now answers for seizing one of the halves of the divided nail, which is turned over, drawn out, and speedily detached from its median portion to the free border, and from before backwards, and the same immediately afterwards done for the other half. The operation is thus composed of three stages—the first for the division, the two others for the successive removal of the two portions of the nail. The entire operation is so rapid, also, as not to consume more than half a minute.

If the disease should have been of long standing, and of great obstinacy, Dupuytren preceded the operation, of which I have just been speaking, by a semi-lunar incision, with its convexity backward, the object of this incision being to lay bare the root of the nail from behind forwards, and to destroy its matrix completely.

10. *Process of M. Néret.* In lieu of scissors, M. Néret proposes to employ the ordinary spatula. The following is the way in which he proceeds, (*Archiv. Gén. de Méd.*, 3e série, t. ii., p. 202:) After having placed the toe as in the usual manner for this operation, M. Néret, grasping his spatula with the entire hand, glides its blade, the concave part of which faces downwards, under the free border of the nail, and then forces it on rapidly from before backwards to beyond the root to be detached. Then turning the instrument upon its axis, he raises the nail from one of its borders, then from the other at its median part, so as to make it spring off, (*faire sauter*,) as it were, with one stroke. If, after having detached it from its middle part, and then upon its outer border, the spatula should not separate it completely, M. Néret seizes it with a pair of stout forceps, and removes it as in the ordinary process.

[Dr. Mott says the scissors ought to be made with great care, with very short, stout blades—one thick, the other thin and sharp. It is, at best, he thinks, a cruel operation, and one in which he always feels some apprehension of lockjaw.—*T.*]

11. *Appreciation.* These processes, then, are comprised under two divisions, which it is important not to confound; the one, which proposes only the destruction of the part of the nail that is imbedded; the other, which has for its object the removal, also, of a part or of the whole of its root. Whether in the first case we follow the process of Paul of Ægina, that of Fabricius, Dionis, Sommé, Blaquière, or Bégin, is a matter of little importance; they are such slight modifications of the same method, as not to require specific classifica-

tion. Their disadvantage is, that they rarely secure the patient against a return of the disease, and that they permit the portion of the nail which has been destroyed to grow out again soon after, and again to become a source of irritation to the parts.

As to the tearing out of the third or the half of the imbedded nail, whether we effect this as Ambrose Paré did and as M. Bonafond proposes, (*Epidaure*, t. i., p. 135,) by removing the nail and the flesh from behind forward with the bistoury; or whether in the manner of Dionis, Boyer, Dupuytren, Delpech, and Larrey, we first slit it from before backward, and afterwards remove it with a forceps, can in neither case be a matter of any importance; I see in these, trivial modifications only of the same process; except that the operation is quicker by the simple excision than by the process of tearing the nail out, properly so called. This operative process, a little more painful perhaps than the preceding, is, however, more expeditious, and more generally followed by a radical cure. By destroying at once both the portion of the nail which is imbedded and also its root, we run infinitely less risk of a return of the disease.

But we relieve in this manner only one of the sides of the imbedded nail. The process of Dupuytren, or that of M. Néret, has certainly the advantage of destroying at once the whole of the nail, and of putting the parts in a better condition to shrink and resume their normal state.

The slit of the nail being the same in both cases, is a reason why the whole amount of the suffering is not perceptibly greater for the complete than for the partial removal. In addition to this, I generally prefer the entire evulsion (*avulsion*) to that of one of the halves of the nail. Moreover, I do not believe it to be a matter of great importance to effect this evulsion (*arrachement*) rather with the spatula of M. Néret than the scissors of Dupuytren; neither has it seemed to me, if we take care to prolong to a sufficient distance backward the antero-posterior slit, that it would be really advantageous to cut posteriorly the small semi-lunar flap of Dupuytren. As the reproduction of the disease is caused much more by the back of the tissue that covers the phalanx than by the pretended matrix of the nail, this small flap does not give a better security against a return than the pure and simple evulsion.

c. *Destruction of the Nail by Caustics.*

Under the belief that the nail vegetates exclusively from behind forward, many surgeons have proposed to destroy only the root of it.

12. Circumscribing the whole imbedded edge in a perforated strip of diachylon plaster, (*une fenêtre de diachylon*,) M. Wanderbach (*Journal de Méd. Militaire*, t. xxviii.) applied three grains of caustic potash upon the tissues, in such manner as to effect, after the third application of this remedy, the destruction of both the fungous flesh and the corresponding portion of nail, with its root included.

13. Another military surgeon, M. Kremer, (*Même Journal*, t. xxviii.,) says he has succeeded by spreading a layer of potash on all that portion of the nail which is attached to the skin, and thus causing it to fall off entire.

14. This last process has been modified by M. Troy, (*Bulletin Méd. de Bordeaux*, 1833, p. 199; *Gazette Méd.*, 1834, p. 773,) by not applying the potash except on the matrix of the nail, but not on the fungous growths.

Some prefer the actual cautery to chemical caustics.

15. M. Labat, for example, (*Annal. de la Méd. Phys.*, 1835,) cauterizes by means of a plate of red-hot iron, in the direction of an arc of a circle, at four lines behind the border where the nail appears to issue from the skin.

16. M. Pointier proposes that in this process we should only cauterize the portion of the matrix that gives birth to the imbedded border of the nail, (*Donzel, Thèse*, Strasbourg, 26 Mai, 1836.)

17. M. Scoutetten carries the point of a straight bistoury to two lines behind the nail upon the diseased side, makes in that place a longitudinal incision whose lips he keeps apart, and at the bottom of which he fixes a small ball of lint, in order to insert in this place, on the succeeding day, a layer of caustic potash. The root of the nail by this means mortifies, and all that remains is to wait till it falls out.

18. This process, which M. Donzel lauds, (in his Thesis cited,) M. Ganderax (*Donzel, Thèse*) proposes to modify as follows:

19. This last surgeon gives less extent to the incision, and substitutes nitric acid for the potash, and makes two or three applications of it daily, until the nail softens and falls into a state of slough, (*putrilage.*)

20. Finally, M. Donzel himself, reviving the plan of M. Troy, proposes that we should dispense with the incision, and confine ourselves to an application of caustic paste upon the point to be destroyed, the same as if we intended to establish an issue in the part.

21. Combining the process of M. Scoutetten with that of M. Troy, M. Gairal makes a longitudinal incision six lines in extent, then, at the posterior extremity of this last, a transverse incision upon the root of the nail to be destroyed, and in this last places the caustic potash, (*Bulletin Clinique*, t. i., p. 108.)

d. *Appreciation.*

It is easy to perceive that these different processes of cauterization tend to the same result as those of extirpation. Their ultimate effect is the same, but we cannot deny that their action is more tardy and their efficacy less positive. The only advantage they seem to offer, is that of causing less dread to the patient, and of being attended in reality with a little less pain. They should not, therefore, have the preference but in cases where, after the destruction has been decided upon, it is found impossible to have recourse to

the cutting instrument. As to the choice to be made of methods so much resembling each other, I am of opinion that we should more particularly give the preference to those of MM. Troy and Donzel, that of M. Kremer, or even that of MM. Frebeau and Ganderax, (*Donzel, Thèse*, Strasbourg, 1836, p. 41,) which, besides being somewhat more simple, are full as efficacious as those of MM. Wanderbach, Labat, Pointier, Scoutetten, and Gairal.

II. *Destruction of the Fungosities only.*

22. In the endeavor to cure the *onglade* without attacking the nail, many surgeons have supposed that they could effect this object by acting on the soft parts only. To this method must be referred a process of Albucasis, (liber ii., cap. 89–91,) who, as Fabricius afterwards did, advises to raise the edge of the nail with a probe, and to excise and afterwards cauterize the flesh; that of Ambrose Paré, (*Œuvres Complètes*, in-fol., p. 465,) who limited himself to cutting off completely, and with one stroke, the flesh lapping over (*recourbée sur*) upon the nail, and who says he has often succeeded by adopting this mode: the process of M. Brachet and of M. Gantret differ but little from that of Paré.

23. Like Paré, M. Brachet confines himself to the excision of the flesh. Holding his bistoury like a writing-pen, he introduces its point between the nail and the raised border of soft parts, which he cuts through from above below, and separates first at its back part; then, seizing with the forceps the flap which has been thus cut, he terminates its section forward by a second stroke of the bistoury. This process, M. Gantret (*Donzel, Thèse*, Strasbourg, 1836) says he has often employed with success, and M. Lisfranc (*Malgaigne, Man. de Méd. Op.*, 2e édit., p. 98) believes he has made an improvement upon it, in proposing to detach the flap first by its anterior part, in place of commencing by the root of the nail, as M. Brachet does.

The method of excising the fleshy growths by the cutting instrument, being fully as painful as the processes which consist in removing at once both the nail and the fungosities which cover it, does not, in reality, deserve a preference over these last. It has also been attempted to substitute for this the destruction of the parts by caustics.

24. M. Levrat, of Lyons, who appears to have been the first who urged the advantages of this mode, applies caustic potash to the fungous growths only, and through a perforation in a piece of diapalm or diachylon plaster. After the eschar is detached, he inserts between the flesh and nail a piece of prepared sponge, which gives an opportunity for the cicatrix to be properly formed. It is a modification which M. Brachet has himself adopted, and which M. Séné (*Journal Gen. de Méd.*, 2e série, t. xxxii.—*Bulletin de Thérapeutique*, t. ii., p. 378) thinks he has simplified by substituting for the plaster and caustic of M. Levrat some filaments of lint saturated with potash, and which he insinuates into the bottom of the

wound which separates the flesh from the edge of the imbedded nail.

25. Another surgeon, whose name is indicated only by his initials, (*Bulletin de Thérapeutique*, t. iv., p. 303,) has also suggested that it would be advantageous to make use of the Vienna caustic in lieu of potash. Finally, it is proposed by M. Moreau (*Gaz. Méd. de Paris*, 1836, p. 830) to introduce burnt alum under the edge of the diseased nail, instead of caustics.

Appreciation. It is evident that the processes of MM. Levrat, Séné, and A. T., differ scarcely from that of M. Wanderbach, since the cauterization of the flesh is almost always complicated with that of the edge of the corresponding nail, and reciprocally. Being, therefore, more uncertain, they ought not to be retained but for simple cases, or for patients who have an excessive dread of every kind of operation.

III. *Readjustment (Redressement) and Reduction (Rétrécissement) of the Nail.*

26. Many practitioners, observing that cauterization succeeded but imperfectly, and deterred also by the pain of extirpation, have supposed that, by reducing or readjusting the nail, we should effect the removal of the disease. A process of this kind was already in favor in the seventeenth century. Dionis, who describes it, (*Cours D'Opérat.*, édit. de Lafaye, t. ii., p. 281,) says it consists in scraping the nail every month upon its middle with a piece of glass, and of thinning it (*l'amincir*) until it yields to pressure.

27. M. Biessi (*Gaz. Méd. de Paris*, 1834, pp. 773, 774) has supposed that he has invented a new process by uniting to the attenuating process, spoken of by Dionis, that of cauterization with nitrate of silver.

28. I have myself made trial, once with success, and twice without any advantageous results, of a process suggested by M. Moreau, of Tours, and which consists in passing the point of a small silver spoon, (*la queue d'une cuillère d'argent*,) heated to 60 or 70 degrees, (Reaumur,) [*i. e.* 170° to 190° Fahrenheit,] along the back of the nail, while the imbedded border is raised up with the point of a horn. With the view of forcing the nail to withdraw itself from the flesh, M. Guillemot (*Journal de Méd. Milit.*, 1814, t. i., p. 264) has supposed that it would be sufficient to cut its opposite angle from the middle of the free border to one-third of its length upon the adherent border. Next we have M. Faye, (*Thèse*, No. 164, Paris, 1822,) who, after having cut out a V upon the middle and anterior part of the nail, passes a waxed thread through the two sides of the notch, which he tightens by means of a small garrot, as if he was operating for the union of a hare-lip.

[This is certainly an ingenious suggestion, and would seem to derive force from the efficacy of the V incision in the gum, which I found so successful in liberating an inverted incisor. (See the chapter on teeth, above.)—*T.*]

In these four processes, the surgeon endeavors to readjust the nail by acting on its middle part, and in some degree without acting upon its edges. None of them have appeared to me to be very efficacious; but if we had to give the preference to any one of them, it would be that of M. Moreau or of M. Faye which I would recommend.

29. In another series are arranged the processes which consist, like that of J. Fabricius, in insinuating some soft body under the edge of the nail. MM. Hervey and others (*Archiv. Gén. de Méd.*, t. xxi., p. 142) make use of pieces of lint precisely after the manner of Fabricius ab Aquapendente. I might say the same of M. Tavernier, (*Bullet. de Thér.*, t. ii., p. 197,) who also uses a tent of lint, but gradually enlarged in size as it glides more and more deeply under the imbedded border of the nail; and of M. Moulinié, (*Bullet. Méd. de Bordeaux*, 1833, p. 199,) who prefers introducing in the same manner small balls of the same substance; of an anonymous author, (*Bullet. de Thér.*, t. ix., p. 158,) who introduces carded cotton, in place of lint, between the flesh and nail; in fine, of M. Bonnet, (*Bullet. de Thér.*, t. vi., p. 339,) who substitutes, for all these, some pieces of prepared sponge. By this process, we at the same time depress the flesh and raise the border of the nail. It is certainly one of the most mild remedies that can be imagined; it is, however, unfortunate that it fails the oftenest, and is almost always ineffectual when the fungosities have extended to a very considerable distance upon the side of the root of the nail. We are still compelled, therefore, the same now as formerly, to look for a more effective power for disengaging the imbedded nail from the flesh which covers it.

30. Desault, (*Œuvr. Chir.*, t. ii., p. 529,) who was fully sensible of the difficulty, proposed to glide under the edge of the imbedded nail a small plate of tin, about an inch and a half long, and three to four lines in width, which he then bent back upon the swollen flesh from the dorsal towards the plantar surface of the toe, and fastened in this position by some turns of bandage. It is this process which Boyer and Richerand have modified by substituting a piece of sheet-lead for the strip of tin used by Desault; but besides the fact that these plates are easily displaced, tend to cut the flesh, and rarely attain the object we have in view, they also have the inconvenience of sometimes occasioning very severe pain.

MM. Dudan, Vésigné, Grabowsky, and Labarraque, in their desire to improve the many imperfect processes in use, have constructed a kind of clasps, (*agrafes*,) or hooks, (*crochets*,) which act on the borders of the nail without necessarily pressing upon the flesh.

31. The instrument of M. Vésigné, modified and improved by M. Grabowsky, (*Thèse de Paris*, Juillet, 1838,) is composed of two plates, which are united by a hinge on the middle of the nail, and terminate in a hook on each side. After having adjusted the hooks under the edges of the nail, we elevate them by gradually tightening the clasp by means of a screw. This clasp, besides being liable to be displaced, acts at the same time on both sides of

the nail, though there be but one side only which is diseased, and also makes an irritating pressure on the back of the toe; it is, besides, so complicated as to require the aid of a mechanic.

32. The apparatus of M. Labarraque (*Thèse*, No. 101, Paris, 1837) is infinitely more simple. I have often used it with success. The plate of tin which composes it, and which is similar to that of Desault, being terminated in a narrow hook at one of its extremities, and having on its anterior part, at the distance of three lines, a small notch upon its edges, allows of our attaching to this part, by means of some turns of thread, the end of a narrow and long strip of adhesive plaster. To apply it, we attach the hook, and make it glide as far in as possible between the nail and flesh; afterwards, drawing the strip of adhesive plaster in an opposite direction, we make a turn with it around the toe. The circulars of this little bandage, in passing upon the free portion of the tin plate, cause it to act (*la font basculer*) from above downward, after the manner of a lever of the first kind; we thus raise, with all the force desirable, the edge of the nail. Two similar plates would be necessary if the nail was imbedded on both sides. In taking care to renew the dressing every three or four days, and at the same time to depress the fungosities with small rolls of lint, we generally obtain, by means of this contrivance, a complete cure in the space of fifteen days to a month.

IV. *General Remarks.*

In glancing at the three methods of which I have spoken, and upon the numerous processes which are arranged under them, we are struck with the analogy they present in their point of departure. Directing their remedies against the exuberant flesh, or the edge of the depressed nail, surgeons sometimes endeavored to destroy or repress the fungosities, and sometimes to remove or raise the imbedded portion of the nail. There is a disputed question upon this point, since, according to some, the nail, being more incurvated, narrower, and more projecting upon its sides than usual, in reality penetrates into the tissues, and irritates them; whilst, according to others, it is the tegumentary parts, which, crowding, (*refoulées*,) and coming up from the plantar to the dorsal surface of the foot, drive in the nail, and thus lap over upon it. It would seem, in fact, in adopting the ideas of the first, that all the efforts of art should be directed against the nail, while, to be in accordance with the principles of the other party, we should occupy ourselves with the soft parts. The fact is, that the origin of the disease in this matter, furnishes no means for determining the nature of the treatment to be employed against it.

Whether as cause or as effect, the border of the nail and the fungosities unite together to constitute the disease. In the end the nail becomes the annoyance, (*l'épine;*) this difficulty being removed, the others almost always disappear. If we remove the flesh without touching the nail, the cure is scarcely ever more than palliative;

from whence it finally results, that the imbedded nail should be treated in the following manner. We begin by advising easy shoes. If the disease is slight and recent, we treat it by lint, cotton, or sponge, inserted between the flesh and the edge of the nail. Should there be fungosities, we repress them with alum, nitrate of silver, or even with caustic potash, when they are of considerable size. We should continue in this manner until the nail is effectually raised and the soft parts sufficiently restored. If there are fungosities at the root of the nail, as well as around it, we proceed as in the previous case, except in giving the preference to the nitrate of mercury as a caustic. When the affection is of very long continuance, and that these means have been tried without relief, we have only to choose between the readjustment and the evulsion of the nail. The readjustment by M. Labarraque's process is the most convenient and the most certain of all; it should, therefore, be preferred: but as it exacts delicate and repeated dressings, it is scarcely suitable, except for those who have it in their power to remain at rest, and to nurse themselves for several weeks at home; so much the more prompt would the return of the disease be, if these precautions were not persevered in for at least a month or two beyond the apparent cure of the evil. With laboring people, therefore, and in general with the class of poor, it will often be preferable to proceed at once to the evulsion of the nail, which, moreover, is always left as a last resource, after all other means fail. This operation, which many authors treat of as one that is excessively painful, and which is generally qualified with the epithet of *horrible*, causes in reality much less suffering than that of extracting a tooth. A very considerable proportion of the patients whom I have operated upon by this process, have borne it without uttering the least cry, and have told me that they suffered but in a moderate degree, though many of them were very young subjects, timid women and men of every age.

In using scissors with pointed strong blades, we cut, in fact, in an instant, from the free border of the nail to beyond its root, operating too upon fibrous tissues that have in reality but little sensibility. The evulsion, properly so called, of the two halves of the nail, being also effected with great celerity, only wounds, in fact, as a simple source of irritation, (*élément irritable*,) the cutaneous duplicature which surrounds its sides and root. All this, therefore, can be no more painful than would be the rapid tearing off of a small portion of skin. After the evulsion of the nail and the cauterization of the fungosities, the dressings are unimportant, and the patient may resume his labors at the expiration of some days. It is evident, if the cutaneous groove, or pretended matrix of the nail, should be ulcerated, or in a state of suppuration, or should present fungous excrescences of a bad aspect, it would be necessary to cauterize it deeply with nitrate of mercury, the Vienna paste, or the caustic potash.

The proof, in fact, that the tearing out of the nail is less painful than has been said, is that in cases where the root of this plate only

is separated by disease, as we often see it in the fingers, the surgeon passes a branch of the forceps under it, and with a single stroke from behind forward, detaches it without the patient making any serious complaint.

The wound that results from it, should be treated like every other fungous wound; only that the physical cause which occasioned it having disappeared, it frequently happens that it tends immediately to improve of itself.

[*Imbedded Nail.* In reference to the contrivances of various kinds of metallic or other substances inserted under the imbedded edge of the nail, as those of tin, lead, &c., and to which the author gives the preference over other means that have been suggested to effect a cure without coming to the more serious operation of an evulsion of a part or of the whole nail, it is to be remarked, that the parts, especially in old cases, are often so extremely sensitive that none of these contrivances can be applied. That of M. Labarraque seems the most efficient, but there are few, it would seem, who could long endure so hard and irritating a material as a tin plate in such a position. We have generally found, in ordinary cases, that a long, narrow, doubled compress of linen, inserted in the same manner, and the scraping of the nail down through the entire length of its middle part, to as thin a state as it will bear, and extending this attenuating process as near as possible to the imbedded edge, and preserving the anterior corner of the nail rather long, as an effectual point of resistance or lever upon the pledget, will generally effect a cure, and with the aid of slight cauterizations, soon repress the fungous growths that had covered it. In addition to this, another contrivance of a very ingenious and efficient nature, which may be had recourse to where other means fail, consists in perforating the anterior projecting angle or corner, and also the middle portion of the border of the imbedded edge, but not too near the edge, with one, two, three or more circular openings made in the proper place and at suitable distances; then inserting, successively and cautiously, through each of these apertures, one end of a very narrow, strong, tape-like strip of adhesive plaster, which is to be there fastened by a knot placed outside of, and resting upon the imbedded border. Finally, carrying each strip obliquely, that is, posteriorly and upward, across the body of the nail, previously thinned down through all its middle part, each one is to rest, the same as on a pivot, upon a small, narrow, graduated compress, placed lengthwise on that attenuated part of the nail, and the free extremity of the strip to be then passed to the opposite side of the toe, and between that and the next toe, to the plantar surface of the neighboring metatarso-phalangeal articulations, where it is to be kept firmly and steadily fastened by means of one or two broad strips of adhesive plaster, over the outer surface of the layers of which the narrow strips may be reversed for greater security, while the broad strips are rendered more immoveable by making them pass round and embrace the whole foot. These narrow strips may thus be regulated, and made to act with such

force as we please, and as so many levers or ropes, the resistance to be overcome being the imbedded border of the nail, and the compresses the pulleys. The force of the levers may be increased with their length, and their power acts steadily and effectually till the imbedded nail is ultimately completely raised up into its proper position, when it is to be kept there by a narrow, thick, and suitable compress, until it entirely recovers its natural condition. By this very plain and easy process, there is constant relief being administered to the patient, and without the slightest pain, and we have none of the pressure, hardness, and annoyance of the metallic hinged clasps, &c. Conjointly associated with these narrow strips, and co-operating with them, we may attach the extremities of others, of considerably greater width, to the fungous growth itself, and as near the nail as possible. The other extremities of these strips being then passed on the outside of the toe, supposing it to be the great toe, and the outside of its nail which is affected, and fastened to its plantar surface, or extended also to that of the foot, are fixed the same as, or with the others, and thus present, so far as these last plasters are firmly adherent to the skin of the fungous growth, an antagonist force to that acting upon the nail, but admirably co-operating with it to separate the two diseased portions from each other. In all cases, we must not forget to scrape and thin the middle of the nail, but not its imbedded edge, for the strength and greater thickness of that is an advantage, to prevent the perforations tearing out. Leaving the angle on the anterior edge, it is a still more powerful purchase if much projecting. The graduated compress may be made adherent by diachylon.—*T.*]

§ IV.—*Exostosis, with Sub-Ungual Fungosities of the Toes.*

The last phalanx of the great toe sometimes presents upon its dorsal surface an exostosis, which lifts up the nail and separates it, and which, once established, rarely fails to take on a fungous character, and to give rise to a very abundant suppuration. Though ordinarily situated under the free border of the nail, this exostosis, which Dupuytren (*Leçons Orales*, t. iii., p. 58) was the first to investigate with care, shows itself also, sometimes, towards the middle, or nearer still to the root of the phalanx. But it is not the great toe alone which may be the seat of it; I have met with it also on the neighboring toes, and even on some of the fingers. In its first stage, it is characterized only by dull pains; which are sometimes quite severe if it is placed under the middle part of the nail. At a later period, it is recognised by its fungous, red, and purulent character; it is then that it might be mistaken for the disease known under the name of *onglade*, or the imbedded nail; often, also, it presents itself under the form of a fibrous mass covered with rugosities, and united at its root with the dorsum of the phalanx.

This affection can be cured only by the aid of a surgical operation. Dupuytren was in the habit of proceeding first to the total

evulsion of the nail, and of afterwards excising the fungous exostosis, even down to the body of the phalanx. In a young student of medicine, I was obliged to unite cauterization by the hot iron to those two first stages of the operation. For the large toe, that is the remedy to be preferred. We proceed afterwards as has been said above in treating of onyxis, with this difference, that it is not in this case indispensable to destroy entirely the matrix or root of the nail. The nail being once removed, the surgeon destroys the exostosis with the bistoury, using it as we do a knife in cutting a pen. The actual cautery is immediately applied to the wound in the same manner as for arresting hemorrhage.

If the disease should exist in one of the four last toes, we could proceed in another way; the nail and the last phalanx to these not having any real importance, might be readily sacrificed without any inconvenience. The disease would be radically and promptly cured, by performing amputation of this phalanx at its articulation with the second. Then, four or five days would suffice for a complete cure, while in the simple excision we require near a month. The disarticulation, moreover, is infinitely more simple and less painful than the operation proposed by Dupuytren. I have already performed it several times, and have had every reason to be satisfied with it.

[Dr. Mott has seen the nail of the great toe degenerated to such degree as to increase by morbid growth to the length of an inch, and of proportionate thickness, resembling a horn. It bled when cut, though it was entirely free from pain or inflammation. —*T.*]

SECTION SECOND.

OPERATIONS WHICH MAY BE REQUIRED FOR DEFORMITIES.

The operations which are to be described in the present chapter, naturally divide themselves into several groups, though they all belong to the same class. I shall form them into five families, which will relate: 1. To the deformities from alteration of the skin; 2. To those from alteration of the sub-cutaneous tissue; 3. To those from alterations in the tendons or muscles; 4. To those from alteration of the ligaments; 5. To deformities from alterations in the articulations or the bones.

CHAPTER I.

MORBID CICATRICES, (*CICATRICES VICIEUSES.*)

Cicatrices and tegumentary bridles require the intervention of operative surgery, either from the pain they occasion, or from their interfering with the functions of certain parts. To estimate the inconveniences of certain bridles and morbid cicatrices, we must also, before all other things, consider their mechanism.

Article I.—Anatomy of Cicatrices.

When solutions of continuity close without suppuration, there usually results a pliant cicatrix, which scarcely differs in its physical characters from the rest of the tegumentary tissue. When a wound or ulcer has not been enabled to cicatrize, except by the aid of a new substance, or by second intention, we see formed, on the contrary, instead of natural integument, a dense, elastic, retractile tissue, which constantly tends to approximate the neighboring parts to its centre, and which Delpech long since described in our days under the name of inodular tissue, (*tissu inodulaire.*) But these cicatrices, which are principally remarked as the consequence of burns, sometimes give rise to very considerable deformities. I have seen them turn the toes back upon the dorsum of the metatarsus, or towards the sole of the foot, and even to the outside or inside of this part. On the instep they bring the tarsus upward, fix it on the forepart of the leg, and produce one of the varieties of the pied-bot (*club-foot,*) anterior or talus. When inward or outward towards the malleoli, they cause the deviations of the foot known as *varus*

or *valgus*. I have seen a patient who thus had the foot thrown to the outside, from the effect of a long cicatrix upon the entire outer surface of the leg. In the popliteal space they cause an unavoidable retraction of the calf towards the posterior part of the thigh. I have seen the two thighs glued (*collées*) by this deformity to the walls of the lower belly. A young girl, whom I treated at the hospital of La Charité, had cicatrices of this kind which extended from the lower part of the chest down to the knee, and which forcibly drew the right thigh outwardly towards the hip. In a woman, to whom I was called by M. Morisse, they formed upon the entire hypogastrium, that is, from one spine of the ilium to the other, bridles so solid and so extended that they strangled the womb towards the middle of its length, and became the cause of an unnatural labor. At the anus and vulva, and in the vagina and urethra, the inodular cicatrices form obstacles, of which I shall have occasion to speak in treating of the operations that are performed on these organs.

We see similar bridles on the side, (*au flanc*,) so that the last rib is sometimes brought down upon the crest of the ilium. The thoracic extremity is still more frequently affected by them than the pelvic; nothing is more common, in fact, than to see one or many fingers made to deviate (*déviés*) by this cause, either towards the palmar or dorsal surface of the hand. The entire metacarpus, or the wrist, may also be turned either backward or forwards, inward or outward, by the action of a similar cause. It is very common, also, to see the forearm drawn towards the arm from the flexion caused by the new tissues. The arm, also, is very often glued (*collé*) to the chest by cicatrices upon its inner surface, or by bridles in the hollow of the axilla. In the neck, the cicatrices of which I speak may depress the chin to near the sternum, or incline the head towards one of the shoulders. The lips, eyelids, and ears, also deviate under the influence of inodular tissues into every possible direction. These morbid cicatrices, which are, also, sometimes attended with the inconvenience of gluing together the fingers and the toes, and the upper portions of the thighs, and of narrowing or shutting up most of the natural openings, claim, therefore, every attention from the operative surgeon.

Article II.—Treatment.

Notwithstanding the variety and multiplicity of forms which morbid cicatrices assume, the operations which are performed to remedy them are reduced to a very small number. We confine ourselves, in fact, to the destruction of these inequalities, or the projecting portion of them, to incising them transversely on many points, or to extirpating them in whole or in part.

§ I.—*Excision.*

If the inodular tissue causes no other inconvenience than the inequalities it produces upon the surface of the skin, or the morbid

sensibility and pains which it sometimes occasions, we may confine ourselves to its simple excision, or even to its cauterization. These small operations must not be performed out of mere complaisance, that is, when the cicatrix, causing in reality no inconvenience, presents itself simply under the form of a seam or small eminence on some other part than the face, hands, and feet. We should then, also, forewarn the patient that a remedy of this kind will probably render the surface more regular and uniform, but that it will not remove from the part its unnatural color, nor its appearance of deformity. The cauterization with the nitrate of silver, nitrate of mercury, or nitric acid, will suffice, in fact, to destroy simple cutaneous prominences or seams; but the cutting instrument is evidently preferable. We then shave off with a keen-edged bistoury all the exuberance of the cicatrix; after having dressed the wound for some days with the perforated linen and lint, we proceed, if the diseased part admits of it, to the application of strips of adhesive plaster. Upon the supposition that the adhesive plasters are not applicable, we must take care to repress the vegetations of the wound frequently with nitrate of silver.

If the cicatrix should form a painful nucleus, (*noyau douloureux*,) as often happens when the extremities of some nerves are found confined in it,* the cauterization would not answer. In the place of shaving it down, we should hook an erigne into the central part, and completely excise its whole substance. Violent pains have thus been made to disappear which had endured for many years, and which had all the characters of true neuralgia. It is, however, evident, that this species of operation is not applicable to retractions nor to deviations of the organs, and that it cannot be employed except for the removal of simple and bona fide projections and excrescences of inodular cicatrices.

§ II.—*Incision.*

Up to a late period, we possessed only one kind of operation for restoring to their natural direction parts that were distorted under the influence of morbid cicatrices. This operation consisted in dividing through the cicatrix transversely from space to space, either partially or totally; afterwards we gradually and imperceptibly adjusted the retracted part, either by the aid of bandages or machines. Care was then taken to force the wounds of the operation to cicatrize by the second intention, and to keep their lips wide apart. It was necessary, also, to make every effort, even after the cure, to resist the tendency of the organs to resume their unnatural position, and to cauterize the wounds frequently during the course of the treatment.

If the cicatrix was long and very prominent, some surgeons preferred cutting through its base with a double-edged knife, in order to shave it off from one extremity to the other, and thus cut it out

* [See a case of this kind from bleeding, supra, as noticed by Dr. Mott.—*T.*]

entire. They afterwards incised the borders of the wound as in the preceding case, and proceeded in the same manner for the rest of the treatment. Though of easy and rapid execution, this last process has the inconvenience of sometimes causing very severe pains, from the commencement to the termination of the cure, and of producing, moreover, like the simple incision, scars and nervous symptoms, and sometimes even a deep-seated gangrene; also, of leaving in its train protuberances and inequalities of great deformity, and finally, of not succeeding except in a very small number of cases. It is certain, in fact, that, in spite of the best-adjusted bandages and dressings, the new cicatrices resulting from this mode of proceeding often resist all the efforts of the surgeon, and ultimately bring back the parts to the position which they were in before the operation. It was going too far, however, to say that the transverse incisions of the cicatrices had always failed. Science now possesses a very considerable number of authentic facts which demonstrate its efficacy. I have seen a young man, whose forearm was thus detached from the anterior surface of the arm, have it completely extended out in the space of six weeks. The motions of this limb at the end of two years had lost none of their freedom. Similar observations have been published by M. Hourmann (*Clinique des Hôpitaux*, etc., t. i., No. 16, p. 4) and by M. Bérard, jeune, (*Jour. des Connaiss. Méd. Chir.*, t. ii., p. 202.) The adhesion of the arm to the side of the chest, and the retraction of the fingers, have sometimes yielded completely to the simple incision. In the young girl whom I have spoken of above, and who had such enormous ridges upon her side and upon the external surface of the thigh, the transverse incisions effected a partial restoration of the limb. Besides, when the cicatrices are wide, or numerous, or very irregular, the incision is almost the only remedy we can oppose to them. It is a method, therefore, which should be preserved, and one which some modern surgeons have unjustly proscribed.

§ III.—*Extirpation.*

Having shown, as a principle, that every cicatrix, by the formation of a new substance, destroys the pliancy (*souplesse*) of the tissues, and tends to retract incessantly upon its middle portion, Delpech deduced therefrom this conclusion, that the incision is rather injurious than useful when its object is to remove the inodular bridles. In lieu of the ancient method, therefore, he proposed to substitute the extirpation, in fact, of the whole cicatrix. After having raised the indurated layer by incisions, which were made upon the sound tissues, he carefully approximated the borders of the wound, and directed all his efforts to obtaining immediate union; by this means Delpech obtained a linear, pliant, moveable, distensible cicatrix, similar to natural integuments, and which could in no respect interfere with the movements of the affected region.

There is no doubt that it would be preferable to act in this manner when the cicatrix is narrow, and is situated upon a bulky part

of the body. Upon the dorsum of the foot, and upon the leg, thigh, hand, forearm, and trunk, and even upon some regions of the face, an inodular cicatrix, which should not exceed six to ten lines in breadth, might in this way be extirpated with advantage. Though the wound should have several inches length, and that we should be obliged to detach (*décoller*) each side of it to the extent of some lines, there would still be room to hope for immediate reunion, either by the suture, or by means of uniting bandages or straps of adhesive plaster; but it is evident that, for the fingers and toes, and for the eyelids and nose, as for all cases where the cicatrix is large and very irregular, the method of Delpech would expose to more inconveniences than the old operation, and would offer no better chances of success.

CHAPTER II.

SUB-CUTANEOUS BRIDLES.

I SEPARATE here the abnormal bridles from cicatrices, properly so called, because these latter belong almost exclusively to the cutaneous tissue, while the former are very often situated in the cellular or the fibrous tissue. There are, in fact, four varieties of bridles capable of producing deformities—the *tegumentary*, *sub-cutaneous*, *aponeurotic*, and *ligamentous bridles*. But I shall here speak only of sub-cutaneous bridles, those which belong to the skin, blending themselves with the morbid cicatrices of which we have just spoken; those of the ligaments, aponeuroses, and tendons, belonging to another chapter.

ARTICLE I.—ANATOMY OF SUB-CUTANEOUS BRIDLES.

Sub-cutaneous bridles are a fibrous transformation of the fascia superficialis. An attentive examination of the cellulo-adipose tissue shows, that lamellæ and filaments of considerable density pass in the natural state in a more or less oblique direction from the integuments to the aponeurosis. These lamellæ, which, in fact, are only the origin or termination of certain muscular or aponeurotic fibres, preserve in the normal state a pliancy and distensibility which cause them to be constantly confounded with the cellular tissue, properly so called. Under the influence of certain causes, and by a process which is still but little understood, they become, on the other hand, indurated, hypertrophied, and retracted, so as to constitute inelastic bridles, which forcibly draw together the moveable parts which serve for their insertion. They are a species of tendons or abnormal aponeurotic partitions which are formed under the skin at the expense of the *fascia superficialis*. Though these

indurations and fibrous transformations of the cellular tissue may take place on most of the regions of the body, upon the internal surface of the enveloping aponeuroses, in the centre of the limbs, as well as in the sub-cutaneous tissue, and that they are seen sometimes in the substance of certain organs, as in the mammæ, lungs, and bladder, for example; it is, nevertheless, upon the palmar surface of the hand that we most frequently notice them. These bridles differ from morbid cicatrices in this, that it is not necessary that they should have been preceded by any solution of continuity or wound, and that the skin remains moveable upon their surface, the same as upon the aponeuroses and tendons. Supervening without inflammation, pain, or any previous recognisable pathological phenomena, they disturb only by the deformity which is sometimes occasioned by them.

Article II.—Treatment.

No local application, no general medication, can relieve a patient of sub-cutaneous bridles; we must either do nothing, or have recourse to the bistoury. Bandages, forced extensions, and the most ingenious apparatus, are powerless in such cases. Generally confounded with retraction of the tendons, these bridles had, until later times, been usually ranged by most surgeons among incurable diseases. Since their independence of the tendons has been perfectly established, we have become rid of this doctrine, and new operations have been proposed for their cure.

Two general methods present themselves under this head: the object of the one is to divide the bridle on one or many points, while the other requires its extirpation.

§ I.—*Section of the Abnormal Bridle.*

When the bridles, of which I have just been speaking, show themselves under the skin in the form of the cord of an arc, so as to cause retraction of certain moveable parts, we are, as it were, compelled, in spite of ourselves, to divide them upon their most projecting points. Three different methods have been proposed to fulfil this indication.

A. *Process of Dupuytren.*

Dupuytren, who was one of the first to draw attention (*L. Maudet, Thèse*, No. 141, Paris, 1832) to the nature of sub-cutaneous bridles, maintains, that the best way to relieve the patient of them is to cut through both the skin and the abnormal fibrous cord, sometimes on one point only, and sometimes on many, until the readjustment of the retracted part may be ultimately effected with ease and without pain. This process, which was several times practised at the Hôtel-Dieu, of Paris, appears to have almost constantly succeeded. When we wish to make trial of it, the instrument should divide

with care both the principal bridle and the small accessory bridles which are almost always found in the neighborhood. Dupuytren felt himself sometimes obliged, also, to dissect the lips of the wound a little on either side, and to glide the bistoury underneath to destroy the remaining retracted cords. The process of Dupuytren involves a serious inconvenience. From the necessity of dividing the skin freely, it may happen that the extremities of the incised bridle will become incorporated with the lips of the tegumentary wound, and that the inodular cicatrix, which might result from this, tends almost unavoidably to re-establish the deformity. It is, therefore, quite natural that surgeons have sought another mode of proceeding.

B. *Process of M. Goyrand.*

Wishing to avoid the necessity of suppuration and cicatrization of the external wound by second intention, M. Goyrand (*Mémoires de l'Acad. Royale de Méd.*, Paris, 1834, t. iii., p. 589) proceeded in the following manner: He commences by dividing the integuments in a direction parallel with, and to the extent of the whole length of, the abnormal bridle; in this manner the cord to be divided is laid bare, and shows itself to the eye of the surgeon under the form of a fibrous partition. Then separating the lips of the wound, the operator cuts through the bridle transversely, as Dupuytren did, from space to space, or on a single point, if one incision alone should seem sufficient. Then reuniting the lips of the external division, he obtains a perfect cure by first intention; the skin, preserving its pliancy, in no respect interferes with the movements (*glissements*) of the divided bridle, or the mobility of the part which was previously retracted.

This process has the inconvenience of not permitting as complete a division, as that of Dupuytren, of the lamellæ or fibrous cords which might exist in the neighborhood of the principal bridle. As a general rule, however, it should be preferred to his. I have used both, and can affirm that that of M. Goyrand answers in most cases.

C. *Process of A. Cooper.*

A process more simple still, and which M. A. Cooper (*On Dislocations*, &c., Goyrand; *Gaz. Méd. de Paris*, 1835, p. 485) long since recommended, consists in inserting by puncture on one side of the bridle the point of a straight bistoury. The instrument, held flatwise, is then glided along to the opposite side, grazing by the internal surface of the skin; after having turned its cutting edge downwards, the section of the abnormal cord is made transversely and from the skin towards the aponeuroses. The operation, thus reduced to a simple puncture of the integuments, produces no pain, and is followed by no flow of blood. Were it not that the process of puncture is sometimes rendered impracticable by the adhesions or want of mobility in the parts, it certainly would be preferred in all

cases. It would not answer to practise in this manner several punctures and several sections in place of one, except where the bridle was of a certain length.

In conclusion, the three processes which I have described should be retained in practice. The section by simple puncture of the skin will have the preference, as often as the pliability and mobility of the tissues will allow of its being performed. If the insertion of the instrument between the bridle and the integuments should appear to be attended with too much difficulty, the process of M. Goyrand ought to be substituted for that of M. Cooper. In fine, we should return to the process of Dupuytren in cases where the bridle is irregular, and of great width, and has intimate adhesions with the tegumentary tissue.

§ II.—*Extirpation of the Bridle.*

Setting out from the doctrine established by Delpech, and afterwards by M. Earle, (*Abernethey, Leçons*, &c., p. 97,) in regard to the properties of the inodular tissue, I had thought it would be better to slit the skin longitudinally, and then extirpate the bridle, rather than to make a simple section of it in the manner of Dupuytren. I performed an operation of this kind at the hospital of La Pitié, in the beginning of the year 1833. I hoped, by acting thus, to be enabled to close the wound immediately, and instantly to restore to the retracted parts their natural mobility ; but although this operation was followed by success, and that it included the first steps in the process of M. Goyrand, I have since perceived that the extirpation had not in reality any advantages over the simple section, and that it constituted, in truth, a longer, more painful, and more complicated operation. I do not think, therefore, that there is any use in retaining it, except where the bridle should have undergone an actual degeneration, (*véritable dégénérescence.*)

It is useless to add, that after these operations, and whatever may be the process which has been adopted, the cure would not be obtained, if bandages, apparatus, and suitable dressings, did not come to its aid. It is necessary, in fact, to do all in our power to effect the union of the wound of the integuments without suppuration, and that the retracted part may resume its natural direction and be maintained in it, without effort, violence, or fatigue to the organs, until the cicatrization is complete. The suture, adhesive straps of diachylon, and uniting bandages, to which are joined the perforated linen and lint, refrigerants, emollients, or antiphlogistics, for the period of four or five days, and according to the nature of the case, are therefore indicated. We make use, at the same time, of such dressings as will maintain the part, whose adhesions and retraction we have destroyed, in that state of elongation which we wish it ultimately to have.

ARTICLE III.—OPERATIONS ACCORDING TO THE REGION IN WHICH THE BRIDLE IS SITUATED.

§ I.—*The Hand.*

The fingers and toes are subject to three kinds of deformities from bridles, or abnormal cicatrices. They are sometimes completely or but partially united at their sides, at other times simply retracted into a flexed position, like segments of a circle, or drawn backward, or forward, or sidewise. Though the toes are not strangers to these three varieties of deformity, the fingers, nevertheless, are their favorite locality.

A. *Adhesions of the Fingers at their sides.*

When the fingers are completely blended together at their two sides, and that the bones which compose this part of the skeleton seem, so to speak, to touch each other, there is but little prospect of our succeeding in our attempt to separate them. It is not that we find any difficulty in making the bistoury pass between them from before backward, or from behind forward, or to separate them from each other, but the little strip of skin which in these cases is left upon the palmar and dorsal surfaces, not being in all instances sufficient to keep up the circulation, almost always has a tendency to become gangrenous. The wound on the side of each finger vegetates, assumes a fungous aspect, and, moreover, does not cicatrize but with extreme difficulty, in addition to which, a new agglutination of the parts rarely fails to take place.

A young girl of fifteen years of age, whom I had thus operated upon for an adhesion of the three last fingers of the right hand, was seized with a gangrene which included the whole of the last phalanx and the anterior half of the middle phalanx of the ring finger. Some portions also of the skin mortified upon the two other fingers, and the cure, which was protracted to a long time, left the patient with as great a deformity at least, though of another nature, as the one which I had wished to remove. It is true that a roller bandage, with strips of adhesive plaster of diachylon, and a dressing wet with cold water, which I had applied to prevent all excess of inflammation, concurred, perhaps, in bringing about this unfortunate result. I should not, therefore, venture to recommend but with caution the destruction of morbid adhesions when found so extensive and complete. The want of integuments on the entire side of the fingers is in these cases a cause of failure, which no means that I am acquainted with has the power to remedy. We are not, however, to believe that the complete union of these appendages is absolutely and always irremediable. An observation of Dessaix (*Gazette Salutaire*, année 1761, No. 22) proves the contrary. A newly-born child had the hands transformed into two fleshy masses, the entire extremity of which was covered trans-

versely by one single nail. Without paying any particular attention to the number of the bones, Dessaix divided each of these masses into four parts instead of five, and thus made as many fingers of each of them. The child succeeded in being enabled to write and to work, though the metacarpo-phalangeal articulation was the only one which existed, and that the bones of the metacarpus did not appear to have any particular continuity of connection with the fingers. The author adds, that the operation was of short duration, caused no reaction, and required a month to heal up all the wounds.

This fact, at most only probable, is as we see very extraordinary; but Dessaix relates it with details so circumstantial, that it is difficult to call it in question.

On the contrary, should the adherent fingers retain their mobility, and appear to have a tegumentary membrane between them, recalling to mind, in fact, the idea of web-footed (*palmipèdes*) animals, there is room to hope for their relief. Under such circumstances, however, we should deceive ourselves strangely, if we believed the thing easy. The destruction of the bridle in these cases is the least difficult part of the operation. After having perforated this bridle by a puncture near its root, we divide it from behind forward, or from before backward, holding the bistoury perpendicularly, while an assistant stretches apart the fingers that are to be separated. We might equally well make use of a scissors, if the partition should have only a slight degree of thickness. This section performed, we should, if no obstacle were interposed, perceive the two sides of the wound reunite again imperceptibly, from the root to the pulp of the fingers. Even it is found that pledgets of lint, plates of lead, strips of plaster, and bandages of every sort, placed as foreign bodies between the two separated fingers, often contend in vain against the tendency to a new agglutination.

Surgeons are so well convinced of this difficulty, that many of them have come to the conclusion to proscribe the operation itself, and others have advised to associate with it a certain process of anaplasty. M. Krimer, (*Journal de Graefe et Walther*, t. xiii., p. 602,) among others, has proposed to bring forward, between the roots of the two fingers, a flap of tegument detached from the back of the hand, in order to unite it to the palmar teguments, and to construct, out of all of these, a perfect commissure. This process, which is attributed to Zeller by M. Chelius, (*Trad de Pigné*, t. ii., p. 13,) and which would, moreover, considerably increase the danger and pain of the operation, is not in my opinion necessary. I should prefer to proceed as follows: I commence by introducing three preparatory ligatures (*ligatures d'attente*) in the part the most remote (*la plus reculée*) from the intra-digital partition, one at the middle, and one on each side. Having divided, and either by puncture from behind forward, or from before backward, the abnormal partition, to within two or three lines of the points traversed by the ligatures, I seize hold of each of these successively, in order to make of them a simple suture of three stitches. I obtain by this an almost imme-

diate coaptation of the lips of the wound throughout the whole extent of the commissure. The reunion on this point being effected, makes the separate cicatrization afterwards of each of the fingers a very easy matter. I would also recommend to avoid carefully all compression and application of refrigerants upon the wounds which result from this operation, at least during the first week. Moreover, it should not be performed if the articulations of the fingers should appear to be anchylosed and incapable of recovering their natural mobility. I may add, that during the whole course of the treatment, from beginning to end, the fingers newly separated should be frequently flexed or extended, so as to render them limber (*à les assouplir*) by degrees.

B. *Retraction* (*renversement*) *of the Fingers by a Morbid Cicatrix.*

I have often seen all the four fingers, entire, retracted by cicatrices from ancient burns, or from lesions which had taken place during the period of intra-uterine life; I have more frequently from such causes seen the retraction of only one or of some of the fingers, either backward, towards the sides, or forward.

When the infirmity is of very old date, or when it is complicated with a profound alteration of the articulations; when, in a word, it is evident that, though the bridles of the cicatrix were destroyed, the finger would not recover its former mobility, the disease can only disappear with the amputation of the finger itself. It is, therefore, only in cases where the articulations appear to have preserved both their form and a part of their natural mobility, or where both the extensor and flexor tendons appear to have been only slightly (*médiocrement*) altered, that it is allowable to undertake one of the operations which I have spoken of above. In that case, we may also take into consideration the section from space to space of the bridle which keeps the finger in a faulty direction. A number of incisions, and going to but little depth, ought to be preferred in such cases to a single one penetrating to a considerable depth below the thickness of the skin. The extirpation of the cicatrix by the method of Delpech, would answer only for very narrow bridles, and is in reality but rarely applicable to deformities of the fingers.

If the retraction should be backwards, the fingers should, in such cases, be afterwards held in a state of sufficiently strong flexion, and should not be allowed to deviate from this direction, except at intervals, until the cicatrization is completed. The cicatrices on their palmar surface, on the contrary, would require that they should be kept properly extended by fixing them to a palette of wood or of pasteboard placed on their dorsal surface. It is easy, however, to understand the variety of palettes, plates, and splints, which we may have occasion for in such cases.

C. *Deviation of the Fingers by Sub-Cutaneous Bridles.*

An unnatural flexion of the fingers may arise from a solution of continuity, a paralysis of their extensor tendons or muscles,

an anchylosis, a deviation, certain tumors on their articulations or phalanges, the retraction, shortening, or some alteration of their flexor tendons, or actual diseases either of their nerves or vessels, or of the teguments of their palmar region; but I design only to speak in this article of the flexion which depends upon sub-cutaneous bridles, intending farther on to examine other kinds of deviation to which they are liable.

Previous to the observations published in the name of Dupuytren in 1831 by M. Paillard, (*Jour. Univers. et Hebd.*, t. v., p. 349, et t. vi., pp. 67, 364,) in 1832 by M. Lemoine Maudet, (*Thèse*, No. 141, Paris, 1832,) by MM. Buet and Brière, (*Leçons Oral. de Dupuytren*, t. i., p. 1—25 et 516—531,) by M. Vidal de Cassis, (*Gaz. Méd. de Paris*, 1832, t. i., p. 53, in 8°,) and M. Avignon, (*Thèse*, No. 16, Paris, 1832,) and which have been resumed by M. Goyrand, (*Mém. de l'Acad. Royale de Méd.*, t. iii., p. 549, et *Gaz. Méd. de Paris*, 1835, p. 481,) the cause which I have here adverted to had scarcely been thought of. All authors confounded it with the contraction (*crispature*) of the tendons, and regarded it, moreover, as an incurable disease. The observations of Dupuytren have incontestably demonstrated that the tendons are generally unconnected with this retraction; but they have not so clearly proved, as this surgeon believes, that the retraction of the fingers depends upon an induration or a shortening of some of the bundles of the palmar aponeurosis. These bridles, which present themselves under the form of projecting cords under the skin, extend almost always over a great portion of the length of the finger; they occupy especially its median line, and prolong themselves at least upon the palmar surface of the first phalanx, very often, also, upon the second, and sometimes even upon the third. But anatomy teaches that the palmar aponeurosis, properly so called, terminates at and fixes itself to the root and sides of each finger, becoming blended either with the sheath of the flexor tendons, or with the ligaments of the articulation. Again, the aponeurosis of the hand does not extend itself either to the thenar eminence, or to the root of the thumb. An observation, noted in the practice of Dupuytren himself, (*Gaz. Méd. de Paris*, 1833, p. 112,) makes mention of an individual who had all the fingers contracted, (*crispés*,) and the palmar surface of whose thumb presented one of these bridles in the fullest state of development. Having myself proved by dissection, and upon a living person, that the palmar aponeurosis sometimes remained untouched after the incision or extirpation of these bridles, I announced, in the beginning of the year 1833, (*Anat. Chir.* t. ii., p. 75, 2e éd., 1833,) that the abnormal bridle, of which Dupuytren had spoken, was not always formed by the aponeurosis; that in one patient it appeared to me to be nothing more than the fibrous transformation of the sub-cutaneous tissue; and that I should not have been surprised to find that it was often so. The researches of M. Goyrand have fully justified this prediction. I will add, as I have elsewhere done, (*Gaz. Méd.*, 1835, p. 511, et *Anat. Chir.*, 3e édit., 1837, t. ii., p. 487,) that the opinions of Dupuytren, of M. Goyrand, and of M. Sanson, (*Mém. de l'Acad.*

Royale de Méd., t. iii., p. 592,) would, like mine, be inexact, if we were to adopt one of them, and, after the manner of the ancients, substitute it absolutely to the exclusion of the others. If it is false to believe, as M. Mellet still asserts, (*Man. Prat. d'Orthop.*, 1835, p. 246,) that the retraction of the fingers more frequently arises from a contraction of the flexor tendons, it would be also so to maintain that this cause never exists; in the same way as in rejecting the doctrine of Dupuytren as too exclusive, we should be wrong not to admit it for some cases.

In fine, the retraction of the fingers arises most frequently from the fibrous transformation of one or more of the lamellæ of the sub-cutaneous or superficial fascia. In reality caused, in certain cases, by a contraction (*crispation*) of the palmar aponeurosis, it also sometimes depends upon a degeneration of the skin itself, or upon some cicatrix of this tissue, (*membrane.*) It is well, also, to add, that the fibrous sub-cutaneous degeneration, which causes the retraction of the fingers, does not always assume the appearance of a cord, or simple bridle. In one of the patients of Dupuytren, it was perceived that there were transverse fibrous radiations, at the same time that others ran obliquely and some with the axis of the hand. I have myself seen a man of fifty-seven years of age, and otherwise enjoying the most perfect health, in whom the retraction of the fingers was kept up by unequal bridles, whose roots were evidently lost in a hard, insensible layer, (*plaque,*) covered with lumps of the size of a small nut, and which occupied almost the entire palm of the hand.

However this may be, experience has now proved that this species of retraction, which, as M. Vidal says, principally attacks the ring and little fingers, and which in certain rare cases only invades the thumb and other fingers, and which is scarcely ever met with, except in persons whose occupation demands a certain pressure or frequent and continued extension of the palmar surface of the fingers, or of the hand, upon certain hard bodies, is not incurable. It was for this, especially, that the different kinds of operations which I have described above were proposed.

If we are disposed to follow the method of Dupuytren, we may spread out the hand of the patient upon its dorsal surface. While an assistant holds it fixed in this manner, and endeavors to straighten the fingers as much as possible, the surgeon, directing a straight or curved bistoury upon the most tense part of the bridle, makes a transverse incision there, which should include both the skin and the sub-cutaneous fibrous tissue. On the supposition that this first incision suffices for the complete extension of the finger, it is not repeated; on the contrary, should there still remain any of the cord or stiffness beyond the first section, we perform a second one, and even a third. Acting upon these principles, M. Gensoul (*Journal Clin. des Hôpitaux de Lyon*, t. i., p. 496) has shown that the incision of the bridles was sufficient for removing the retraction of the fingers and of the hand. The hand is afterwards fixed by its dorsum upon a palette properly padded. A few turns of a narrow bandage,

or strips of adhesive plaster of diachylon, passed between or anterior to the incisions, take a point d'appui upon the palette to maintain the finger in the necessary degree of extension. The wounds are, in other respects, dressed by the ordinary applications.

According to M. Goyrand, (*Gazette Médicale de Paris*, 1835, p. 485,) the hand being fixed as above, the surgeon, armed with a straight bistoury, held like a writing-pen, ought to incise the skin in the direction of the bridle itself, and to the extent of one or two inches. This being done, he cuts the fibrous cord from space to space upon all the points which appear tense, and even excises some portions of them, if they should seem to be too moveable, or floating, as it were, at the bottom of the wound. He then unites by the first intention, retaining the fingers in a state of complete extension.

On the supposition that it might be possible to insert a narrow instrument between the skin and the abnormal cord, we should make the puncture of the integuments on one of the sides of the bridle, which latter must be previously stretched tight. In order to relax it a little, and to introduce the bistoury more easily under the skin, it would be proper to increase the flexion of the fingers a little, until the instrument should have reached to the other side of the transformed tissue. Then, having turned the back of the instrument forward, we should again extend the fingers, in order that the bridle might, in some degree, be enabled to divide itself from behind forwards. After having repeated this kind of section by a sufficient number of punctures, and from space to space, it would become necessary here, also, to maintain the fingers in a state of extension. Only in place of agglutinative bandages, and of the ordinary dressing, it would be proper to apply some resolvent compresses, and to establish a moderate degree of pressure upon the small punctures.

As to extirpation, I have already said, that, in performing it for the first time in the beginning of the year 1833, I proceeded in the same way that M. Goyrand did a short time after, and that, not being able to produce results more advantageous than by the simple section, it did not appear to me deserving of general adoption. I would, therefore, recommend not to have recourse to it but where tumors or certain kinds of nodosities should be found to exist under the skin with the bridle.

The operation being performed, and the wounds cicatrized, we should still deceive ourselves, whatever may have been the process used, if we should look upon the patient as safe against any return, and did not recommend to him to adopt some precaution. Complete extensions, often repeated, and suspension of the occupations which had brought on the induration, the massage of the parts,* oleaginous ointments, and mucilaginous baths, are still necessary, if we wish the cure to be radical, as they might also have sufficed

* [*Le massage* (see supra) means, pinching, twisting, shampooing, and otherwise exciting the parts.—*T.*]

in the first months of the disease, if the patient had been disposed to make trial of them.

§ II.—*The Forearm.*

When the forearm is found adherent (*collé*) to the front part of the arm, in consequence of morbid cicatrices, we remedy the deformity by means of incision or excision of the new tissues. This operation, however, should not be undertaken, unless the disease has supervened since the period of infancy, or that we have it in our power to assure ourselves that the articulation at the elbow preserves, or is capable of re-acquiring, a great portion of its mobility. Otherwise, to destroy the cutaneous adhesions could, in fact, have no object.

When the adhesions have been formed in early life, the articular surfaces are so modified that they no longer permit in adult age the forearm to be extended or flexed, except by a kind of sliding movement, (*glissement.*) If the patient, however, is found in favorable conditions, the operation must be undertaken as soon as possible.

Here the method of Delpech, that is, the excision of the inodular tissue, and the immediate reunion of the wound, will rarely answer. We should not have recourse to it, except after the practice of Benedetti, when there are only simple narrow bridles. In this case, also, we should guard against extirpating the cutaneous fold in its whole width; for by the extension of the limb, there might thereby be produced an enormous wound. We should therefore incise the integuments along the borders of the bridle, from one of its extremities to the other, in place of following the angle of flexion at the bend of the arm. The excision would be thus limited to the cord which forms the free border of the morbid cicatrix or abnormal bridle. In these cases, where this first kind of operation seems insufficient, it is preferable to destroy the adhesions by numerous transverse sections, or by an exact dissection of the agglutinated (*conglutinées*) surfaces. Malvani (*Journ. Gén. de Méd.*, t. cviii., p. 40) speaks of a patient who had the forearm thus flexed in consequence of an ulcer at the bend of the elbow joint. He treated it by incisions. After the extension the wound attained the width of the palm of the hand, but nevertheless resulted in a perfect cure. Demarque (*Œuvres de Jacques Demarque*, 1662, p. 467) had already been tempted to perform the same operation on an individual whose forearm, in consequence of a burn, was adherent to the arm, up to the apex of the shoulder; but the patient, who gained his living by this deformity, would not listen to any treatment. I have said above that such an operation had been performed in 1825, at the hospital of Perfectionnement, on an adult man, with entire success, by M. Bougon. In the two cases of the same kind published by M. Hourmann, and M. Bérard, jeune, the success was not less complete, though the deformity existed in the very highest degree. The possibility, therefore, of curing patients

laboring under this kind of disease, by simple incisions, may now be deemed an established truth.

The patient being seated, or lying down, and having the elbow supported upon a cushioned table, or on the bed, is seized by the shoulder and hand by an assistant, who endeavors gently to extend them apart. The surgeon then proceeds to the section of the bridles, taking care to guard not so much against the number as the depth of his incisions. If in the place of bridles there should be a homogeneous agglutination of the skin, it would be necessary to guide the bistoury in such manner, sometimes in the direction of the arm, sometimes in that of the forearm, that the two surfaces might be rather unglued than really cut. It would be much better, therefore, to make the dissection by proceeding from the external and internal grooves towards the median line, than to proceed at the very first from above downward.

We may conceive that the success of an operation like this depends as much upon the after-treatment as upon the action of the bistoury itself. It is important, therefore, if the arm can be immediately straightened, to extend it upon a well-padded trough, (*gouttière.*) which might reach from the neighborhood of the shoulder to the root of the fingers, and to fix it in this trough by means of turns of bandage properly arranged. By the aid of some compresses, a long splint of pasteboard, and a bandage saturated with dextrine, we could construct upon the spot a perfect apparatus, if the operation should not have produced too long a wound in the bend of the arm. It would suffice, in fact, to pass some turns of bandages crosswise (*en sautoir*) upon the elbow, in order to have a roller bandage on the parts towards the hand and the axilla, which should leave the wound in the bend of the arm uncovered. This wound, which it is well to dress with the perforated linen and lint, and whose vegetations must be often repressed with nitrate of silver, should not be abandoned to the retractile power of the inodular tissue, until a long time after the cure. It is useful, however, in order to give suppleness to the articulation by degrees, to exercise some movements of flexion upon the forearm, towards the end of the treatment, at least once a week.

§ III.—*The Arm.*

Demarque (*Œuvres, &c.*, p. 467) relates that a pauper had the arm completely glued to the ribs, and that in this man the connecting parts were so loose that they followed all the movements of the limb. If such an adhesion should be met with, it would be necessary to proceed as at the fold of the arm, provided the scapulo-humeral articulation had not lost the power of resuming its motions. If it was a simple bridle, we ought to divide it either from above downward, or from below upward, while an assistant should hold it as tightly stretched as possible, by drawing the elbow from the trunk.

In a patient who had the arm and forearm thus glued to the

chest, in consequence of a burn, M. Aertz (*Encyclograph. Bullet. Méd. Belge*, 1836, p. 154,) succeeded in excising the bridles, and afterwards in keeping the limb extended upon a splint.

The precautions to be taken would then be the same as in the division of the intra-digital partitions of which we have spoken above. We should, moreover, take care to approximate the edges of the wound on the thorax as much as possible, by means of adhesive straps, or even by the suture, if it should be found to be possible to place them in immediate contact. If the wound of the arm should have more than an inch in width, I am of opinion that we should run the risk of gangrene of its edges in endeavoring to narrow it by force, (*mécaniquement*,) and that it would be better to treat it by simple dressing, and to favor the cure by second intention. In other respects, if the bridle was rather wide, there would be an opportunity, perhaps, to proceed in a different manner. For example, I should pass, at distances of six lines from each other, a sufficient number of threads near its attachment to the arm; then I would introduce, near the axilla, the point of a straight bistoury, which might shave off this bridle from above downward, keeping at the distance of three lines to the outside of the threads, which latter we should then only have to tie into knots, to have, formed to our hand, that number of stitches of suture, capable of uniting immediately all this portion of the solution of continuity.

The wound being cured on the side of the arm, would no longer be exposed to a return of the adhesions, though that on the chest might continue for a long time. It is evident, also, if the thing should appear more easy, that we ought to practise the suture upon the thoracic wound in preference to the other, the object in such cases being to close one of the wounds immediately, in order to prevent the surfaces from having it in their power to become re-attached.

In case we could not immediately close either of the two wounds, it would be necessary to dress the arm in such manner that it could be kept constantly separate from the chest, and in a position varying but little from that of a right-angle; for at the axilla, as at the fold of the arm, the cicatrices have an extreme tendency to re-establish themselves, and to reunite the parts whose separation has occasioned so much pain.

§ IV.—*The Toes.*

Sub-cutaneous bridles are seen in the toes, the same as in the hand, but they are infinitely more rare. They depend almost always upon a disease of the musculo-tendinous system. I have not, therefore, to speak of them in this place, as they will be treated of in the chapter on *tenotomy*. I have many times met with retraction of the toes from morbid cicatrices on the dorsum of the foot. A young girl of twenty-seven years of age, whom I operated upon in 1832, in the hospital of La Pitié, by numerous incisions, was perfectly cured of them. I have attempted nothing in other cases.

§ V.—*The Legs.*

Morbid cicatrices may glue the leg to the posterior surface of the thigh, in the same way as the forearm to the anterior surface of the arm. A woman had her two legs thus glued together at the age of ten years, in consequence of a chronic Pemphigus. Having died without being operated upon, the case of this woman induced M. Champion (*Correspondence Privée*, 1838) to study the cause of such retraction. While the dead body was yet warm, this surgeon in vain endeavored to extend the two legs. Having adopted the suggestion of incising the aponeurosis which separates the adductors near the tibia, he immediately found that the two legs could be extended with great facility.

This unnatural flexion of the leg may arise from a great variety of causes, such as pure and simple cohesion, the inodular tissue, sub-cutaneous bridles, and also from the more deep retractions, which I shall have occasion to speak of hereafter.

Here, as at the forearm, the deformity may present two distinct modifications—1. Where the adhesions have their centre in the hollow of the ham, and are extended from thence to a greater or less distance upon the leg or the thigh, as in the case of M. Champion; 2. Or, as was remarked in a new-born infant, spoken of by Demarque, (*Opera Citata*, etc., p. 468,) where the calf had contracted adhesions with the posterior part of the thigh, leaving the popliteal space free. Here the operation would offer every possible prospect of success. It would even be unnecessary, after the separation of the parts, to hold the leg forcibly extended by means of apparatus. In the first case, on the contrary, besides that the dissection would be very delicate, in consequence of the tendons of the biceps, semi-tendinosus, semi-membranosus, sartorius, and gracilis, which it would be important to avoid, we should have, moreover, to contend against the tendency of the cicatrix to re-establish the abnormal adhesions during the cure of the wound. It would also be necessary to maintain the leg in a state of complete extension, by means of a suitable apparatus, until the wound was perfectly cicatrized, and to proceed, in other respects, in every precaution to be taken, in the same manner that we have described for cases of retraction of the forearm. By means of the simple section of the bridle, M. Moulinié (*Bulletin Méd. de Bordeaux*, 1836—*Arch. Gén. de Méd.*, 3^{e} sér., t. i., p. 113) has thus succeeded in curing a remarkable retraction of the ham. It is evident, in conclusion, that, during the operation, the patient should lie upon his belly, in order that an assistant may hold the upper part of the thigh, and another moderately stretch apart the leg from it, while the surgeon divides the unnatural bands and bridles.

§ VI.—*The Thighs.*

Many facts prove that the thighs may be glued together upon their inner surface to a variable extent, and particularly towards

their upper part. The child of which M. Demarque speaks, (*Œuvres*, etc., p. 468,) and which had the right calf glued against the corresponding thigh, presented, moreover, an adhesion of the two thighs at their upper part, and to the extent of three inches. Though difficult to cure radically, this deformity, nevertheless, should it occasion inconvenience or pain, should be subjected to an operation. We find in the thesis of M. Lelong (No. 179, Paris, 1819) an instance of the union of the thighs at their upper part, which existed from the age of eighteen months, had been occasioned by a burn, and was operated upon successfully at the age of twenty-three years by Quesnault. It would be necessary, in such cases, to place the patient upon his side, and to see that we raise up one of his knees, while the other should be held against the bed. The disunion having been effected from below upwards, as far up as to the neighborhood of the perinæum, should be kept open by the means and precautions I have pointed out in speaking of the liberation (*décollement*) of the arm; if the state of the parts permitted, we should attempt immediate union of the wound, at least upon one of the thighs; otherwise, we should, in order to prevent a new agglutination of the parts, permanently retain in the upper angle of the division some compresses, or adhesive straps—in fact, some foreign body, until the end of the treatment. This would be a case, also, for borrowing flaps of skin, by dissecting them off in front and behind in the neighborhood of the anus and scrotum, and uniting them in the form of a commissure between the two thighs, as I have recommended for the fingers.

§ VII.—*Abdomen and Genital Organs.*

In the patient mentioned by M. Lelong, and which was one of Quesnault's, there was, also, adhesion of the scrotum to the penis, and of the thighs to the scrotum. A careful dissection of the parts, and the delicate dressings, which the results of such operations require, did not, however, effect a complete cure.

M. Champion has communicated to me the case of a child of twelve years of age, in whom the upper half of the left thigh was closely glued to the walls of the abdomen from the age of four years, and in consequence of a burn. After having separated the thigh by dissection, this surgeon united the wound by first intention in its three lower fourths, by borrowing teguments dissected off in the neighborhood, and by making use of adhesive plasters, together with several stitches of sutures. The inodular cicatrix of the remainder of the wound partially re-established the flexion of the thigh upon the belly, but did not occasion a sufficient degree of retraction to prevent the patient from walking almost erect. Having practised the section of bridles in the groin, M. Nichet, (*Arch. Gén. de Méd.*, 3e sér., t. i., p. 114,) in a case of this kind, immediately covered (*combla*) the wound by a flap borrowed from the neighborhood, by the French method, and cured his patient.

It is well to remark, nevertheless, that, in trying to separate the

penis from the scrotum, it would be important to avoid the urethra and the corpora cavernosa on the one hand, and the dartos and other envelopes of the testicle on the other. If we had to isolate the scrotum only, there would be less danger in inclining the bistoury towards the side of the thigh than in the other direction. To obtain a complete separation of the thigh itself, when it adheres to the walls of the abdomen, we should never lose sight of the fact, that we are in the neighborhood of the femoral artery, its corresponding vein, and the saphena interna. The intimate cohesion (*fusion*) of the parts in this neighborhood could not, consequently, be destroyed, but by operations of a delicate and sometimes even very dangerous nature.

The most suitable dressing, to prevent a new agglutination during the cicatrization of the wounds, would consist of a long piece of pasteboard, extending from the lumbar region to near the ham, and fastened by a body bandage above the hips, and by a circular bandage above the knee; in such manner, that this latter bandage, previously saturated with dextrine, should make some turns on the trunk, to redescend by one or more crosses upon the outer surface of the breech and thigh to above the knee. If we were treating the penis, we should take care to keep it raised up by means of adhesive plasters upon the forepart of the abdomen. If it was the scrotum that we had detached, (*décollé*,) adhesive straps, passed crosswise very near the upper part of the thighs, would suffice to support and hold it up.

As respects the bending back (*renversement*) of the legs upon the thighs, of the thigh upon the abdomen, and of the whole lower extremity, back, forward, or to the outside, as I have seen in many new-born infants, it is almost always the effect of another order of lesions: it is to diseases of the articulations or tendons that these deformities must generally be attributed.

§ VIII.—*The Trunk.*

In no place do cicatrices and abnormal bridles so often produce deformities as in the head. It is to these that we must refer almost all the varieties of ectropion, the greater part of deviations and coarctations, whether of the nose, lips, or ears; but, as it will be necessary to return to this, in treating of anaplasty and other operations that are performed upon these different parts, I will say nothing of them at present.

A. *Bridles of the Neck.*

Burns of the neck sometimes cause a depression of the lower jaw towards the sternum, as in the patient of whom Rideau speaks, (*Leçons, Thèse*, No. 179, Paris, 1819, p. 26,) and sometimes an inclination of the head sidewise towards one or the other shoulder. These deviations, which exist to a great extent, and of which frequent examples are met with in practice, are generally of very difficult cure. A patient, mentioned by M. Lelong, (*Ibid.*, p. 27,) was thus

bridled from the temporal extremity of the eyelids down to the fingers of the left hand. Some journals of medicine (*L'Abeille Médicale*, t. iii., p. 454) described, about ten years since, a case as having had a successful issue after operations performed for this species of deformity; but the patient, who was then a child, and whom a great many persons, as well as myself, saw at the hospital of La Pitié, was never cured. It would, in such cases, be necessary to divide transversely, by numerous incisions, all the cutaneous or sub-cutaneous bridles. Then, to prevent all new retraction, to have the chin held up by a species of leather strap, (*courroie*,) or cord, (*lac*,) fastened firmly to a leather bonnet, which should also be attached above and behind to an inflexible upright, (*tige*,) which should be fastened to the lumbar region by means of a cincture, (*Mellet, Manuel Pratique d'Orthop.*, p. 98.) The upright having a hinge and a spring at its upper part, would also permit of the head being moved and held, either backward, or to the right or the left, a little deviated from its natural direction, until the cicatrization of the wounds of the operation should have acquired all its required solidity and consistence. The difficulty in these cases arises from the necessity in which the patients are placed of frequently lowering the jaw, the feebleness of the forces provided to raise up this bone by its middle part and the weight which naturally draws the head forwards. If, therefore, it should not be found possible to save the skin of the chin, we should have little chance of success, unless by covering immediately, by means of anaplasty, all the wounds with flaps of skin borrowed from the neighboring regions.

The bridles and adhesions upon the side of the neck are infinitely less unyielding to surgery than those which we have just spoken of. After having divided them on many points, and to sufficient depth, all that is necessary to prevent their reproduction, is, in fact, to keep the head held up, and then inclined in an opposite direction, by means of a dividing bandage for the neck. This bandage, which could be rendered immoveable and very solid by connecting it with pasteboard, and then saturating it with dextrine, would have the advantage of producing infinitely less fatigue to the patient than the machine of M. Mellet.

B. *Cohesion of Parts*, (*Fusion des Parties.*)

Under this title, I cannot record any fact or operation in relation to cicatrices and abnormal bridles, which has been the object of the slightest attempt at surgical relief. Nevertheless, there exists a species of deformity which is worthy of occupying our attention a moment upon this occasion; I mean *diplogenèses*. These monstrous associations, which are all congenital, and which in my opinion are almost always produced by the abnormal and prolonged contact of two fœtuses during the period of intra-uterine life, should be ranged in two great classes, in their relations to operative surgery. If there is a close cohesion of the two beings by

some important organ, it would be dangerous, and in some cases criminal, to attempt to destroy it. When there exist, for example, two heads for one trunk, two arms or a single one for each head, and when the two beings possess also a distinct chest, or that they have only one for both, as was seen in Ritta-Christina, the surgeon who should wish to meddle with them would be culpable. In animals the head is the individual; and in man it would be as cruel to remove one of the heads of a bicephalous monster, in the view of preserving the other, as it would be to assassinate a new-born infant.

If, on the contrary, there existed four lower limbs, or some cohesion of the lower half of the body, with a single chest and a single head, moral obligations would not be violated in attempting to destroy the supernumerary parts; but then the operation in itself would be too dangerous for us to venture upon.

In fine, as often as the two bodies should be united in such manner that the cohesion involved the skeleton, whether on the dorsal or sternal regions, or on the sides and pelvis, we should have nothing to do with it. In all other cases, we may discuss the question, whether it is prudent to separate the individuals from one another; we may here suppose a number of cases:

1. Where the fœtuses are born united by the cranium, either vertex with vertex, or by the forehead, or occiput, or on the sides; then we should proscribe all manner of division if the cohesion is large and extends to the bones. If its extent was small, or involved only the integuments, we should not hesitate, I think, to destroy it by the cutting instrument. If it should be left undisturbed, the two beings would almost inevitably perish, without taking into the account that if they live, their existence must be a charge upon society, and a misfortune for themselves. By the operation, on the contrary, we have many chances of restoring them to liberty.

2. When the fœtuses are united by the anterior surface or their posterior surface. The dorsal and the sternal union should not be declared incurable, unless it should extend deeper than the thickness of the integuments, and comprise a great extent of surface. At the abdomen, also, we should shrink from an operation, if there should appear to exist the least communication between the viscera and between the peritoneum of the two individuals. Otherwise, that is to say, if the thoracic or abdominal cavity is perfectly independent in each of the two beings; if, as we have seen in the two young Siamese, the parts are not united but by a large bridle or cutaneous growth, (*plaque*,) they may be separated. The operation would, in such cases, be performed in the manner I have described in speaking of adhesions of the arm to the chest, of the fingers with one another, and those of the upper part of the thighs. This, moreover, is not a mere suggestion. Sue relates (*Histoire des Accouchemens*, t. ii., p. 251) that Fatio had thus operated and effected a cure, at Bâle, in 1752, in the case of two fœtuses united at the epigastrium. This kind of operation has rarely been put in practice up to the present time; 1. Because most of the fœtuses

thus formed die soon after their birth, if they do not die before the termination of the labor; 2. Because those who continue to live, contract such a habit from their position, that they feel no need of changing it; 3. Because, if they attain the age of reason, they almost always refuse every attempt having for its object their separation; 4. Because many parents use these monstrous beings for objects of public curiosity and sources of gain. For these reasons, therefore, and in order that the operation may be the less dangerous, we should perform it as soon as possible, and in general in the first months after birth.

3. When a fœtus, or a portion of fœtus, is as it were implanted into a child otherwise well formed. When it concerns only a finger, leg, arm, or in fact a portion of limb, no one should oppose its entire removal. But if the second fœtus is implanted upon the head, chest, or belly, the case is more serious, and practitioners are not agreed. On the supposition that the pelvis, a part of the abdomen, and the lower limbs, should be appended to the sternum or umbilicus of a living individual, as is related of a case published some years since, (*Isidore Geoffroy Saint Hilaire; Histoire des Anomalies de l'Organisation dans l'Homme et les Animaux*, Paris, 1832–1836, 3 vol., in-8vo, fig.,) we might attempt its extirpation, if a careful examination satisfied us that the other portion of the supernumerary fœtus did not project (*proémine*) into the splanchnic cavities, and if the operation would not make too large a wound. It is, moreover, evident that none of these disunions and extirpations can be submitted to any special rule, and that it is for the surgeon to choose, in each case, the mode of operation which suits the best.

CHAPTER III.

DEFORMITIES FROM ALTERATION OF THE TENDONS OR MUSCLES.

The deformities which may result from an unnatural state of the muscles or tendons are referrible to the division, adhesions, and accidental retractions of these tissues, (*organes.*)

Section I.—Accidental Divisions.

The muscles and tendons cannot be divided without producing some disturbance in the locomotive actions. The accidental division of the tendons, however, should more frequently call the attention of surgeons to this subject than that of the muscles. I shall, therefore, occupy myself in this place almost exclusively with what concerns the division of tendons, persuaded that the reader will apply without difficulty what I shall say of them, to wounds of the muscles.

Article I.—Tendons in General.

All the tendons of the body, in fact, may be divided, either by external violence, gangrene, or ulceration. It is only those of the limbs, however, and some of those of the neck or abdomen, which can require the aid of operative surgery.

§ I.—*Pathological Anatomy.*

When an extensor tendon is completely divided, the antagonist muscle unavoidably draws the part into a state of flexion. The disease may then be compared to a kind of paralysis. If it were to take place with certain flexor tendons, the limb, on the contrary, would remain in extension.

The division of the tendons is followed by a process, (*travail,*) which differs according as there exists at the same time a wound in the skin, or that the process takes place protected from contact with the air.

A. *In Contact with the Air.*

If the solution of continuity is at the bottom of an ulcer or a wound, the two ends of the tendon remain for a long time pale, like an inert substance, (*tige ;*) ultimately, however, they become vascular, and covered with reddish granulations. These granulations, which encroach at the same time upon the surrounding cellular fibres, (*feuillets,*) are the point of departure and the termination of a vegetation, which results in filling up in part the void which the extremities of the ruptured tendon leave between them. Here, then, the solution of continuity is cicatrized by second intention ; cellular tissue, aponeurosis, vessels, sub-cutaneous tissue, and tendons, are all finally blended together in a single mass, which itself contracts intimate adhesions with the skin in the neighborhood. It is this which is observed, when, in consequence of gangrene, large ulcers, and long-protracted suppuration, there has ensued an exfoliation of tendons at the bottom of the wound. In this case, the mobility and play (*glissement*) of the principal organ cannot take place without communicating the same degree of motion to all the other tissues with which it has become associated.

When the division of a tendon, notwithstanding it is hidden under the integuments, and that the external wound has united, is followed by purulent inflammation, there results from it the same process, and consequently the same dangers. In that event, however, it is possible that the suppuration may be confined to the sheath of the tendon, and to some few of the surrounding tissues, (*lames ;*) and that after the cure, the skin, and the muscles and tendons, more or less perfectly retain the independent use and play of their movements. In these two orders of cases, as is readily perceived, it is next to impossible that the disease, left to itself, would allow of a complete restoration of the functions of the wounded organ.

B. *Protected from Contact with the Air.*

If the tendon is ruptured under the skin, or divided without any inflammation supervening, we must expect results of a totally different nature, but which vary, according as the two ends of the tendon are kept in contact or remain apart. The agglutination of the tendon is effected either by first intention if the contact is perfectly exact, or, in the contrary case, through the medium of a plastic matter, which, at first soft and gelatinous, (*gélatiniforme*,) soon assumes a lamellar and fibrous appearance. Blending itself with the tendon, this material is converted into a sort of kernel, (*noyau*,) or node, (*nodus*,) which itself rarely fails to disappear at the expiration of some weeks or months. Being neither stretched out, nor soldered (*soudé*) to the surrounding tissues, the tendon thus soon recovers all its primitive power and mobility. When there is a separation of several lines between the two ends, there occasionally takes place in that part an effusion of blood, of fibrine, or of plastic lymph. This effusion often becomes organized. Its liquid and coloring matters are gradually absorbed; the fibrine and plastic lymph harden as they become cemented to the two ends of the tendon, which they envelop in the manner of a ferule, (*virole.*) Afterwards, becoming transformed into fleshy tissue, (*se carnifiant ensuite*,) we may recognise, on the tenth or twelfth day, an appearance of fibres, or of a substance like felt, (*feutrage*,) and an elasticity which continues to increase. The final result is, that there is formed from this a portion of new tendon, which appears to have been created there for the purpose of giving greater length to the old tendon. It may readily be conceived, that from this period a part of the functions of the wounded tendon will be restored, but that its excess of length will not readily permit it to resume entirely all the power it possessed in its normal state.

When, with the separation which I have mentioned, the union of the teguments with the cellular tissue at the bottom of the division has been effected before the effusion has taken place, and without any inflammation, the two ends of the tendon, if they are very far apart, cicatrize separately, each one in its place, and remain without the new uniting medium, (*sans lien nouveau*,) and as if they were lost in the cellular tissue; the action of the corresponding muscles is, in this case, completely destroyed.

The knowledge of this process (*travail*) shows, at once, what we have a right to expect, and what it is proper to do, when the continuity of a tendon has been interrupted.

§ II.—*Treatment.*

Two classes of means are placed at the disposition of the surgeon to remedy the division of the tendons—position, aided by bandages, and the suture. With this is connected a question which has always divided surgeons—should we, or should we not, practise the suture of the tendons?

Confounding all the white tissues under the title of *nerves*, the ancients considered that a wound of the tendons was extremely formidable, and that it exposed to convulsions, tetanus, and death. So Galen, who seems to allude to the suture of tendons, is far from formally extolling it, whatever Guy de Chauliac may say of it, (*Edit. de Joubert*, p. 263, Rouen, 1649,) and who, in venturing to reject the doctrine which, according to him, had been falsely attributed to Galen, was severely reproved for it by many of his successors. It was useless for Guy (*Traict III.*, doct. 1, chap. iv.) to invoke the authority of Avicenna, Lanfranc, and G. de Salicet, and then to add, that he had "seen and heard it said, that in many persons the cut nerves and tendons had been so well restored by sutures and other remedies, that no one would have afterwards supposed that they had been divided," for he did not change the practice of his cotemporaries. To change this opinion, it was necessary to prove that the tendons, aponeuroses, and serous membranes, were endowed only with a feeble sensibility. It is what Haller endeavored to show, and what Castel (20 *Janvier*, 1753, *Thèse de Haller*, trad. franç., in 12, t. iii., p. 280–382) was especially desirous of demonstrating by a variety of experiments. Other experimenters and practitioners (*Bagieu, Examen de Plus. Parties de la Chir.*, p. 575) have, nevertheless, maintained, with the ancients, that the tendons enjoyed an acute sensibility, and that the wounding of them exposed to serious dangers.

Some casual observations, that have been, from time to time, made in favor of suture of the tendons, have finally awakened the attention of modern surgeons to this important subject. Paré, who limits himself (*Livre XXIII.*, chap. 10) to the recommendation of machines to restore the actions of divided tendons, relates, also, (*Livre XXV.*, chap. 17, p. 773,) the case of a suture of the two tendons of the ham, performed with complete success by Tessier. M. A. Severin (*Chir. Efficace*, chap. 120, livre ii.) has no hesitation in recommending it. Marchetis, (*Collect. de Bonet*, t. iii., p. 260,) who accuses Severin of having imperfectly comprehended Galen and Paré, in vain opposed the suture of tendons, for it did not prevent Verduc (*Opérat. de Chir.*, p. 256) from extolling it, and describing in detail the process that the Surgeon Bienaise then employed for performing it. We may also see in Heister (*Institut. Chir.*, vol. ii., p. 1087, cap. 172) the enumeration of the surgeons who, up to that time, had declared themselves for or against the suture of the tendons. Gauthier had noticed a case of this kind, which he related to Wepfer, (*Ephémérides des Curieux de la Nature*, 1688, *ou Collect. Acad.*, t. vii., p. 524 ;) De La Motte, (*Traité de Chir.*, éd. Sabatier, t. ii., p. 162,) Balthasar, (*Ancien Jour. de Méd.*, t. lxviii., p. 142,) and a great number of other practitioners, also relate examples of it. [Notwithstanding these facts, the question still remains undecided.—*T.*] M. Barthélemey, (*Jour. Hebd.*, t. ii., p. 222,) justifying himself by the practice of M. Larrey, published some cases of cures effected by suture of the tendons. If the experiments which M. Acher made, (*These*, No. 112, Paris, 1834,) and the facts he has gathered

in the practice of M. Gensoul, confirm the opinion of M. Bienaise and of Guy de Chauliac, we see M. Rognetta, (*Arch. Gén. de Méd.*, 2e série, t. iv., p. 206–215,) on the other hand, asserting that the suture of the tendons is useless and dangerous; so that, to reconcile all parties, M. Mondière (*Arch. Gén. de Méd.*, 3e série, t. ii., p. 57) considers that it is sometimes useful, rarely indispensable, and very often of no value.

In my opinion, this question, examined in a proper point of view, is less difficult to solve than one would at first sight suppose. One indisputable fact is this: the more completely in contact the ends of a divided tendon are, the more prospect is there of restoring it perfectly to its functions. All that we have to ascertain, therefore, is, whether the suture will fulfil this indication better than any other remedy.

At the time of Paré, surgeons believed so little in the union of divided tendons, that, in speaking of a noble personage, who, in consequence of a wound of the tendons, wished to have his thumb amputated, this author found nothing better to sooth him, not to cure him, as M. Mondière thinks, (*Arch. Gén. de Méd.*, 3e série, t. ii., p. 59,) than the employment of an apparatus which enabled him to straighten or bend in a slight degree the wounded finger.

An observation of Marchetis, that of Martin of Bordeaux, and that of Mareschal, (*Arch. Gén. de Méd.*, 3e série, t. ii.,) show, on the other hand, that the surgeons of the seventeenth and eighteenth centuries had, at that time, made actual cures by means of position and bandages. The rupture of the tendo-Achillis, of which Monroe had seen sixteen cases, (*Journ. de Chir.*, par Desault, t. ii., p. 50–64,) the instances of this kind which are related by Bagieu, (*Examen de Plus. Part. de la Chir.*, p. 461,) Thiébault, (*Jour. de Desault*, t. ii., p. 268,) and Mothe, (*Mél. de Méd. et de Chir.*, 1812,) a fact recorded in the practice of A. Petit, (*Ancien Jour. de Méd.*, t. xliii.,) and the facts related by MM. Rognetta (*Arch. Gén. de Méd.*, 2e sér., t. iv., p. 206–215) and Mondière (*Ibid.*, 3e série, t. ii., p. 61) are not less conclusive. I have myself seen many cases of wounded tendons, among which was a sausage-maker's boy, (*garçon charcutier*,) who had had the middle and ring fingers almost entirely severed; also a young butcher, who had a simple wound in the fore and middle fingers, and both of whom recovered the perfect movement of the parts, though I had employed in their cases no other means than position and bandages. Another case occurred in the hospital of La Charité, in August, 1838. The extensor tendons of the forefinger had been completely divided. Bandages only were employed to unite the wound, and the cure was effected at the expiration of twenty days. Nothing of all this, however, positively proves that the union of the tendons has been effected by the actual contact of the ends of the division; every thing, on the other hand, demonstrates that there is a sort of bridle formed in these cases, a new production, which extends from one end of the division to the other, like a band added to the original length of the tendon itself. It is thus that the continuity of the parts is re-established, not only after

the rupture of tendons which are acted upon by powerful muscles, but also after the fracture of certain bones, as, for example, the patella and olecranon.

The experiments made in our times, and the examples of sections of tendons with the view of remedying deformities, have, moreover, most abundantly proved, that the substance which is formed between the two ends of a divided tendon in no respect destroys its action.

It follows, hence, that the operations which should be performed in cases of accidental division of the tendons should vary, according to the different circumstances—1. According as there is, or is not, at the same time, a wound of the skin; 2. According as it is, or is not, possible to obtain a perfect contact by means of bandages; 3. According as the tendon, either from the position it occupies, or the functions it performs, has need or not of being replaced exactly in its primitive position.

That class of divisions of the tendons, which is not accompanied with wounds of the integuments, almost wholly forbids the use of the suture. We should not, at least, allow ourselves to think of an operation in such cases until after having vainly attempted relief by position and bandages. In regions where the delicacy and multiplicity of the movements are not the principal functions, the suture is equally unnecessary. A separation of half an inch, or even an inch, would not hinder the triceps or biceps from extending or bending the forearm. I have often seen a separation of one, two, or even four fingers' width, from a transverse fracture of the patella, together with rupture of the ligament of the patella, or of the tendon of the rectus femoris, produce only a slight inconvenience in the movement of the leg. In the hand and wrist, wounds of this kind exact a little more attention. In these cases, however, as well as in others, if, by means of a position properly chosen, we can oblige the ends of the tendons to touch each other, we can dispense with the suture. In the contrary case, the suture is an operation which would be formally indicated. [Dr. Mott does not approve of stitching tendons; you might as well wire bones. Position, in his view, is every thing.—*T.*]

Compared to position and bandages, however, the suture of the tendons has inconveniences and advantages which the surgeon should carefully weigh. We may reproach him for introducing into the wound a substance necessarily extraneous, and of thus rendering it impossible to effect a cure by the first intention; but by this remedy the contact of the ends of the tendons is made more perfect than by means of bandages, and the patient is not confined to any position, or to any fatiguing compression. Dispensing with the suture, we may immediately close the wound of the integuments, and obtain a cure without suppuration, but the union of the tendon is not immediate; whereas, though the suture almost unavoidably causes suppuration, and requires more time for the external cicatrization, it gives, as a compensation, a direct union of the tendinous cord. We thus perceive, therefore, what are the cases

in which we should be at liberty to resort to one of these methods in preference to the other.

A. *Position.*

When we have recourse to position and bandages, we must first place the part of the wounded limb in a state of complete extension, if it is the extensor tendons, and in a moderate degree of flexion, if it is the flexor tendons, and then proceed immediately to the union of the wound, either by adhesive plasters, or by the suture. There is some advantage in conforming, in such cases, to the precept of M. Champion, who recommends that we should, if possible, make the two ends of the tendon ride a little over each other, (*chevaucher.*) It is also important, as this practitioner has shown, that the bandage should make but little pressure opposite to the solution of continuity, that it may not tend to displace the extremities of the tendon which we wish to unite. The most convenient position having been given to the limb, we immediately apply a roller bandage, taking care to commence at the origin (*racine*) of the muscle, and to act upon the parts in such manner as if to draw them towards the wound. It is often serviceable to associate splints of wood or pasteboard, or troughs straight or bent, with the rest of the dressing, in order to give it greater steadiness. The observations of modern orthopedists have proved, that, in order to cure the division of a tendon without any intermediate substance, it is necessary to keep their ends in contact, (*rapprochés,*) at least during twelve to fifteen days. We should, therefore, guard against prematurely making the least movement of the part. We should not, therefore, lay the bandage aside until after the fifteenth or twentieth day, it being understood that the hardest portions of the dressing shall have been taken away at the tenth or twelfth day. We then proceed to make gentle and gradually increasing movements of flexion and extension of the wounded tendon. The other precautions are the same here as in the cases of stiffness, which succeeds to diseases of the joints.

B. *The Suture.*

When we have decided in favor of the suture, it may be advantageous to enlarge and equalize the wound of the tendon. Ordinarily we find the lower end of this cord above the lower lip of the division of the skin; the other end, on the contrary, retracted by the action of the muscles, is raised to a considerable distance beneath the integuments. If the wound is recent, and by a cutting instrument, we may insert the suture without previously cutting it smooth, (*sans avivement préalable.*) [Dr. Mott would not touch it. —*T.*] If the wound has existed for some days, and is accompanied by laceration (*écrasement*) and contusion, it would be more prudent to cut off the ends of the tendon, in order that we may have a fresh wound to unite.

It is possible, moreover, that the wound of the integuments may have completely cicatrized, or that there has never been any. If, as Séverin and Verduc have advised, and as Petit has practised, (*Mondière, Archiv. Gén. de Méd.*, 3e série, t. ii.,) we should, in a case like this, wish to insert a suture, it would be necessary to divide the integuments, to bring the ends of the ruptured tendon together, and cut them off smooth, and afterwards to proceed as in the two preceding cases. As to determining whether it is better to follow the process of Bienaise than that of any other, it is a question of but little importance; we may succeed with all the modes. For seizing the tendon, I prefer the hook-forceps (*pinces à crochet*) to the ordinary forceps; I begin with the lower end rather than with the upper; I use small spear-shaped needles, slightly curved at their point, in place of the ordinary semi-circular needles, and I substitute the common thread for all those of a special character.

If the tendon has not more than two lines of breadth, one stitch of suture suffices; and I insert it at the distance of from two to three lines from each end of the division. Two stitches would be requisite for every tendon of three lines of transverse diameter. We would only apply three, or a greater number of them, when operating upon one of the largest tendons of the muscular system. It is advisable that each stitch should embrace the entire thickness of the two ends of the tendon. The simple suture, also, is here preferable to the twisted. After having placed a sufficient number of ligatures, we cut one of the two threads of each very near its knot, the same as after ligatures upon arteries; each remaining thread is then brought out by the shortest direction to the skin, the wound in which latter is then united as accurately as possible. Nothing is afterwards required but a simple dressing and an immoveable position, to allow nature to agglutinate the parts.

In the suture to tendons, the threads generally detach themselves very slowly, since they cannot come off until after having divided the densest fibrous tissue of the animal economy. It is important, however, not to make any traction upon them, but to leave them to separate of themselves, or, as it were, spontaneously.

In a case where it was impossible to bring together, end to end, the two portions of the same tendon, Missa (*Gazette Salutaire*, 1770, No. 21) adopted the plan of attaching the upper one to the edge of the neighboring tendon. Two muscles were thus charged with the duty of moving the same finger. M. Champion writes me that he proceeded in the same way, after the exsection of the fourth metacarpal bone. We shall see, in treating of suture of the tendons of the fingers, in what cases it would be advisable to adopt this mode.

In respect to the subsequent treatment, also, we must proceed after the suture, as after the attempts to unite by bandages or the simple position.

Article II.—Tendons in Particular.

§ I.—*Tendons of the Fingers.*

In order that the functions of the fingers may be preserved, it is necessary that their tendons should neither be elongated nor shortened, nor more nor less adherent than in their natural state. There is, therefore, no room here for hesitation; we should, when they have been accidentally divided, do all in our power to re-establish their continuity. Formerly, surgeons contended that the partial section of the tendons exposed to accidents as serious as the partial section of the nerves. Wagert (*Observ. de Méd. et Chir.*, p. 211) relates that, in 1717, there was a great discussion, with the view to determine whether, in a case where the last three flexor tendons of the fingers had been half divided by the cut of a sword, the section should be completed or not. But since that epoch, Chabert (*Observ. de Chirurg. Prat.*, p. 215) has related the case of a partial section of the extensor tendon of the fore-finger, which recovered, like the case of Wagert, though the complete division had not been performed. M. Champion and a great number of modern surgeons have made the same observation. I myself have more than twenty times seen partially divided tendons gradually reacquire all their functions, and I have never observed any accidents that could be imputed to the undivided state of a portion of their fibres. Though ever so few, therefore, remain, we ought to preserve them with scrupulous care; for, were it but a few filaments, these answer as substitutes for the suture and bandages, and to enable the plastic lymph or modified cellular tissue to fill up in a very short time the notch in the division. If, therefore, the tendons of the fingers are only incompletely divided, we should not have recourse either to the suture or to fatiguing bandages; all that would be required would be, to keep the finger in a state of immobility from ten to fifteen days. In case the division of the wounded tendon should be complete, we should proceed in a different manner, according as it related to the extensor or to the flexor tendons.

A. *Extensor Tendons.*

Whether the division takes place on the dorsum of the metacarpus, or upon the fingers, it nevertheless includes in it, sometimes the tendon or tendons of one finger only, sometimes the tendons of several fingers at the same time. Here, more than in other cases, it is necessary to obtain as exact a reunion as possible.

I. *Position.* By means of the position only, Mareschal cured a soldier whose extensor tendons of the four fingers had been divided by the cut of a sickle, (*Mondière, Arch. Gén de Méd.* 3e série, t. ii., p. 60.) It was in the fingers, also, that Heister (*De Sutura Tendinis in Manibus, &c.; Institut. de Chirurg.*, vol. ii., p. 1087, caput 472) has seen take place a union of the tendons without the aid of a

suture. In the work of Mothe (*Mél. de Méd. et Chir.*, Paris, 1812, t. i., p. 813) we find the case of a section of two extensor tendons of the fore-finger that got well in the same manner. I have mentioned above a similar fact, observed by me at La Charité, in 1838. A. Petit (*Anc. Journal de Méd.* t. xliii., p. 449) gives the case of three of the extensor tendons of the fingers which were completely reunited in ten days by the aid of simple bandages. Similar facts are detailed in the journal of Desault. Many of the cases of Barthélemey, Acher, and Rognetta, and the two cases recently published by M. Mondière, are additional examples of this kind.

When the solution of continuity exists in several tendons, Le Dran (*Consult. Chirurg.*, p. 357) recommends that we should make use of a trough, (*gouttière,*) with a hinge (*brisée*) near the wrist. Another gutter, more complicated, had already been proposed by Arnaud, (*Garengeot*, t. iii., p. 260,) and M. Champion informs me, that he has succeeded very well with a palette of tin without a hinge, but which inclined the wrist and fingers backward as much as was desired.

If it were the tendons of the thumb, as in the patient spoken of by A. Paré, it would be necessary, after having surrounded this finger with a layer of roller bandage and some turns of spica, to place on its palmar surface a small splint of pasteboard, which should reach to the root of the hypothenar eminence, and which should be fastened by one or two more layers of the roller bandage. In this manner the thumb would be maintained in a permanent state of extension, and in the most perfect immobility, without the rest of the hand or other fingers experiencing any inconvenience from it. For the fore-finger we should also apply a layer of roller bandage fixed by one or two turns on the wrist, as is done for each finger in the application of the gauntlet. A splint of pasteboard, extended backward to the thenar eminence, should then be applied, and fixed upon its palmar surface, in the manner I have just described in speaking of the thumb. It is evident that we should proceed after the same rules if we were treating the middle, the ring, or the little finger. The essential point is not to confine all the fingers, because there is a wound in only one of them. It is important, nevertheless, for greater security, to hold them all in a state of immobility during a certain time, though there may be only one of them wounded; in the four last fingers, especially, it would be difficult to communicate motion to those that were sound, without involving to some extent the metacarpal bone of the finger whose agglutination we were desirous of effecting.

An exceedingly easy and secure mode of dressing, consists in placing the roller bandage of each finger in such manner as to leave the seat of the wounded region uncovered, then to besmear the surface of this first layer of bandage with a solution of dextrine, then to place on the splint of pasteboard saturated with the same matter, and finally a second layer of roller bandage, also saturated with dextrine. We have in this way an immoveable dressing, which does not prevent our examining and dressing the wound of

the integuments and tendon as often as we desire. When several tendons are divided at the same time, it is generally better to substitute the palettes or large splints in place of the separate tongued splints, of which I have just been speaking. On the supposition that the wound was upon the fingers themselves, it would be better to make use of a palette with perfectly distinct digitations, than of a splint or one entire sole. This foreign body, which is placed on the palmar surface of the forearm, wrist, hand, and fingers, should always be separated from the skin by some folds of linen or turns of bandage. As the extension requires in such cases to be carried beyond the axis of the limb, the ordinary palettes and splints of wood would require fillings, which in the gutter of Le Dran and the splint of M. Champion are advantageously dispensed with. But I substitute, for all these objects, palettes or pasteboard softened with a solution of dextrine, and fastened on by means of a bandage saturated with the same liquid. We obtain thus an immoveable bandage, which we may bend at pleasure, and mould exactly upon the elevations and depressions of the region until it has completely dried.

II. *Suture.* If the patient is intractable, and especially if we are treating a wound accompanied with laceration, and upon the back of the fingers, the suture would offer more security than the simple position. The surgeon Mainard made use of it successfully to unite the tendons of the fingers that had been divided by a knife, (*Moïnichen*, lib. iv., p. 123.) M. Mondière quotes from Baster the history of a young peasant, who had the tendon of the supinator-longus divided, and which this surgeon cured by means of a single stitch of the suture. We find, also, in Delaisse, (*Observ. de Chir.*, p. 148,) a case of suture of the extensor tendons of the thumb; that of Balthasar (*Ancien Journal de Médec.*, t. lxviii., p. 142) was a case of suture of the extensor tendon of the fore-finger. We see, also, in the thesis of M. Acher, that the fortunate results obtained by M. Gensoul also relate to the extensor tendons of the fingers. The operation would present but very little difficulty in this region, the tendons there being covered only by pliant skin, and having for their foundation a solid plane. The thread should be passed first through the digital end of the tendon, (which is at the same time the least sensitive and the easiest to seize,) then through the muscular end, previously disengaged and drawn out by means of a hook forceps. It would suffice, afterwards, to keep the hand and fingers gently extended upon a common palette, or, better still, on a long piece of pasteboard, fastened by a bandage saturated with dextrine, in such manner as to allow, when necessary, the points occupied by the suture, to be uncovered without in any manner deranging the rest of the dressing. M. Robert de Chaumont (*Com. Privée de M. Champion*) having to treat a division of the tendons, accompanied with considerable retraction, nevertheless succeeded in effecting, by means of the suture, as I have already stated, the cure of his patient, without leaving any deformity.

If, contrary to all expectation, it should happen that we could

not join the two ends of the divided tendon, perhaps it would be better, rather than attempt nothing, to imitate Missa, and to sew the upper end to the neighboring tendon, and the lower end to the tendon along side of it. We see, in fact, in the case of Missa, that it was the tendon of the middle finger; that the muscular portion of this tendon was united to the tendon of the fore-finger, and the digital portion to the tendon of the ring finger; so well that the muscles of this last could be used for the motions of the wounded finger. We may still more easily comprehend the utility of attaching the tendon of a finger which has been amputated to one of the collateral tendons, after the manner that M. Champion adopted after the exsection of the fourth bone of the metacarpus. It is certain, however, that this connecting together (*accollement*) of tendons can rarely be required, or, I may add, be advantageous, on the dorsal region of the fingers or hand.

B. *Flexor Tendons.*

The section, rupture, or division of the flexor tendons of the fingers, is infinitely less common than that of their extensors; it is, at the same time, much more serious. It is, in almost every case, in fact, complicated with division of the nerves, arteries, or some other important parts; and whether it takes place on the palm of the hand, or on the forepart of the fingers themselves, it is frequently followed by an inflammation, which may be attended with most serious consequences. The resources which art borrows from operative surgery to remedy this species of injury, are here, also, position and the suture.

The suture in these cases has not the same advantages as for the extensor tendons. It is easy, in fact, to perceive that, in addition to the difficulties of the operation, the suture of the flexor tendons, whether in their sheath, (*coulisse*,) or in the palm of the hand, would also incur the risk of propagating inflammation or suppuration towards the wrist and fore-arm by means of the synovial membranes, (*toiles.*) There would, also, almost inevitably result from it such extensive adhesions as to interfere with the play of the tendon. It appears, however, that it has occasionally been performed with success. In Gautier's case, for example, the suture was applied to the flexor tendons. It was the same, also, in the old soldier whom M. Blandin mentions, (*Dict. de Méd. et de Chirurg. Prat.*, t. xiii., p. 234.) There are, however, but a very small number of such cases; it must also be added, that some of them relate much more to the tendons of the wrist than to those of the fingers.

Simple position, on the contrary, succeeds in this region with its usual effectual results. In a patient of Warner, (*Observ. de Chir.*, trad. française, p. 179,) the flexion of the hand, and pressure made from above downwards upon the forearm, allowed the flexor tendons, which had been divided by a piece of glass, to resume their functions. Martin relates (*Ancien Journ. de Méd.*, t. xxiii., p. 555) that a woman, who had the flexor tendons of the fingers and wrist

divided by the cut of a sabre, was perfectly cured in three weeks by means of simple position. In the first volume of the Mélanges of Mothe there is a similar case, in relation to the flexor tendons of the ring and little fingers. I have myself several times seen the entire section of one or more of the flexor tendons of the fingers followed by an exact reunion of the divided ends, solely by means of the position of the parts. In truth, flexion is, to a certain extent, the normal position of the fingers of the hand. It is, then, quite natural that this flexion, methodically sustained, should suffice to replace the two extremities of the tendon in contact. There is, also, an anatomical arrangement in these parts which is entirely to the advantage of position and bandages. I allude to the kind of fibro-synovial sheath (*étui*) which resists every deviation of the flexor tendon, before as well as after its division; a sheath which, it is true, does not exist in so perfect a state in the palm of the hand, but is replaced in that part by an aponeurosis or muscular masses, which still, however, possesse the power of restricting the tendons to a very limited space.

Consequently, the suture would not be indicated upon the palmar surface of the fingers or of the hand, except where the divided tendon projected into the interior of the wound, or where its ends, disengaged from their sheath, exhibited too great a tendency to separate from each other, and that it should appear next to impossible to cure the wound without suppuration.

As to the position and dressing, we may proceed in two ways—1. After having approximated and united the lips of the wound, and properly flexed the wrist and fingers, the hand is to be filled with lint and compresses. The whole is then fixed in this position by means of a roller bandage, surrounding a dorsal splint, and a cushion, which are prolonged to the extremity of the metacarpus. 2. We then mould upon the dorsal surface of the forearm, wrist, and fingers, a piece of wet pasteboard, curved into a semi-circular shape below, and maintained by means of a bandage saturated with dextrine. We thus obtain an immoveable bandage, which, leaving the wound uncovered, allows also of our dressing it separately, at such time and in such manner as we wish. Being moulded upon the parts, the layer of pasteboard causes no inconvenience scarcely, and furnishes to the parts a support which they do not find either in splints or in pieces of wood or metal.

If one finger only were wounded, there would be an advantage in keeping that one only flexed, so much the greater because the extension of the others would rather draw down than cause a retraction of the upper end of the divided tendon.

Moreover, we must not forget that the flexor tendons of the fingers, surrounded by synovial membranes, or close fibrous sheaths, lose a great part of their mobility as soon as they contract the least adhesion with the surrounding tissues, and that, if the wound, of which their division constitutes one portion, should pass to the state of purulent inflammation, they would rarely reacquire the perfect integrity of their functions.

§ II.—*Tendons of the Hand.*

The muscles which move the hand, without extending to the fingers, are on the forepart—the flexor carpi ulnaris, the palmaris longus, and flexor carpi radialis; and on the back part, the extensor carpi ulnaris, the extensor carpi radialis longior, and the extensor carpi radialis brevior. It is evident that, if the tendons of these muscles should be divided, the power of flexion or extension of the wrist would be greatly enfeebled. Nevertheless, there is not on record a known instance of paralysis of the hand solely imputable to the division (*interruption*) of these tendons. This is so true, that no one has scarcely ever suggested for them the application of the suture. We find, however, by a case of Gautier, (*Archiv. Gén.* 3e série, t. ii., p. 57,) that this operation was performed with success in a patient who had had the flexor tendons of the carpus completely divided. Job. Baster, cited by M. Mondière, (*Ephém. Curios. Nat.*, 1688,) speaks, also, even of a case of division of the tendon of the supinator longus, which was treated by suture. But to some facts which might be adduced of this kind, we could oppose a great number of others which attest the success obtained by the simple position or bandages. In the case of Warner, (*Observ. de Chir.*, etc., p. 179, trad.,) for example, all the flexor tendons of the carpus had been divided at the same time with those of the flexors of the fingers. I have cured in the same way—1. Two men, who had had the tendon of the flexor carpi ulnaris divided; 2. Several patients, in whom the tendons of the flexor carpi radialis and palmaris longus had been divided, together with some of the other flexors; 3. The same thing has occurred to me with the extensor carpi radialis longior, the extensor carpi radialis brevior, and the extensor carpi ulnaris. These are a kind of wounds so frequent that it would be impossible to enumerate them.

A great number of reasons unite here to forbid the use of the suture. In respect to the supinator longus, it would be, I should suppose, an entirely superfluous precaution; for, if this tendon should attach itself (*collât-il*) at an inch higher up the radius, it would still act upon the forearm full as well. Nor is the action of the flexor carpi radialis and of the palmaris longus sufficiently important in their detailed movements to make it necessary to devote any particular care to restoring them to a perfect condition. The flexor ulnaris muscle, being fleshy to near the wrist, retracts itself but very little; the same, nearly, may be said of the extensor carpi ulnaris. Whether these tendons are a little longer or a little shorter, or draw the hand inwards a little more or a little less forcibly, is a matter of very trivial moment. The same must be said of the extensor carpi radialis longior and brevior, which, being held in a sort of fibrous sheath on the postero-external face of the radius, are thus prevented from deviating either backward or forwards. The reasons stated, therefore, when speaking of the flexor tendons of the fingers, could be those alone which would justify the suture of the flexor tendons of the hand.

A bandage, whose solid part, in order to leave some freedom to the fingers, does not go beyond the level of the metacarpo-phalangeal articulation, is sufficient for keeping the hand in a convenient position. If we are treating the flexor tendons—that is to say, the flexor carpi ulnaris, the flexor carpi radialis, and the palmaris longus—the pasteboard splint, placed behind, will conveniently raise up the hand and wrist into a state of flexion. In the case of the section of the extensors, it is necessary to place the splint on the opposite surface of the limb, to raise up the metacarpus in a state of extension. This pasteboard should be fixed on the radial side of the forearm and hand, if the section was that of the adductor tendons—that is to say, of the tendons of the flexor carpi ulnaris, or of the extensor carpi ulnaris only; finally, it should be placed on the inner side, if the section was that of the extensor carpi radialis longior, or of both the extensor carpi radialis longior and the brevior. With the immoveable dressing, we should have, in these different cases, to leave a space opposite the wound, in order to be able to examine what is passing, and to watch the process of cicatrization, without incurring the risk of disturbing the position which it has been thought proper to give to the parts in the beginning.

§ III.—*Tendons of the Elbow.*

In the humero-cubital region there are, in reality, but two tendons which can, when divided, claim the aid of operative surgery: they are the tendon of the biceps in front, and the tendon of the triceps behind.

A. *Tendon of the Biceps.*

Destruction by ulceration or gangrene, a rupture purely mechanical, and a division by external violence, may occur in the tendon of the biceps. As this muscle is the principal flexor of the forearm, it is natural to suppose, that the solution of the continuity of its tendon would produce in this part a manifest difficulty. Being isolated from the radius to the scapula, and detached near its lower extremity, the biceps muscle would seem, moreover, calculated to undergo a considerable degree of retraction at its humero-cubital extremity. We must, then, regard its division as a very serious matter, and endeavor to remedy it as perfectly as possible. Experience, nevertheless, tends to show that it is less serious than one would at first suppose. Haller, citing Molinelli, speaks of a patient who, having for a long time a retraction of the forearm, broke the tendon of the biceps by a sudden extension, felt at the same moment a cracking noise accompanied with pains, and soon after found himself completely cured.

We find in the Bibliothèque of Planque, a case related by Granier and requoted by Lafaye, (*Dionys. Oper.*, t. ii., p. 681,) the result of which was, that the section of the tendon of the biceps did not prevent the movements of the arm and forearm from being restored after the cure of the wound.

Among the facts which I could adduce in support of the observations of Granier and Molinelli, I will confine myself to the following. A young printer came to the hospital of La Charité, in 1836, for a large contused wound, which had divided not only the skin, but the aponeurosis, and the whole of the biceps, and even a part of the brachialis-anticus, immediately above the articulation. I took upon myself to say, that if this young man got well without an amputation, he would at least remain incapable of flexing the forearm. I was in this point deceived; the cure took place, and the movements of the limb were almost perfectly restored.

We may, therefore, be permitted to say, that solutions of continuity in the biceps do not inevitably lead to a loss of the movements of flexion at the elbow. These movements are preserved after wounds of this kind, both by the action of the brachialis-anticus, and by the re-establishment of the continuity, either mediate or immediate, of the divided tendon.

The course to be pursued, under such circumstances, varies according to the simple or complicated nature of the wound. If the wound is large, if the two extremities of the tendon are easily seized, and if there is a hope of obtaining a direct agglutination, the suture ought to be applied. The simple position might suffice to bring the two extremities of the tendon in a line with each other, but it would not suffice to keep them in contact without any deviation during the time necessary for their adhesion. In other cases, that is to say, when, either in consequence of the conditions in which the wound itself is found, or for any reason whatever, the direct union appears next to impossible, it is better to have recourse to the use of bandages, which ought, moreover, to be associated with the suture, when it is judged advisable to employ it.

The bandages required in cases where there is a section of the tendon of the biceps at the bottom of a wound, should keep the forearm in supination, and the flexion at a right-angle, while it prevents every kind of movement in the articulation of the elbow, during the period of treatment. I make this dressing without any difficulty by means of a long bandage saturated with dextrine, and a piece of pasteboard behind, which extends from the shoulder to the wrist. A course (*plan*) of roller bandage is first applied to the skin; the pasteboard splint comes next, then the dextrine bandage, to make a second, or even a third circular layer. The whole should leave an opening opposite the wound, that is to say, in front of the articulation. If it should be found necessary to increase either the flexion or extension of the forearm, it would be sufficient to moisten the bandage opposite the elbow; then leaving it afterwards to dry, it would be enabled to reassume all its immobility.

B. *Tendon of the Triceps, and Olecranon.*

At the elbow, the tendon of the triceps is liable to the same lesions as that of the biceps. Only one example, and that very

doubtful, (*M. A. Severin, Méd. Efficace, Bibliot. de Bonet*, p. 593,) is recorded of its rupture or section; its wounds, in fact, have, up to the present time, generally been passed over in silence. In the place, however, of rupture of the tendon of the triceps, science furnishes numerous cases of fracture of the olecranon. But these fractures, also, which have so much attracted the attention of practitioners, and which are accompanied with a separation of from two to fifteen or eighteen lines, do not destroy the extension of the forearm, even when they are not submitted to any course of treatment. The case of a woman, who, in consequence of a fracture of this kind, had the olecranon for six years drawn up more than an inch from the ulna, without suspecting it, or experiencing any sensible inconvenience in the movements of the limb, emboldened me to leave many fractures of this kind without dressing; and I ought to say, that they have appeared to me to recover more rapidly and more perfectly than those that have been treated with the most ingeniously devised bandages. Every thing shows that the division of the triceps ought not to lead us to form too unfavorable a prognosis. Either by the aid of the suture or of simple position, we could effect its union, either direct or indirect, and so perfectly, that the function of the forearm would be scarcely in the least degree impaired.

If the wound was smooth, or by a cutting instrument, the suture would be preferable to bandages. We should proportion the number of the stitches to the width of the divided tendon, that is, it would require from three to six, according to the age or muscular development of the individual. It would be advisable, also, that the stitches of the suture should include only two-thirds or three-fourths of each end of the tendon.

Supposing that the wound should be contused, and the suture seemed impracticable, or of too difficult application, we should then place the limb in a state of moderate extension, by means of a roller bandage, and a long splint of pasteboard, adjusted upon the anterior surface of the arm and forearm, the whole having been saturated with dextrine, and so arranged as to leave an opening (*fenêtre*) opposite the wound. It is obvious that this wound should be treated, moreover, by the known uniting means, and that the roller bandage should press down the soft parts towards the elbow as much as possible.

For a fracture of the olecranon, indeed, it would be necessary, in order to prevent the retraction of the fragment, to slip between the bandage and the upper fragment some pieces of linen, in fact, a graduated compress, to crowd it downward towards the ulna; but this compress would be extremely injurious if we were treating a division exclusively of the tendon of the triceps.

In the case of rupture of the extensor or flexor tendon of the forearm, we must, as in rupture of the tendons of the wrist and fingers, be prepared in due time to encounter a stiffness (*roideur*) in the neighboring articulations. If the cicatrization appears to progress regularly, we commence at the twelfth or fifteenth day

to moisten the bandage a little opposite to the joint. Eight days after, we need have no fear of increasing the motions a little more; and the dressing is finally removed before the end of the month. From this time we are to take the same precautions as if we were treating a fracture whose callus was not completely consolidated.

We ought, perhaps, to say a word here of the section of the muscles of the axilla and shoulder, and more especially of the tendons of the pectoralis-major and pectoralis-minor; but it has never yet come to my knowledge that any one has proposed to perform the slightest operation on them, with the view of re-establishing their continuity. I will remark only, that those two muscles have been very often divided, either to allow of the axillary artery being tied, or for the extirpation of certain tumors; and that in patients who have survived these serious operations, it has not been observed that the movements of the arm were perceptibly changed. In the only case of this kind which I have had an opportunity of seeing, an intermediate substance, a kind of fibro-cellular membrane of great thickness, which had restored the continuity of the two divided muscles, explained to me how the arm had lost nothing of its power. No doubt the same thing would take place in the deltoid, if it should happen to be cut through a great part of its breadth.

§ IV.—*Tendons of the Foot.*

The extent, variety, and importance of the movements of the fingers, make an important distinction between them and those of the toes. So also has the division of the tendons of the foot occupied the attention of practitioners infinitely less than those of the fingers. Admitting that the solution of continuity of the extensor tendons of the toes should render it impossible to raise those appendages at will, we do not perceive, therefore, that this would thereby be attended with so much inconvenience as to require any great precautions, or an operation that is at all difficult. It would suffice, then, in case of a wound of this nature, to confine ourselves to containing and uniting bandages, without recurring to either a suture or any fatiguing extension.

I should say the same, also, of the flexor tendons, whose entire division, however, appears to be a very rare occurrence. Here, moreover, the indication would be, to keep the toe or toes corresponding to the wounded tendons as strongly flexed as possible. Having a great tendency to turn back upon the dorsum of the foot, they might, without this precaution, be injuriously drawn in this direction by the antagonist extensors.

A. *Tendons of the Tarsus and Metatarsus.*

We find about the lower part of the leg the tendons of the three peronei muscles, the tibialis-anticus, the tibialis-posticus, and the tendo-Achillis, besides those which extend to the toes.

I. *The Anterior Tendons.* If the tendon of the tibialis-anticus only was cut, perhaps there would result from it but little inconvenience to the movements of the foot; but if there should exist at the same time a division of the extensors of the toes, we should have to fear the loss of movement in the flexion of the tarsus, and consequently the formation of a pes equinus, [a variety of club-foot.—*T.*]

Surgery has consequently a part to play here. If the conditions of the wound permitted it, we should apply the suture to the divided tendons. Supposing, unfortunately, that some articulation should have been laid open by the same blow, it would, in order to avoid suppuration with greater certainty, be much better to confine ourselves to the employment of bandages. The bandage could then consist of a sort of stirrup, (*étrier*,) fastened by any contrivance whatever to the neighborhood of the knee. That which offers the greatest security, and at the same time the greatest solidity, is the roller bandage saturated with dextrine, especially if we take the precaution to insert between its layers (*entre ses plans*) a wide and long strip of moistened pasteboard. After leaving an opening on the instep, and keeping the foot forcibly raised up by means of a loop of bandage, until the dextrine is consolidated, there is nothing more to attend to.

II. *Tendons of the Peronei.* The section of the peroneus-tertius would require the same treatment as that of the tibialis-anticus; except that it is far from having the same importance, and it would be important to raise up the foot at its outer edge at the same time with the extension, while with the tibialis-anticus it is directly the reverse.

Tendons of the Peroneus-Longus and Peroneus-Brevis. Concealed as it were behind the external malleolus, and enclosed there in a kind of fibro-synovial groove, the severing of these tendons must necessarily be a rare occurrence. Their division would inevitably cause the turning of the foot inward, and would put this part of the limb in the same state as if there were a paralysis of the outer muscles of the leg. This occurred in a case which I saw: one of the tendons had been completely divided, and the other was half torn off by large broken fragments of a vase of Delft ware. The foot, strongly turned inward, could no longer be brought to its natural direction by the will of the patient. We should apply to this division, also, what I have said of the tibialis-anticus; we should make use of the suture, if the ends of the tendons, though visible, do not appear disposed to put themselves in contact by the aid of position, and provided the wound be sufficiently smooth to leave scarcely any thing to apprehend from suppuration. The position only should be reserved for the other cases. We should have so much the less motive for the employment of the suture, from the fact that even with an intermediary cord, the continuity of these tendons would be sufficiently well established to restore to the foot afterwards all its required force and agility. In a patient I attended, and who is a distinguished physician of Paris, I confined myself to applying a

suture to the integuments, to keeping the foot in abduction, and to subduing the inflammatory symptoms; and although some purulent collections were formed, and the skin seemed to contract adhesions with the subjacent parts, the foot, nevertheless, regained its power and natural mobility.

The dressings in these cases would require only a slight modification. The opening should be left on the outer part instead of in front; the pasteboard splint should be on the inner side in place of behind; a large cord, fastened between the turns of the roller bandage, on the inner side, and passing in form of a bridle under the sole of the foot, would serve to raise the outer edge of this member, by being fixed to the outer surface of the knee.

III. *Posterior Tendons.* The tibialis-posticus and the flexors of the toes, in the event of being divided, should be subjected to the same rules of treatment as those which I have just described, except that it would be more difficult to apply the suture to them; so that position, associated with bandages, would, of themselves, be generally quite sufficent.

B. *The Tendo-Achillis.*

A solution of the continuity of the tendo-Achillis has always seemed a very serious matter. Desport (*Traité des Plaies par Armes à feu*, p. 166; *Bagieu, Examen.*, &c., p. 463) relates, that, but for Méry and Thibault, amputation of the leg would have been performed, at the Hôtel-Dieu, upon a patient who had had this tendon divided, and who, moreover, recovered perfectly without the necessity of this mutilation. The solutions of continuity of this tendon have also been regarded in various points of view; some facts, for example, lead to the supposition that its incomplete divisions expose to more dangers than those that are complete. Molinelli speaks of an individual who, having a partial division of the tendo-Achillis, caused by the cut of a scythe, was seized with a violent fever, pains, and delirium, from which no relief could be obtained but by completing the section of the wounded tendon.

In another patient, in whom the tendo-Achillis was almost entirely divided, who was tormented with pains and by a violent tension, the symptoms were arrested by excising a portion of the tendon of the plantaris, which was found in the form of a fold at the bottom of the wound, (*Mém. de l'Acad. de Bologne*, t. ii., ou Supp. à la Trad. d'Heister.) Clément of Avignon (*Heister*, ibid., p. 135) relates the case of an individual who, after having the tendo-Achillis cut three quarters through, was seized with inflammation, gangrene, and a kind of hydrophobia, but in whom these symptoms suddenly ceased as soon as the remainder of the tendon was divided.

We should, nevertheless, be wrong in concluding, from examples of this kind, that the surgeon should always terminate the divisions begun in the tendo-Achillis. If it be true, that some of the filaments of this tendon may transmit the inflammation and pain both

above and below, when they are found at the bottom of a large purulent wound, it is also true, that they must frequently serve as a point d'appui for the deposite of the new material which is soon to re-establish the continuity of the parts. A man has two-thirds of the thickness of the tendo-Achillis removed by the kick of a horse. The wound, an inch and a half wide, is cleansed, purified, granulates (*se comble*) and cicatrizes, and the patient is completely cured at the end of a month. In any case, however, the tendo-Achillis, when once ruptured, merits all the attention of the practitioner; for it cannot be denied that, in some cases at least, its rupture might involve a severe infirmity. In a patient thus wounded by the cut of a scythe, the reunion did not take place, and walking was utterly impossible, when M. Syme, (*Arch. Gén. de Méd.*, 3e série, t. i., p. 112,) who relates the case, undertook its cure.

Bandages and sutures have often been made trial of to prevent the dangerous consequences which might result from the section of the tendo-Achillis. In two cases of Molinelli, as in that of Clément, the cure was complete, and, nevertheless, bandages only were used to effect it. In another case, (*Collect. Acad.*, t. x.; *Mém. de l'Acad. de Bologne*, t. ii.,) the tendo-Achillis, though entirely cut through, and indurated and tumefied at its inferior extremity, was redissected at two different times in the direction of the os calcis, (*calcaneum*,) without the cure being thereby impeded. The heel, which was at first drawn upward, ultimately, in fact, became depressed. The following three facts are still more conclusive, but resemble each other so much that the question might very naturally be asked, if they do not relate to the same patient, though recorded by three different authors. One is found in the dissertation of Behr, (*De Tendinis-Achillis Soluti Sanatione*, Halle, 1765;) it relates to a man aged forty years, who had the tendo-Achillis divided, from the blasting of a rock. When the tendon itself was pinched, the patient was not sensible of it, but complained severely as soon as the sheath of this fibrous cord was touched. The suture was not applied, and the wound was found filled up at the expiration of six weeks. The patient, who was exceedingly intractable, as it appears, ruptured his tendon anew; incisions were made to evacuate the effused blood, and the reunion took place still more promptly than on the first occasion. Care was then taken against a return, by fastening the heel to the side of the knee by means of a leather strap, (*Gaz. Salutaire*, 4 Dec., 1766, No. 49.) The second of these facts is related by Juvet, (*Journal de Méd.*, Mars, 1760, ou *Bibliot. de Planque*, t. x., in-4°, p. 867.) An officer of the horse grenadiers had the tendo-Achillis divided by a basin of Delft ware which broke under his foot. At the end of six weeks the union appeared complete. An imprudent effort to disengage the foot from beneath the rounds of a chair, reproduced the disease. A separation of more than an inch took place between the ends of the tendon. Treated a second time, and without the suture, the wound got well as at first, leaving, however, a sort of ganglion, of the size of a small nut, on the very place where the rupture of the tendon had been. In the

third case, related by Hérice, (*Méd. Éclairée par les Scienc. Phys.*, t. ii.,) there was a divided tendo-Achillis, which cicatrized with the aid of bandages alone, which again became ruptured, and was reunited anew by means of the same treatment.

If it is certainly true that these three facts relate really to three different persons, they prove indisputably that the section of the tendo-Achillis is far from always requiring the suture. Lieutaud d'Arles, (*Bibliot. de Planque*, t. x., in-4°, p. 870,) also, relates the case of a patient who had the tendo-Achillis divided by a ploughshare, and in whom the cure was effected by simple bandages. The same thing took place in a man of whom Beson (*Desault, Journ. de Chir.*, t. ii., p. 50) speaks, and in whom the tendo-Achillis had been divided by a saw.

We see, moreover, by the cases that Desault refers to, and by a multitude of other facts, that the tendo-Achillis, after its divisions, may generally resume its functions without the intervention of a suture. According to what Dupouy says, (*Desault, Jour. de Chirur.*, t. ii., p. 60,) Pibrac had often seen the rupture of the tendo-Achillis recover by rest alone. Gauthier, (*Ibid.*, pp. 60, 61,) who rejects bandages, gives two facts in support of the doctrine of Dupouy. Rodbard, (*Ibid.*, p. 62,) convinced that the reunion is, in these cases, effected by the deposite of a new material, had no apprehension from walking the day after it occurred. Another patient, treated in the same manner, recovered as well as he did.

One of the most conclusive proofs in favor of this assertion is the fact communicated to Garengeot (*Traité d'Opér.*, t. iii., p. 267, 2e éd.) by Poncelet: There was a fracture of the os calcis; it was thought necessary to open a deposite of blood which was connected with it; the surgeon cut the tendo-Achillis above, and removed its inferior extremity, with the moveable fragment of the os calcis; the patient got well without any deformity. The suture, nevertheless, deserves to be still retained in some cases of solution of continuity of this tendon. Coste (*Garengeot*, t. iii., p. 266) had long since practised it several times with success. A case of the same kind is related by Cowper, (*Philos. Trans.*, 1699, No. 252, *ou Bib. de Planque*, t. x., in-4°, p. 864.) In the article of Desault (*Journ. de Chir.*, t. ii., p. 54) there is also a case of reunion of the tendo-Achillis obtained by suture. There is to be found another case in the report of the Hôtel-Dieu of Lyons for 1822.

Recapitulation. In conclusion, the functions of the tendo-Achillis are too important to make it prudent, where it is divided and easily seized at the bottom of a wound, to rely alone upon position and bandages. There is no doubt that, where there exists a contused wound and bruised tissues, and a large surface in suppuration, we should be satisfied with bandages and dispense with the suture; but should the wound be recent, and still free of inflammation, and resemble wounds from a cutting instrument, and present the possibility of bringing the ends of the tendon in contact, the suture merits the preference.

To apply the suture here, it is necessary to have needles that are

very sharp and strong, because of the firmness of the tendon. Also, it is better to use single than double threads. However fine may be the stitches of this suture, we have scarcely any reason to fear their cutting through the parts embraced by them. Three, four, or six stitches may be required in these cases. As with the fingers, and the other tendons in general, it is better to keep one extremity of these threads outside, and to await its separation. We clean and then unite the wound in a proper manner, before putting the limb in the position it requires to be kept in until the termination of the treatment. This position, which is the same as where we dispense with the suture, has for its object to relax the muscles of the calf. The machines contrived for this purpose, whether those of J. L. Petit, (*Acad. des Sciences*, année 1722, *ou Bibliot. de Planque*, t. x., p. 852,) or of Monro, (*Jour. de Desault*, t. ii., p. 52,) appear to me to be utterly useless. The observations of Rodbard, Dupouy, &c., above referred to, prove even that they would be injurious.

If the immobility of the knee and the flexion of the leg were indispensable, nothing would better answer for this purpose than a long splint of pasteboard, moulded on the forepart of the thigh, knee, leg, and foot, and enclosed in a roller bandage, which, without compressing the limb, would confine it in the position in which it would be desirable to maintain it during the whole course of the treatment. But when we use the suture, this position is entirely superfluous, and when we do not use it, a few lines, more or less, between the two ends of the tendon is a matter of too little consequence for the discreet surgeon to incommode his patient on this account. The ordinary roller bandage, extended from the roots of the toes to below the knee, and made more secure in front by a large splint of pasteboard moistened, will be sufficient in such cases. A band, in the form of a strap, under the sole of the foot, and fastened near the ham, keeps the heel raised up until the bandage, saturated with dextrine, has become thoroughly dried. An opening, expressly reserved, allows the wound to be dressed separately, and the whole occasions but very little inconvenience.

If we were treating a fracture of the os calcis, this bandage would require no other modifications than the addition of a graduated compress, analogous to that which I have spoken of in treating of the olecranon, and which should be fixed above the heel.

The ordinary rupture of the tendo-Achillis would do equally well with the same dressing. It would be sufficient, then, in order to have a perfect bandage, to leave no opening, and to place no graduated compress between the turns; a long splint of pasteboard, moreover, could be applied upon the posterior surface of the leg and the plantar surface of the foot.

In place of leaving the foot immoveable in this position for two months, as many writers recommend, it is proper, in the division of the tendo-Achillis, whether complicated or not with wounds of the integuments, that we should discard the immoveable dressings and extensor apparatus towards the end of the second week, in order from that time to impart gradually more and more extended move-

ments to the parts. For a long time I have used with such of my patients as have been affected with rupture of the tendo-Achillis no other treatment than this.

§ V.—*Tendons of the Femoro-Tibial region.*

The solution of continuity of the fibrous prolongations, that are destined to move the leg, should be examined, both, at the ham and knee.

A. *Tendons of the Ham.*

The projections that these make behind in certain positions of the leg sufficiently show, that the biceps, on the outer side, and the sartorius, and gracilis, and semi-tendinosus, on the inside, may be reached and divided in certain wounds of the popliteal region. I have found no case in authors of solution of continuity of the tendon of the biceps, properly so called. It is not so with the tendons which form the inner border of the ham. Two facts, at least, prove that the division of these tendons does not involve an irremediable loss of the motions of the knee, when treated by simple position and the suture.

A member of the ancient academy of surgery, Boucher, (*Mém. de l'Acad. Royale de Chir.*, in-8°, édit. 1819, t. ii., p. 205,) relates the history of a wound from firearms, which included two orders of flexors in the leg, and which, in spite of destruction of parts sustained by the condyle of the femur, nevertheless allowed of the perfect restoration of the movements of flexion at the knee.

Paré (*Œuvres Complètes*, 9e édit., 1633, in-fol., p. 773) relates the following fact, as among *strange things*, (*choses étranges.*) Etienne Tessier, says he, a master barber-surgeon, has told me that he dressed Charles Vérignel, for a wound which he had in his right calf, with complete incision of two of the tendons which flex the leg. He sewed these two tendons together, end to end, and treated his patient so well that the wound consolidated perfectly.

It may be conceived that, in a region like this, the suture could not be attempted, unless it should appear easy to reach and approximate together the two extremities of the divided tendon. This suture would be so much the more necessary, as the tendons of the ham retract, in general, to a great distance in the direction of the thigh. If, however, it should not seem prudent or practicable to apply it, we should have no great reason to regret it, seeing that the divided tendons, ultimately becoming attached to the muscles which remain fixed upon the tibia, would, in fact, make use of these last to transmit their action to below the knee. The best position of the limb, in such cases, is that which keeps the leg in a state of flexion and the thigh in a state of extension.

B. *Tendon of the Knee.*

The extensor muscles of the leg, arriving at the knee, all unite together to form one single tendon. Interrupted by the patella, this

tendon, which is more especially the termination of the rectus femoris, is inserted, as we know, upon the tubercle of the tibia, after having taken the name of the inferior ligament of the patella.

We may thus comprehend how it may be divided in three different regions—that is, above and below the knee, and also on a line with its articulation. These three different kinds of solution of continuity are, moreover, represented by the *transverse fractures of the patella*, by the ruptures of the sub-patellar ligament, and by the solutions of continuity of the *tendon of the rectus femoris*.

Whether viewed in its ensemble, or in one of its regions, the extensor tendon of the leg has never been divided without creating great anxiety in the minds of surgeons. The numerous dressings devised for curing fractures of the patella are a proof of it. As bandages have less hold on the ligament of the patella and the tendon of the rectus femoris, than on the fragments of the patella, properly so called, authors have been still more alarmed with the pure and simple division of the tendons of the knee than with fractures of the patella itself. Seeing that the muscles of the thigh had thus lost all their attachment to the tibia, it was thought that the leg, no longer able to extend itself, would then be inevitably drawn backwards by the flexor tendons.

Fracture of the Patella. An attentive observation of facts happily shows, that practitioners, on this point, have been deceived by false inductions. The numerous examples, however, of fractures of the patella remaining with an extended separation of the fragments, and without the functions of the knee having thereby lost their power or agility, ought to have awakened attention on this point. For my own part, I have seen facts of this kind of the most conclusive character. An ancient officer of marine, who had a separation of five fingers' width between the two fragments of the patella, nevertheless executed with this leg all the functions and all the movements that the other was capable of. I have since met with at least a dozen persons who thus had from six lines to an inch, and even two inches, of separation, resulting from former fractures, yet experienced no inconvenience. Also, since 1832, I have dispensed, in patients affected with this fracture, with all annoying dressings; to prevent the consecutive stiffness of the articulation, I permit them to get up and walk about at the end of twenty to thirty days, and even sooner, if the separation is inconsiderable. In proceeding in this manner, I have seen fractures of the patella recover more perfectly, and with infinitely less trouble, than by the long-protracted employment of the most ingenious dressings. In this very year, (1838,) I have twice observed this fact, and in the same patient, at the hospital of La Charité. A cooper's boy, of strong and robust make, breaks his patella; the two fragments of bone, separated more than two inches, are brought together at the distance of some lines from each other, and kept in contact by the uniting bandage for transverse wounds, associated with the roller bandage, which has been rendered immoveable by the solution of dextrine. It was

impossible to prevent this patient from getting up and walking on the tenth day, and, in fact, from quitting the hospital at the end of a month. Annoyed by this bandage, he found means of getting rid of it before the fortieth day, and came from Passy on foot to show me, at the public consultation, that he was perfectly cured and limped no more. A thick and firm bridle, an inch long, united the two fragments of the divided patella to each other. A month later this boy fell on his knee again and broke the patella a second time, or, to speak more properly, the intermediate substance which had restored its continuity. This time we found a separation of four fingers' width. The same bandage was applied, and the young man left the hospital at the end of three weeks. He took off the dressing himself fifteen days later, and again came from Passy on foot to show me his knee at the consultation. He walked then without limping, and felt no weakness in his knee, except when he attempted to run, or to give a kick with his foot. The two fragments of the patella, however, remained separate by more than twenty lines, and the patient was still only at the sixth week from his second wound. I saw him two months after, and he thought no more of his fracture.

What I have said of the patella is applicable, in every respect, to the superior and inferior ligaments of this bone. We see, in fact, that the extension of the leg ultimately becomes re-established in patients who have rupture of the tendon of the patella, or of the rectus femoris of the thigh. There came into the hospital of La Charité, in 1838, two men with rupture of this last tendon; though it was not practicable to effect the union by immediate contact, the cure, nevertheless, took place in both patients without the functions of the leg being perceptily disturbed. It may also be remarked, that the patient who had been the longest under treatment, and by the most ingenious dressings, retained much more stiffness in the knee than the one who began to walk at the fifteenth day from the accident.

What makes the solution of continuity of the extensor tendons of the leg cause less lameness than one would at first suppose is this, that the new tissue which unites the two ends is itself ultimately transformed into a substance which almost perfectly replaces the primitive tendon. All, therefore, that results from it is, that the cord is found a little longer than it was in its natural state; but, as the retraction of the muscles soon compensates this excess of length, the movements of the limb experience, in reality, but a very slight degree of derangement.

It is also very clear that, at the knee more than anywhere else, the rupture of the tendons with wound of the integuments must be infinitely more serious than that which takes place under the skin. In this last case, however, a roller bandage saturated with dextrine, (*dextriné*,) with the interposition of a pasteboard splint from the ischium down to the heel, and associated with strips of the uniting bandage for transverse wounds, is almost always sufficient. Rendered immoveable and maintained in a sufficient degree of ex-

tension by this bandage, the limb allows of walking at the second week of the accident, and the patient may, without danger, divest himself of all the dressing by the thirtieth or fortieth day.

In the event of there being an opening in the skin at the same time that there is a division of the tendon, it would be necessary to apply the same bandage, if we should be called before the accession of the inflammatory symptoms, but in such manner as to leave an aperture, of greater or less size, opposite the wounded or inflamed region. In this case, we must do every thing to obtain as perfect a coaptation as possible; and as this coaptation never takes place in an exact manner by the aid of simple bandages, when we are treating the supra and sub-patellar ligaments, it would become necessary to resort to the suture. For the tendon of the rectus femoris, there would be an advantage in inserting the needle first on the femoral end, the only one which has any tendency to retract and to become concealed under the integuments; for the ligament of the patella, it would also be advisable to begin with the upper end, which, in these cases, is the most moveable and flabby, (*flasque.*)

I have no necessity of adding, that the surgeon must expect, also, in these kinds of sutures, to meet with great resistance on the part of the tissues, and that he ought to provide himself with very sharp-pointed needles.

The suture being inserted, we apply upon the region left uncovered by the immoveable bandage a simple dressing, or cooling compresses, or emollient applications, according to the indication. If too much inflammation should supervene, leeches should be placed in sufficient number in the aperture of the bandage, which also allows perfectly well of the application of poultices. On the supposition that the wound occupies the ligament of the patella, we should depress the bandage in such manner that, in arriving at the knee, it would push down the patella with a certain degree of force in the direction of the leg. For the rectus femoris, the position of the bandage applied to the leg should, on the contrary, be raised sufficiently high to crowd the patella as much as possible towards the thigh. It is, therefore, only for divisions of the patella itself that it would be proper to approximate the edges of the aperture of the bandage to an equal distance upon each of the fragments, and to associate with the immoveable bandage (*bandage inamovible*) the uniting bandage for transverse wounds. On the supposition that the section should not extend into the capsule of the joint, it would be allowable, if there should supervene no accident to the wound, not to retain the patient in bed longer than from fifteen to twenty days. In the contrary case, no certain rule can be given for the precautions to be taken. All that we can say is, that, after a perfect cicatrization of the wounds of the integuments, there would be no great risk in allowing the patient liberty to get up and perform some movements at the expiration of five or six weeks.

§ VI.—*Tendons and Muscles of the Thigh.*

I have once seen a sub-cutaneous rupture of the sartorius muscle, and several times the section of the muscles which go from the pelvis to the leg. But those muscles are much more apt than their tendons to unite by the aid of a cellulo-fibrous deposition, which speedily and effectually re-establishes their functions. It follows, therefore, that the section of the muscles of the thigh, like those of the leg and arm and forearm, have no need of the aid of operative surgery, and that the treatment it requires is reduced to the keeping of the limb at rest for the space of a few days.

Article II.—Deformities by Retraction of the Tendons or Muscles.

Numerous deviations are caused by certain muscles or tendons becoming permanently retracted and shortened.

§ I.—*Treatment.*

Topical and orthopedic remedies on one hand, and the operation on the other, are the only resources which science at the present time employs for the permanent retraction of the tendons.

A. *Topical Applications.*

The deviations produced by the retraction of the tendons, and for counteracting which, applications of opium and belladonna, also the massage, electricity and sudden fright, (*surprise*,) and an infinity of remedies, have enjoyed a reputation, seem to have now found a more efficacious resource in the methodical section of the tendons or muscles themselves. I shall, therefore, in this chapter, have to treat of an operation which, so to speak, is new, and not of orthopedic means, properly so called; an operation designated under the name of *enervation* by some veterinary surgeons, which is more generally known at present under the title of *tenotomy*, but which would require another epithet to make it applicable at once both to the muscles and tendons.

B. *Tenotomy.*

The section of the tendons should not be performed but for permanent deviations that are already old, or at least of some months' duration. Before deciding upon it, we should be assured that the deviation does not proceed from some articular rigidity, (*roideur*,) nor from sub-cutaneous bridles, nor inodular cicatrices; that it depends, in fine, if not exclusively, yet in great part, upon a shortening and unnatural stiffness in some of the tendons or muscles.

Though apparently modern, tenotomy dates, nevertheless, from an early period. Holland was, it may be said, its cradle. Tulpius, the first who speaks of it, mentions Isacius Minius as having practised it, (*Tulpius, Observationes Medicæ*, liber iv., caput 58, p. 372, 1685.) It appears, moreover, that Solingen, (*Thèse de Jaeger*, 1737,) also, performed it in the seventeenth century. Meckren, and Roonhuysen, whose cases Heister (*Inst. Chir.*, t. ii., p. 672) cites, had also followed, together with Blasius, Tenhaaf, (*Chelius. Man. de Chir.*, trad. de Pigné, t. i., p. 463,) and Cheselden, (*Rust's Handbuch der Chir.*, vol. iii., p. 629,) upon the steps of Minius and Tulpius.

The dangers of wounds of the tendons were so great in the eyes of most practitioners, that, in spite of such essays, tenotomy fell into complete oblivion. A memoir, published in 1742, by de la Sourdière, still terminates in this wise: "*We ought, therefore, to avoid the section of the tendons.*" The sensibility of these organs, as maintained by Boerhaave, explains, moreover, the timidity of surgeons on this subject. And it is not until the year 1782, that we find any new examples of tenotomy. Lorenz, who, according to the assertion of Thilenius, (*Chirurgische Bemerkungen*, 1784, *ou Ammon, De Physiologia Tenotomia, etc.*, 1837,) practised it at this epoch, was but imperfectly imitated by Michaelis, (*Hufeland und Himly's Journal*, Novembre, 1811, t. xxxiii.) Michaelis, in fact, only partially divided the tendon, and denies having made a complete section of it. It is astonishing that Sartorius, (*Gaz. de Saltzbourg*, t. iv.,) who put it in practice in 1812, has not, however, succeeded in causing tenotomy to be adopted in Germany. It was no longer spoken of in any country, when Delpech, (*Malad. Réput. Chir.*, t. i., p. 669,) who had already mentioned it in favorable terms, introduced it into France in 1816. The attempt of the professor of Montpellier, however, had the same fate as that of the German physicians. The veterinary surgeons, nevertheless, of that period, made frequent trials of it. From 1820 to 1836, there have appeared the observations of Lafosse, Bruchet, Debaux, Bouissy, Delafont, Choppin, Lortau, and Casten, (*Dict. d'Hurtrel d'Arboval; Manuel de Watel; Procès Verbal de l'Ecole de Lyon*, 1822; *Journal Pratique de Méd. Vétérin.*, 1826; *Recueil de Méd. Vétérin.*, 1824, 1830, 1832, 1835,) who all demonstrate the advantages and safety of tenotomy. Two observations, also, taken from the practice of Dupuytren, show that this surgeon had performed it on men in 1822 and 1823. There was scarcely any notice, however, taken of these facts, when M. Strohmeyer (*Journaux de Rust, de Casper, de Blasius, et Archiv., Gén. de Méd.*, sér. 2, t. iv., p. 100—sér. 2, t. v., p. 194) published successively six cases, and made known the experiments which he had performed in conjunction with the veterinary surgeon, M. Gunther. Since then, tenotomy has become so general in France, England, and Germany, that it ought to take a definitive rank in the departments of operative surgery. M. Dieffenbach told me, in 1837, that he himself had performed it more than two hundred times. M. Syme, M. Lyttle, and some other English surgeons, have also had recourse to it. In France, M. V. Duval

gives more than two hundred cases of it, (*T. Duval, Thèse*, No. 342, Paris, Août, 1838.) MM. Bouvier, Stoess, Serre, Scoutetten, (*Cure Rad. des Pieds Bots*, 1838,) and Jules Guerin, also, give numerous examples of it.

Tenotomy in General.

Scattered facts in scientific works ought, also, to have sufficed to show how little dangerous is the section of the tendons. Almost all those I have spoken of, in treating of the suture and wounds of tendons, are of this kind. It has also been proposed for carrying out two very different kinds of indications. Some surgeons, in fact, have had recourse to it with the view of remedying the accidents from certain wounds, while tenotomy at the present time is employed only for simple deformities.

a. *Tenotomy in Cases of Wounds.*

One of the cases mentioned by Molinelli, and where the tendon, at first partially divided, was afterwards completely cut through by the surgeon, nevertheless recovered perfectly. In a case where purulent collections (*fusées*) and gangrene were making rapid advances, the excision of a gangrenous portion of the tendon put a termination to the progress of the mischief. In a third case, the unpleasant symptoms caused by a wound which included the tendo-Achillis, were subdued after the excision of the plantaris, which was seen at the bottom of the division. A more remarkable case still, was that of a tendo-Achillis which it was necessary to dissect off at two different times from the side of the os calcis, to prevent the denudation and purulent collections, which continued to extend themselves. Under this point of view, the observation of Clément, already quoted, is equally important. I have also said that Poncelet had thought it advisable to open a deposite of blood which covered a fracture of the os calcis, and to cut the tendo-Achillis to extract the fragment of broken bone. We have seen that Desport, also, divided the tendo-Achillis, because of an ulceration which had invaded it, and of the serious consequences that appeared to be connected with this ulceration. It would, without doubt, be difficult to say, at the present time, whether, in the cases which I have referred to, it was really advantageous to terminate the section, or to excise a portion of the wounded tendons. We are struck, however, with the termination of the difficulties as soon as these operations were performed. On the supposition that such results were not imputable to pure coincidences, it would not, perhaps, be impossible to give an explanation of them. At the present time, no one, as it seems to me, believes in the extreme sensibility of the tendons, in the necessity of their exfoliation when they have been in contact with the air, or in the dangers of their wounds; but when we consider that they are surrounded with synovial networks, or sheaths, sometimes cellular, and at other times fibrous, it appears quite natural that the inflammation which is established at the bottom

of, or around their wounds, should readily take on a diffusible character, and thus soon cause extensive devastations.

Everybody, moreover, knows that suppurative inflammation, which spreads along the tendons and synovial membranes, is soon accompanied with acute pains, cerebral reaction, gangrene, or convulsions. Now is this a sufficient reason that the excision of a denuded tendon, or its section when it is found only partially divided at the bottom of a wound, should be recommended? For myself, I am disposed to believe not; but I admit that we have, perhaps, still further occasion of consulting experience upon this subject.

b. *Tenotomy, properly so called.*

It is, therefore, for the purpose of remedying deformities that tenotomy should, in fact, be reserved. Under this point of view it is applied, and may be applied, to all the tendons and long muscles that are not separated from the skin by any important organ. It has already been practised upon the toes, around the tibio-tarsal articulation, at the lower part of the leg, upon the ham, fingers, and neck. No doubt it is equally applicable to the wrist, bend of the arm, axilla, and knee. Hitherto surgeons have performed it either by dividing, transversely, both the skin and the tendon, or the tendon or muscle, by drawing it outside through a longitudinal opening in the integuments, or by not dividing the skin except upon the side or sides of the tendon; from thence come three different methods of tenotomy, of which one only, as it appears to me, should be retained, under the title of a general method.

1. *The Dutch Method.* Tulpius and Minius scarified the skin (*escarrifiaient la peau*) before dividing the tendon. It appears that others made use even of fire or the hot iron for the whole operation. Joeger, (*De Capit. Obstip., etc.*, Tubing., 1737,) who rejects caustics, and prefers the scalpel to the scissors, recommends, like Heister and Solingen, that the incisions should be transverse, and as near as possible to the clavicle. It is in this manner that Dupuytren still proceeded in 1822. Lorenz, and Michaelis also, divided both the tendon and its envelopes. This method, which M. Roux and M. Amussat have more recently put into practice, ought at the present time to be wholly rejected. Besides the pain, inflammation, and suppuration it may cause, it has the serious inconvenience of making a wound which tends to the formation of an inodular cicatrix, which may at a later period reproduce the deformity.

2. *Method of Sartorius.* In place of dividing the skin transversely, M. Reiche, (*Held, Thèse*, Strasbourg, 1836,) adopting the practice of M. Sartorius, divided the skin lengthwise. This first incision, more than three inches long, as practised by M. Sartorius, had but an inch and a half of extent in the patients of M. Reiche; allowing either the tendon or muscle to be raised up, and to be cut immediately upon a grooved director, it renders the operation very easy. In proceeding thus, we should doubtless have more chances than by the transverse incision, of obtaining an immediate reunion of the wound of the integuments, and which, at the same time,

would not hinder the separation of the two ends of the divided tendon; but there would be too much to apprehend from inflammation and suppuration to make it advisable to confine ourselves to this method, which was put in practice by M. Magendie, and which M. Bouvier, (*Bouvier, Mém. de l'Acad. Royale de Méd.*, t. vii.,) also, seems to prefer. M. Reiche, also, himself admits that in one of his three patients the wound went on to suppurate for several weeks.

3. *Method of Delpech.* Delpech had recourse to another method: having first laid it down that the tendon ought not to be denuded, he believed that in order to effect its section it was necessary to make a kind of circuit, (*détour.*) A bistoury, held flatwise, was inserted by the side of the tendon, and slipped along under the skin to the opposite side, as in the manner of inserting a seton. Having given about an inch in length to each of the wounds, Delpech introduced in the place of the bistoury a small convex knife, which served to divide the tendon through, in cutting from the skin towards the deep-seated parts.

This method differs from the two preceding in an essential point; its avowed purpose is not to permit the tendon to remain on a line with the wound. It includes at present a certain number of processes.

Practised in the manner it was by Delpech, it gave place to two wounds of too great length. In suppurating, these wounds might transmit the inflammation to the two ends of the tendon. It is what actually took place in his patient, since *exfoliation* did not allow him to commence with the extension before the twenty-sixth day, while close adhesions were formed between the sides of the tendon and the cicatrix of the two external wounds.

Process of Dupuytren. M. Strohmeyer, while he adopted the method of Delpech, subjected it, after the example of Dupuytren, to an important modification.

Provided with a narrow bistoury, a little convex towards its point, the operator penetrates by a simple puncture from one side of the tendon to the other, and then divides the tendon by a saw-like movement from its deep-seated surface to the integuments. In this manner tenotomy is reduced to a simple puncture, which is not followed by any flow of blood, and the wounds of which have all the chances possible of cicatrizing immediately.

This process appears to have been modified in France, almost at the same time, by M. Stoess and M. Bouvier. M. Duval, who, on his part, believes that he has brought it to perfection, (*Pivain, Thèse*, No. 212, Paris, 1837,) gives the same position as Delpech to his patient, and inserts the *tenotome* upon the deep-seated surface of the tendon; then turning upward the cutting edge of the instrument, he immediately divides the tissues from the deep-seated parts towards the skin, as M. Strohmeyer does, taking care, as M. Dupuytren and M. Syme had already done before them, not to let the instrument perforate through the skin on the side opposite to that of its entrance.

Process of Stoess. The simple puncture on one of the sides of the

tendon, with the precaution of not disturbing the continuity of the integuments upon the opposite side, now constitutes the most simple process that science possesses. So, also, does this already comprise at least two shades of modifications quite distinct, which belong, one of them to M. Stoess, and the other to M. Bouvier. That of M. Stoess (*Held, Thèse*, Strasbourg, Juin, 1836, p. 53) is no other than the preceding. It is, moreover, seen, by the details given by M. Held, that it was performed at Strasbourg in 1835, while M. Duval could not have used it until a year later.

In approximating dates, in fact, we are induced to think that it was put in practice nearly at the same epoch; that is to say, in January or February, 1836, by M. Stoess and M. Bouvier. M. Duval, in fact, adhered to the primitive process of M. Strohmeyer in his operation in the month of October, 1835, and has not spoken of that which M. Pivain attributes to him until at a much later period. I have, also, already said, that this modification of tenotomy had previously been projected by Dupuytren in 1822, before, therefore, the trials of M. Strohmeyer, and that MM. Syme and Dieffenbach had adopted it since 1829 and 1833.

Process of Bouvier. Besides the process of which we have been speaking, and which M. Bouvier claims, he has, also, occasionally followed another, which consists not in gliding the instrument between the tendon and deep-seated parts, but, in fact, between the tendon and the teguments, so that he divides the retracted cord in going from the skin towards the centre of the limb. It is a process which some other surgeons also have used, and which, it is said, was suggested by M. Dieffenbach in the year 1830. We should do wrong, after all, in attaching any great degree of importance to any one of these varieties of tenotomy over another. They are all good, and the surgeon should be at liberty to use each of them in their place, according to the indication.

Whatever may be the mode of operation preferred, we hear, at the moment of the section, a characteristic crackling sound, (*cracquement,*) which does not cease but with the division of the last fibres of the tendon. At the instant when the tenotomy is terminated, there takes place a separation between the extremities of the divided tendon which may reach to two or three fingers' width. The retracted part being no longer drawn in the direction in which it had until that moment been confined, renders it now practicable to restore it to its natural direction.

The pain caused by this operation is generally slight. We now do all in our power, also, to effect the immediate union of the puncture in the skin, and to prevent suppuration from establishing itself underneath.

c. *Appreciation of the Methods.*

The relative value of the different modes of practising the section of the tendons is easy to determine. It is evident at first sight, that the Dutch method, or that of Tulpius—that is, the one which consisted in dividing successively, or with one incision, both the

integuments and the tendon, belongs to the infancy of the art, and should be totally rejected. At most, it should be reserved for those cases where the tendon upon its external face is blended with the integuments.

The method of Michaelis, having for its object to divide only a part of the thickness of the retracted tendon, whether including in it the tegumentary division of the method of Tulpius, or adopting the first stage (*premier temps*) of the method of Delpech, is out of the question at this day. It is also clear, that the method of Sartorius, in which the skin is incised in the direction of the axis of the tendon, and the latter afterwards raised up to be divided upon a grooved director, has all the inconveniences, without the advantages, of the improved method of Delpech. These, then, are the three methods that no longer merit being preserved, except as applicable to some special cases.

The two long wounds connected with the process which properly belongs to Delpech, would not give to his method a manifest preference over that of Sartorius, since it would be often difficult in that case to obtain an immediate cicatrization of the division of the integuments, and to prevent inflammation from proceeding to the extent of suppuration between the two ends of the divided tendon; but those who have modified it since have remarkably enhanced its value. It is only necessary to add, as I have already said, that the difference between the processes of M. Strohmeyer, M. Bouvier, M. Stoess, and M. Duval, is not of sufficient importance to require that we should necessarily, and in all cases, adopt one in preference to the other. M. Strohmeyer, who, in one of his patients, only partially perforated the skin on the side opposite to the point where the instrument had entered, and who, on this account, would perhaps be entitled to claim for himself the processes which now have the most repute in France, were it not that his own method itself reverted of right to Dupuytren, maintains that the two punctures have no greater inconvenience than a single one, and that they render the section of the tendon more easy. After that, whether the tendon is divided from before backwards or from behind forwards, from right to left or from left to right, cannot, in reality, be a matter of any importance. Whether the wound of the integuments, the same as that of the tendon, is transverse, or longitudinal, as MM. Bouvier and Duval practise it, is also a matter of secondary consideration. In fine, whether we employ for the whole operation an ordinary and rather narrow bistoury, or a kind of small scalpel with a convex point, or begin by a puncture with the lancet, to recur afterwards to the *tenotome* of M. Stoess, M. Bouvier, M. Duval, or M. Scoutetten, will not, as I conceive, in any respect, either take away from or add to the danger of the operation.

In fine, the process which consists in making only a single puncture in the skin, and in which we divide the tendon from its superficial part towards its deep-seated part, is, all other things being equal, the one which merits the preference. In associating with it an incision of the integuments parallel with the axis of the tendon;

in making this incision with the point of a lancet; in inserting afterwards, flatwise, through that puncture, an ordinary blunt-pointed (*boutonné*) bistoury, or one of the tenotomes of which I have just spoken, while with the other hand we raise up the skin in the form of a fold; in thus forcing the instrument onwards, until it has passed beyond the limits of the other border of the tendon; and in then turning down its cutting edge upon the cord to be divided, and which is immediately made tense, in order that, by means of gentle saw-like movements, it may permit itself to be cut through by the bistoury, we have an operation almost entirely destitute of pain, which scarcely causes a drop of blood, whose puncture is generally cicatrized upon the succeeding day, and which, nevertheless, accomplishes all the indications desired.

Nevertheless, we should not be too much alarmed, if the point of the bistoury should make two punctures in the skin, instead of one; or if, in finding some difficulties in passing between the skin and tendon, we should see ourselves compelled to divide this last from its lower to its cutaneous surface, provided we take care, in terminating the operation, to avoid the internal surface of the integuments. There are circumstances, moreover, in which one of these processes should have the preference over the others. We may, in fact, conceive that kind of arrangement of parts, either anatomically or pathologically, which might render the process of M. Bouvier impossible, while permitting the application of that of M. Stoess, and again, in some other cases, we could scarcely dispense with that of Dupuytren or M. Strohmeyer.

I shall have occasion to return to this question again in treating of the section of particular tendons.

The tendon being once divided, it is generally possible to straighten the retracted parts, unless there should be some complication in respect to the neighboring articulations or bones. If that should be the case, however, the deformity would rarely fail to be reproduced. On this subject there are now prevailing two principles, which are quite opposed to each other. M. Strohmeyer recommends not to straighten the parts but by insensible degrees; M. Bouvier, on the contrary, that they should immediately be brought into their normal position, when it is possible so to do.

The practice of M. Strohmeyer, which was also that of Delpech, and which M. Held also extols, is based upon this, that the two ends of the tendon being for several days very nearly approximated to each other, the material which fills up the space between them is then allowed to distend and elongate itself without disturbance; while at an earlier period it might be ruptured or not be formed. M. Bouvier, however, maintains that we may from the very first, with perfect safety, keep the ends of the tendon at one or two inches apart, and that we can thus obtain a more certain elongation, and one full as solid as by the other mode. In order to decide who is wrong or right in such a question, we must interrogate pathological anatomy and direct experiments.

d. *Pathological Anatomy.*

Delpech, (*Cliniq. Chir. de Montp.*, t. i., 1823; *Orthomorphie Humaine*, 1828, t. ii.,) returning to his favorite idea, asserts that the two ends of the tendon are united by means of an inodular tissue. M. Acher (*Thèse*, No. 112, Paris, 1834) relates experiments which would tend to the opinion that this union is effected by an effusion of lymph or glutinous liquid, (*suc glutineux ;*) while M. Held attributes it to an agglutination of the walls of the sheath of the tendon. M. Duval, also, experimenting on rabbits, thinks he has ascertained that the new substance is composed of a melange of fibrine and plastic lymph; but the experiments the most detailed, which have been published up to the present time, with the view of elucidating this question, are those of MM. Ammon, (*Tenotom.*, etc., *ou Expér.*, t. i., p. 155,) and Bouvier, (*Bullet. de l'Acad.*, Nos. 5, 6, 8, 11, 20, t. i., et 15, 16, t. ii., *ou Mém. de l'Acad. Roy. de Méd.*, t. vii.)

1. *Ammon.* Operating on horses, M. Ammon has, at the expiration of twenty-four hours, found the two ends of the tendon lost, as it were, in the midst of a mass (*magma*) of strongly adherent blood. At the end of two days, the extremities of the tendon were surrounded with a clot of blood, (*caillot,*) one portion of which seemed already imbued with plastic vitality. On the fourth day, the intervening space (*l'écartement*) of the division of the tendon was still filled with blood. On the upper end was perceived a small cone of sanguinolent plastic lymph; a similar cone was also found upon the lower end. On the seventh day, the two ends of the tendon having become tapered down into a conical shape, were considerably approximated to each other. Plastic, thread-like exudations extended from one to the other. In a fifth horse, examined at the end of a month, the tendon appeared to be all of one piece; the intermediary substance was an inch long, and differed but little from the structure of the tendon itself.

Repeated upon rabbits, these experiments have not been conducted with sufficient rigor to enable us to deduce any thing of a positive nature from them. The author thus sums up the results of his observations: After the section of a tendon, the wound is filled with a compact clot of blood, which soon becomes confounded with the neighboring tissues and tendinous surfaces. A plastic lymph, which exudes from the cut of the tendon, gives birth in its process of organization to filiform prolongations, which go from one end of the divided part to the other. At a period somewhat later, this lymph is replaced by a tissue very analogous to that of the tendon, which tissue preserves a bloody aspect, and finally assumes a bluish tint.

2. *Bouvier.* In the manuscript which he has had the kindness to send to me, M. Bouvier speaks in a different manner. From the second to the third day this physician has found the cellular sheath thickened, more consistent than in the natural state, and forming a species of canal, which embraced by its extremities the two ends of the tendon. Ecchymosed as it were, or of a bright red color

internally, this sheath was also in contact with itself, (*en contact avec elle-même.*) On the ninth day M. Bouvier found it of a grayish color, and destitute of fibres. At a later period, and towards the twelfth day, the canal of this sheath began to be effaced, and the two ends of the tendon were still distinct in its interior. It presented the form and nearly the size of the tendon towards the eighteenth day, though it still contained a certain quantity of serous liquid. By the twenty-fifth day, it was almost entirely similar to the tendinous tissue itself, at least in consistence. M. Bouvier concludes, from these experiments, that the new tendon is formed at the expense of the surrounding cellular tissue, which, converted at first into a canal with contiguous walls, changes, little by little, into a solid cord of fibrous substance. In this, M. Bouvier differs essentially, as is seen, from M. Ammon, and approximates much nearer to M. Held or M. Acher.

According to M. Ammon, the union of tendons could be explained by the doctrine of Hunter. The blood effused between the ends of the fibrous cord would, in concreting, attach itself to them, and would become organized by mingling with an exudation of plastic lymph, capable of acquiring, by degrees, the consistency and a part of the other anatomical characters of the tendons. The experiments of M. Bouvier would conduct us rather to the doctrine of Bichat, since, according to the satement of this author, the intermediate substance should be no other than the cellular tissue which naturally surrounds the tendon, and which, by a nutritive process, (*nutrition,*) incidentally increased, (*exagerée,*) becomes thickened and hardened, and transformed by degrees into an actual fibrous tissue, and ultimately converted into a true tendon.

3. *The Author.* For myself, I ought to avow, that the experiments of M. Ammon have not to me appeared conclusive; almost all of them, in fact, have been complicated with some accident, whether in relation to the tegumentary wounds, or to the division of the tendon itself. The clots of blood which the author speaks of, are themselves nothing but an accident. Tenotomy, as it is practised at Paris, has not produced any thing similar to them.

Without having made direct experiments on animals, I believe that I may be allowed to speak of the union of tendons according as I have observed it in man. One of the patients whom I attended for a rupture of the tendo-Achillis, had, for a few days only, a very slight ecchymosis opposite the wound. I did not observe in this point any trace, either of effusion or of clots of blood. The rupture, which was recognisable with the aid of the finger, filled up little by little, while it preserved the characters of a cellular tissue, gradually passing into a fibrous transformation. Having watched with much attention the process of consolidation in fractures of the patella, I had here also satisfied myself, that the bridle, which finally re-establishes the continuity of the bone, does not result from an effusion of fibrine, or an effusion of plastic lymph, at least in a majority of cases, but that it results in reality from the approximation, concentration, hypertrophy, or fibrous

transformation of the cellular lamellæ in the neighborhood. I have also had it in my power to observe and watch this action, in a manner to leave no doubt of its nature, in two cases of rupture of the tendon of the rectus-femoris, in many cases of fracture of the olecranon, and in an individual who had had the os calcis shattered.

The action of which I have just spoken, is connected, also, with a great question in anatomy, or organic evolution, properly so called. Minute dissections and observations, detailed in the last edition of my Treatise on Surgical Anatomy, prove, if I do not deceive myself, that cellular tissue may be transformed into fibrous tissue, and this latter into muscular tissue, and vice versâ.

If this be the fact, not only the section of the tendons, but also the treatment of accidental ruptures of these parts, should be subjected to rules that the doctrine of Hunter, sustained by the experiments of M. Ammon, and by some of those of M. Duval, would reject as imprudent or dangerous.

Every thing shows, also, that the union of the tendons is effected nearly in the same manner as that of the bones. At the bottom of wounds, or where the division of the tendon enters into suppuration, or remains a long time in communication with the atmosphere, it is by a sort of cellulo-vascular vegetation, by the production of a kind of inodular tissue, that the union takes place. If no inflammation nor accidental suppuration supervene, and the two ends of the tendon are kept in exact contact, the cicatrix is formed by a true callus, that is to say, by a direct agglutination, or a kind of imbrication of the fibres of each divided end. When a perfect state of immobility has not been maintained, this union is effected by a kind of fibro-cellular thickening, (*renflement*,) in some degree analogous to the ferrule (*virole*) of Duhamel or of Dupuytren. This species of swelling which I speak of, and which sometimes remains during life, on the point of contact of the two ends of the tendon, is not alone seen, as M. Mondière believes, in cases where the suture has been employed. I have observed it twice after the rupture of the tendo-Achillis, once in the extensor tendons of the fingers, and once after the section of the tendon of the flexor carpi ulnaris. Some observers mention it even in certain cases where the two ends of the tendon were decidedly united by an intermediate substance, (*Lenger, Encyclograph. des Sc. Méd.*, 1838, p. 145.)

When the union of a ruptured tendon is effected under the skin, which remains unbroken, and without our endeavoring to approximate its two ends, the effusion of blood or plastic lymph between them would only be incidental. The cellular sheath yields, elongates itself, and is converted into a kind of canal, more or less flattened. Connecting itself with the common sheath above and below, this canal seems as if it were strangulated in its middle portion. In a short time it becomes the centre of an afflux [of blood,] which augments its nutrition; the cellular filaments in the neighborhood attach themselves by degrees to its external surface. The cellular tissue of each end of the tendon swells, and thickens at the same time, which gives rise there to a kind of enlargement,

(*renflement.*) The more it progresses, the more the hypertrophied sheath of the tendon approximates to the form of a ligament, and loses its attributes of a canal. Projecting in form of a cone, each end of the tendon becomes imperceptibly blended with the kind of double funnel (*double entonnoir*) which covers (*embrasse*) its extremities. The molecular process continuing, the entire mass finally forms a cord, sometimes strangulated in its middle, and as if embossed (*comme bosselé*) at its two ends, and which in other cases acquires such density and force of resistance, that the muscular action is transmitted through this part in the same manner as through the sound tendons. Perhaps, says M. Bouvier, the sheath in question would remain too weak, and would retain the characters of cellular tissue towards its middle, if the separation of the tendon was too wide, or exceeded, for example two or three inches. I will remark, however, that in a patient who had taken no repose after the accident, and who, in consequence of a fracture of the patella, had, in front of the knee, a separation of at least five fingers width, the supplementary bridle had, nevertheless, sufficient force to transmit to the leg all the power of the anterior muscles of the thigh.

After these facts, I regard it as very important to practise tenotomy: 1. By a narrow puncture into the skin; 2. By cutting through the tendon as effectually as it is possible to do it, while taking care to avoid its cellular sheath; 3. By avoiding with care the vessels that might cause the least effusion of blood; 4. By straightening the leg immediately, should it not be necessary to obtain a separation of more than an inch and a half: 5. By augmenting this separation little by little, after the tenth or fifteenth day; 6. By immediately applying a bandage or apparatus, which prevents the deformed part from reassuming its morbid position; 7. By moderating with the dressing every species of movement in the divided region, for the space of some ten days; 8. By proceeding afterwards, by degrees, to movements more or less extended, in the direction opposite to that of the flexion or extension which we have wished to overcome. We shall also see that the employment of apparatus, or auxiliary mechanical means, should be continued much longer for some tendons than for others.

Perhaps, after all, there would be fewer inconveniences than advantages in allowing the patients, immediately after the operation, to make repeated movements every day; but experience not having yet determined this question, it appears to me prudent not to try the extension until after the time when the new production has already attained a certain degree of force and density. Even on the supposition that the tendon had not only been cut in the exterior of its sheath, but that this sheath itself was also comprised in the section, this ought not, as I think, to be a source of disquietude. The approximation of the deep-seated lamellæ of the sub-cutaneous fascia, and of the other lamellæ which are found in the neighborhood, would secure us from all inconvenience in this respect. So that if it is better, in fact, to adopt all the precautions required

by the method of Delpech, as simplified by Dupuytren, and afterwards by MM. Strohmeyer, Bouvier, and Stoess, it must also be conceded that the operation would not necessarily fail, merely because we had deviated from the most simple processes.

Tenotomy in Particular.

Certain deformities of the foot, leg, hand, forearm, and neck, may find their principal remedy in the section of the tendons or aponeuroses.

a. *The Hand.*

It was formerly believed, that the deviations of the fingers and of the hand were almost all caused by the retraction of the tendons. We have seen, in one of the preceding chapters, that the greater part of these deformities are at present ascribed to cutaneous or sub-cutaneous bridles. But in this question, as in many others, one error has been destroyed only to give place to another. It is certainly true, that the retraction of the fingers, whether backwards or forwards, is sometimes produced by the shortening of the tendons or muscles. Consulted in cases of this kind, the surgeon ought not to hesitate. The section of the diseased tendon would present every possible chance of success.

1. *Extensor Tendons.* In the fingers and on the back of the hand it would, if it were practicable, be advisable to take up a fold of the skin behind the retracted tendon, to insert a narrow bistoury or a small tenotome on one of the sides of the fold, and to turn it immediately towards the tendon itself, the tension of which should be increased by trying to straighten the finger. On the second phalanx no vessel could be wounded, while on the first and on the metacarpus it would be important to avoid the veins, which in these places are sometimes of considerable size. If there were many retracted tendons, we should have recourse to the same operation for each. On the metacarpus, however, it would not be impossible to insert the bistoury sufficiently deep under the skin to divide two and even three tendons by the same puncture. Here the rule advises that we should incise the tendon upon its most projecting portion, taking care, nevertheless, to avoid the line (*niveau*) of the articulations.

If the case was one of the retraction of the radial tendons, viz., of the extensor secundi internodii pollicis, or the extensor ossis metacarpi pollicis, we could effect the section without danger, in spite of the neighborhood of the radial artery, by taking care, while the bistoury is being introduced under the skin, to force the thumb strongly into extension and abduction. Nevertheless, for the radial tendons only, it would be much better that the hand, turned slightly backward, should be completely shut. We ought, also, in those two cases, to force the tendons, in a certain sense, to make their own division against the bistoury. The extensor carpi ulnaris, not having in its neighborhood any large artery, would exact fewer pre-

cautions. It would be necessary to make its section between the head of the ulna and the upper extremity of the fifth metacarpal bone. After the section of these tendons, we straighten the hand, and incline it slightly into a flexed position by means of a prepared splint, which extends upon the palmar region of the forearm and hand; a pasteboard splint, properly curved, would constitute a support evidently preferable to a wooden splint, if we should associate with it some turns of bandage saturated with dextrine. At the end of six or eight days, we should have to increase the inflexion of the parts, if the opposite tendency still existed; but we should take care to stop as soon as the extension ceased to predominate. From that period, moderate movements of flexion and extension should be persisted in, until the hand should have recovered the freedom of its motions.

2. *Flexor Tendons.* The section of the flexor tendons of the fingers is evidently more delicate than that of the extensors. On the one hand, it might involve an opening into the fibro-synovial sheath, whose inflammation is extremely dangerous; and, on the other, I do not perceive how, in effecting it by the process of simple puncture, we could be assured of the certainty of avoiding the collateral arteries. In all cases it should be performed only on the palmar surface of the first or second phalanx. In place of perforating the skin altogether upon the outside, it would be better to enter on the side of the finger near its anterior surface, and afterwards to divide the tendon, while separating it as much as possible from the bone, without carrying the point of the instrument to any great distance towards the opposite side. Supposing, however, that one of the arteries should have been wounded, its hemorrhage probably could be easily arrested by compression, properly made, upon the two borders of the upper part (*de la racine*) of the finger, or above the wrist, upon the radial and ulnar arteries. If it were necessary to apply a ligature to the vessel, I would prefer seeking for it at the upper part of the finger than enlarging the first puncture for that purpose.

If the retraction of the tendons occupied the palm of the hand, tenotomy would also be attended with real danger; to perform it, it would be necessary to cut through the aponeurosis, and to manipulate in the midst of nerves and vessels of large size, besides that the synovial membranes render the inflammation far more formidable here than on the forepart of the fingers. Only that the retracted tendon, being so stretched as to become sufficiently prominent, would allow of our directing the point of the bistoury upon its opposite border, and of cutting the tendon from one side to the other, rather than from before backwards, and without encountering the branches of the superficial palmar arch. The retraction of the radial muscles, especially of the palmaris longus, would be one of the easiest things to remove by tenotomy. The hand being moderately flexed, while the patient endeavors to approximate the thenar and hypothenar eminences, or, better still, the upper part (*la racine*) of the thumb to that of the little finger, renders the ten-

don of this last mentioned muscle so projecting that there would be neither risk nor difficulty in dividing it. If the section of the flexor carpi radialis should be necessary, it could be effected by avoiding the palmaris longus by means of the indication which I have just given. The puncture of the teguments should then be made on the outside of the tendon, but inside of the radial artery. Carried horizontally under the tendon of the palmaris brevis, the bistoury, whose handle should be held a little raised, would then, without difficulty, effect the section of the flexor carpi radialis with very little danger to the radial artery. As to the section of the tendon of the flexor carpi ulnaris, we may conceive that the neighborhood of the artery would render this operation above the wrist somewhat dangerous.

After the operation, also, in whatever region it may be performed, we must do all in our power to close up the small wound immediately. The same splint as the preceding would serve, also, after the section of the flexor tendons. In the palm of the hand it would suffice, in order gradually to increase the extension, to add to the number of paddings (*remplissages*) on the lower extremity of this splint. Prolonged towards the fingers, it would elongate them also, at the pleasure of the operator.

b. *Elbow and Bend of the Arm.*

At the humero-cubital articulation we find only two tendons—that of the triceps posteriorly, and that of the biceps anteriorly—which might by their retraction become the sources of deformities.

1. *Triceps.* I know no case of permanent extension of the forearm produced by the shortening of the triceps; but should it be met with, the manner in which ruptures of the anterior tendon of the thigh or of the ligamentum patellæ are cured, sufficiently show that its section would be clearly indicated. Nothing, in fact, could be more simple than this section. Inserted by puncture from the outer side towards the inner, or from the inner towards the outer, the instrument, passed under the skin, would cut the tendon from behind forwards, without incurring the least danger, since there is no important organ to avoid. It would be necessary, however, to take the precaution to make this section at about an inch above the olecranon, in order to be more sure of avoiding the synovial capsule of the joint. We should also take care to avoid the ulnar nerve, which is found [running close to] the posterior surface of the inner condyle, (*epitrochlée.*) The forearm, placed immediately in quarter flexion, should be brought into semi-flexion in the space of from eight to fifteen days. We should, after that, give it slight movements of flexion, extension, pronation, and supination, not forgetting, in the interval of these exercises, to support it by a scarf for the space of about a month.

2. *Tendon of the Biceps.* The retraction of the biceps is met with quite frequently; I have already seen seven or eight cases of it, some congenital, others resulting from disease. I have not learned

that this retraction, which holds the forearm, to a greater or less degree, in a state of permanent flexion, which is characterized by a cord in a strong state of tension, whenever we endeavor to extend the arm—a cord which descends from the anterior region of the arm into the hollow of the forearm, has up to the present time ever been submitted to tenotomy; but science at the present day possesses facts sufficient to justify its trial. I have already recurred to an observation of Granier, and to two facts of my own, from which it results that the complete division of the tendon of the biceps, causing thereby the destruction of a part of the muscle, does not destroy the functions of the limb. An observation still more conclusive has been published in England by M. Ballingall, (*Edinburgh Medical and Surgical Journal*, January, 1835; *Archives Générales de Médecine*, 2° série, t. vii., p. 264; *Revue Médicale*, 1835, t. i., p. 393.) It relates to a sub-cutaneous rupture of the tendon of the biceps, which was in some degree left to itself, but which, notwithstanding, soon got well, leaving only a slight weakness in the limb. In the case of retraction of the biceps which Molinelli speaks of, (*Haller, Mém. sur l'Irritabilité*, etc., t. iii., p. 33,) a sudden extension of the forearm, accompanied with a crackling sound and with pain, relieved the patient of his infirmity. It is, moreover, one of those sections of tendons which are the easiest to perform; I have many times practised it on the dead body without the least embarrassment. When stretched tense, and strongly projecting, the biceps, in such cases, is separated to a very considerable distance from the brachial artery. The point of the bistoury, inserted at its outer side by puncture, and afterwards raised so as to glide under the skin till it reaches on a line with the inner edge of the tendon, allows of our then immediately turning the cutting edge of the instrument backwards. We then increase the rigidity of the muscle by trying to extend the forearm. With these precautions, we have only to press moderately, and in a sawing movement from before backwards, in order to divide the whole thickness of the tendon, while we are at nearly the distance of half an inch from the artery. In operating too low down, we might not reach the fibrous expansion which goes from the biceps to the inner muscular mass at the fold of the arm; but this bridle is ordinarily unconnected with the deviation. Nothing, however, would prevent our dividing it in its turn with a second stroke, if it appeared to interfere, in any manner whatever, with the extension of the limb. It is unnecessary to remark here, that we should put ourselves on our guard against the puncture of the median basilic and median cephalic veins, and that it would also be well to avoid the trunk of the cutaneous nerves, both internal and external. To keep the limb afterwards extended, nothing would be more effectual than the bandage saturated with dextrine, which I have already spoken of in treating of sutures of the tendons in the bend of the arm. This extension we should also be under the necessity of protracting for several weeks, in order to overcome the tendency of the parts to resume their morbid position.

c. *Tendons or Muscles of the Axilla.*

The permanent depression (*abaissement*) of the arm which may be caused by cutaneous cicatrices, the formation of fibro-cellular bridles, or by a complete or incomplete consolidation of the scapulo-humeral articulation, have appeared to me to be also produced in many patients by a retraction of the tendons or muscles. The pectoralis-minor, the pectoralis-major, the teres-major, the latissimus-dorsi, and the edges of the deltoid itself, are, in my opinion, susceptible of being thus retracted. In some cases, I have remarked that these different muscles or their tendons always took on the appearance of hard, inelastic, though indolent cords, at the moment when I tried to separate the arm from the thorax; and this in two patients, among others, one of whom had had, several years before, a severe wound in the forepart of the shoulder, and the other an extensive abscess in the fold of the axilla. Would it not, then, be allowable to perform the section of these parts after the modes above pointed out? For the pectoralis-major, or the anterior border of the deltoid, a sharp-pointed bistoury, passed either upon the cutaneous or deep-seated surface of the muscle, would, without difficulty, allow of our dividing it from behind forward, or from before backward. The pectoralis-minor would require that the point of the bistoury should be carried down to its lower border, that we might there divide it by a swinging movement from below upward, and from behind forward. We might reach the latissimus-dorsi, or the teres-major, or the posterior edge of the deltoid, by dividing them either on their posterior or anterior surface. In whatever way performed, it would be necessary afterwards to keep the arm elevated almost at a right-angle, by some apparatus or bandage, for the space of three weeks or a month. Up to the present time, no one appears to have treated of this kind of operation.

d. *Tendons of the Toes.*

In the toes, as in the fingers, there may be retraction both of the extensor and flexor tendons.

1. *Extensors.* The retraction of the extensor tendons of the toes, existing to such an extent as to elicit the attention of the surgeon, is a rare occurrence. I have, however, seen some examples of it; some in which the retraction comprised, at the same time, all the tendons; others, in which it was only the tendon of the little toe, or that of the great toe, which was thus shortened. If the deformity should exist to so great a degree as to cause any real inconvenience, either in exposing the skin to excoriations, or by rendering it difficult to wear shoes, (*des chaussures,*) it would be necessary to have recourse to tenotomy. As there are neither nerves nor arteries of large size on the dorsum of the metatarsus, the only place where it would appear to be advantageous to divide the extensor tendons of the toes, tenotomy in that locality would be extremely easy; it should be performed in the same way as on the back of the hand, by a puncture for each tendon, or even by one

single puncture for the whole of the retracted tendons, preferring, as everywhere else, to make the instrument act from the skin towards the deep-seated parts. M. Dieffenbach (*Bouvier, Mém. de l'Acad. Roy. de Méd.*, t. vii.) is the only person, I believe, who, up to the present time, has had recourse to this operation on the living subject. M. Davidson (*Gaz. Méd. de Paris*, 1838) has also performed it, but by excising a portion of the common extensor, and a cicatrix on the dorsum of the foot, rather than in the light of an operation for tenotomy.

2. *Flexor Tendons.* The retraction of the toes, in the sense of flexion, can but very rarely occur to such a degree as to constitute it a disease. These appendages are so short, and are so well protected (*abrités*) by the sole of the foot, when they are strongly flexed, that their retraction can hardly claim the aid of surgery. It is necessary, however, to observe that the great toe, both by its size and length, and its importance as an organ of sustension and progression, is excluded from this remark; so, also, has it been the object of some special attentions under this point of view. M. Syme (*Archiv. Gén. de Méd.*, 3e série, t. i., p. 115) is the first, as it appears to me, who has divided its flexor tendons, to remedy a retraction produced by a previously existing inflammation. The operation, performed on the first phalanx, was followed by entire success. It would appear, also, that M. Dieffenbach, (*Bouvier, Mém. de l'Acad. Roy. de Méd.*, t. vii.,) on his part, has once had recourse to it, with results not less satisfactory.

It would be preferable to perform the tenotomy of the great toe on the plantar surface of its first phalanx; but if the retracted tendon should be more particularly prominent upon the inner border and at the sole of the foot, nothing would interfere with our dividing it at this point. As in the fingers, we should here have to fear the lesion of some vessels; but being of infinitely less size than in the hand, the plantar arteries and the collateral arteries of the toes could not, in such cases, occasion any very serious apprehension.

e. *Tendons of the Foot.*

The foot may be deviated by the shortening of many orders of tendons. I shall proceed to examine, under this head, the retraction of the peronei and the tibiales, then that of the tendo-Achillis and the plantar aponeurosis. These retractions give rise to the deformity known under the name of *club-foot*, (*pied-bot*,) a deformity which may equally proceed from an alteration in the bones or articulations, but of which I do not now intend to speak, except so far as it is caused by the action of the tendons. There are four principal kinds of club-foot: the foot turned inward, or *varus*; outward, or *valgus*; upward, (*en avant*,) or *talus*; and backward, or *pes equinus*, (*pied-equin.*)

The pied-equin, one of the most frequent, depends, almost always, on a shortening of the tendo-Achillis. In that case, the heel is more or less raised towards the calf, and the patients walk on the point of the foot, that is, on the heads of the bones of the metatarsus

and the plantar surface of the toes. It may even happen, as I have seen in three instances, as in the example M. Stoltz (*Repert. d'Anat. et de Physiol. Pathol.*, 1827) has described, the five cases cited by M. Duval, (*Thèse citée*, p. 7,) and as has been observed, also, by M. Scoutetten (*Oper. Citat.*, p. 107, pl. 2) and other practitioners; it may happen, I say, sometimes, that the foot is so turned backward, as to oblige the patients to support themselves on the dorsal surface of the tarsus. The three patients submitted to my examination, walked on the dorsal surface of the tarso-metatarsal articulations of the cuboid and third cuneiform bone. The whole three had in that part a large sub-cutaneous bursa-mucosa. In one of them, who was an in-door pupil of the hospitals of Paris, this variety of the pes-equinus appeared to me to depend upon the retraction of the plantar aponeurosis, which extended itself, under the form of a very hard and distinct cord, to the head of the second and third bones of the metatarsus. It is, however, rare that the four kinds of club-foot, which I have just mentioned, remain perfectly distinct, or that one of them is not soon complicated, in a greater or less degree, with some one of the others. In the pes-equinus, the metatarsus, also, may be strongly bent back upon the tarsus, as happened in the case of the young physician I have just mentioned, at the same time that the heel was drawn up by the muscles of the calf. The pes-equinus is often, also, complicated with *varus* or *valgus*. It is so much the more important not to forget this remark, that the number of tendons to be divided, when we wish to remedy club-foot, is always in proportion to the varieties or combination of the deformities which it is our intention to destroy.

Perhaps, also, it would be necessary to admit two simple varieties of pes-equinus, that which results from a retraction of the aponeurosis or muscles of the plantar surface of the foot, and that which is caused by a retraction of the tendo-Achillis.

1. *Plantar Surface of the Foot.* If, as occurred in the young physician above mentioned, an instance of which M. Duval, (*Pivain, Thès.*, No. 212, Paris, 1837, p. 24,) on his part, appears also to have met with, the plantar surface (*la plante*) of the foot is found in a certain sense folded upon itself, it is possible that the deformity may arise from a retraction of the plantar aponeurosis, or of the flexor brevis digitorum pedis, much more than from a shortening of the tendo-Achillis. In this case it would be necessary to begin by an operation which, up to the present moment, has not, I believe, been advised by any one, that is, by the section of the retracted cord of the sole of the foot. The patient having the foot extended, and held so by an assistant, would enable the surgeon to introduce the instrument by puncture between the teguments and fibrous bridle, from right to left, or from left to right, almost indifferently. After having turned the cutting edge of the tenotome, it would suffice to hold its handle a little below the plane of the lower surface of the foot, to prevent all danger while dividing the cord from its cutaneous towards its deep-seated surface. As it is quite

difficult in this region to distinguish what belongs to the aponeurosis, and what to the short flexor muscle, or to its tendons, it would be better to carry the incisions as far backward as possible, unless the bridle should be much more projecting, or more conveniently raised up in front than towards the os calcis. The important part of it would be, not to carry the cutting edge of the instrument too much outward nor too much inward, seeing that nearly the whole of the plantar artery lies under the borders of the foot. If, after having divided the principal bridle, we should be enabled by the finger to discover others in the neighborhood of the first, we should endeavor to reach them without stopping the operation, (*désemparer*,) and divide them through the same opening in the integuments.

As this variety of the pes-equinus is almost always accompanied with a greater or less degree of luxation of the second range of the bones of the tarsus upon the first, the section of the tendon, or of the plantar aponeurosis, will rarely allow of an immediate readjustment (*redressement*) of the foot. We must look, therefore, for some difficulties in this direction, and rely upon the aid of an apparatus to complete the success of the operation. If, however, the difficulty of adjusting the foot in such a case should arise from the concomitant retraction of some other tendon, it would be advisable to divide that, as well as those of the sole of the foot. It is thus that the section of the tendo-Achillis, of the flexor longus pollicis pedis, and of the peroneus longus, or of the flexor digitorum communis, might be requisite after that of the flexor brevis, or of the plantar aponeurosis.

In conclusion, I have, up to the present time, seen but one case where the operation which I describe has appeared to me to be practicable; I am aware, moreover, that M. Duval (*Pivain, Thèse citée*, p. 24) has cured club-feet with reversion of the dorsal surface of the metatarsus, by confining himself to the division of the tendo-Achillis.

2. *Section of the Tendo-Achillis.* The section of the tendo-Achillis, which it is said was long ago practised in the Limosin, (*Scoutetten, Mém. sur la Cure Rad. des Pieds-Bots*, Paris, 1838, p. 12,) is now one of the most important operations in surgery. In the cases of Poncelet, Desport, Molinelli, and some others, of whom I have spoken above, it was performed for reasons altogether different than for those of a deformity of the foot.

A. The *history* of this operation, however, is not difficult to be given at the present time. The first surgeon who has spoken of it, in relation to club-foot, is Thilenius, (*Obs. de Méd. et Chirur.*, Francfort, 1784.) It was Lorenz, moreover, who performed it March the 26th, 1782, and not Thilenius himself, as has generally been often asserted among us. More recently, in 1809 and 1810, Michaelis, a surgeon of Marbourg, published a memoir, (*Gaz. de Saltzbourg, et Journal de Hufeland*, 1811,) tending to demonstrate the advantages of the partial section of the tendons in certain cases of

old deformities, and more particularly the section of the tendo-Achillis.

Sartorius (*Journal de Siebold*, t. iii.) also made known, in 1812, a case of section of the tendo-Achillis for the removal of a pes-equinus produced by a previous suppuration in the posterior part of the leg. Up to that time there had been nothing said of tenotomy of the tendo-Achillis in France; and when Delpech had recourse to it in 1816, on a boy then six years of age, and whom M. Bouvier afterwards met with in Paris, in 1837, it was everywhere thought that it was an operation absolutely new. Having been badly described, or badly understood, the section of the tendo-Achillis was a second time forgotten, both in France and Germany, though many veterinary surgeons (*Miquel*, *Debaux*, etc.; *Blanc*, *Jour. Pratiq. de Médec. Vétér.*, 1826, p. 202; 1828, p. 283; 1830, p. 346) soon availed themselves of it, and demonstrated its advantages in the horse; but the six cases, collected from 1831 to 1834, and published by M. Strohmeyer, (*Magas. de Rust.*, t. xxxix.; *Arch. Gén. de Méd.*, 2e série, t. xii., p. 116, etc.,) finally brought back public attention to this subject. It was from that time performed, on the 23d of October, 1835, by M. Duval, the 15th of January, 1836, at Paris, by M. Bouvier, and about the same epoch by M. Stoess, at Strasbourg, (*Held, Dissert. sur le Pied-Bot*, p. 69.) To set out from this period, the tenotomy of the tendo-Achillis has been performed anew by M. Strohmeyer on M. Little, an English physician, (*Bouvier, Mém. sur la Section du Tendon d'Achille dans le traitement des Pieds-Bots; Mém. de l'Acad. Royale de Méd.*, t. vii., p. 411;) by M. Reiche, a surgeon of Magdebourg, (*Held, Thèse*, Strasbourg, 1836;) by M. Dieffenbach, at Berlin; by M. Serre, (*Correspond. Privée*, 1837,) at Montpellier; by MM. Roux, Blandin, and Laugier, at Paris; by M. Lenger, (*Encyclograph. des Sc. Méd.*, 1838, p. 145,) in Belgium; by M. Little, in England; and by M. Scoutetten, (*Mém. sur la Cure Radicale des Pieds-Bots*, 1838, in 8°, avec 6 pl.,) at Metz. M. Pivain asserts that, up to the month of July, 1837, M. Duval alone had performed it more than eighty times; his brother, M. T. Duval, (*Thèse*, No. 342, Paris, Août, 1838,) now claims for him as many as two hundred cases; and M. Dieffenbach told me, in the month of October, 1837, that he had performed it one hundred and forty-five times. In his last memoir, M. Bouvier also claims about twenty as the number of his cases. It is, therefore, an operation which may count at the present day more than four hundred examples. Nor does it appear, up to the present time, that the life of a single person has been sacrificed to it, and, if we believe to the letter what its declared partisans say of it, it has never, so to speak, been unsuccessful. Every thing at least shows, that it has in the greatest number of cases succeeded, and that the only accidents that have accompanied it have been violent pains, as in the patient of Sartorius; an abundant suppuration, as in that of Delpech; and some gangrenous eschars, of which examples have been mentioned by MM. Duval, Blandin, and Bouvier.

It would be in vain, then, that surgeons should raise the objection

of danger of destroying the continuity of the extensor tendon of the foot. Modern experience, on the contrary, tends to prove, that the fatiguing dressings, so difficult to maintain, and devised by J. L. Petit, Monroe, Desault, and so many others, to remedy the rupture of the tendo-Achillis, are only calculated to aggravate the disease. From the year 1832, I began to treat the rupture of the tendo-Achillis by no other means than simple rest and the immobility of the limb for the space of three weeks or a month. The two first cases which I submitted to this kind of treatment, the one in 1832, the other in 1833, did so well, that it was not possible to keep them in the hospital over three weeks.

B. *Appreciation.* The tenotomy of the tendo-Achillis is not proper, except in the pes-equinus, whether that be simple or complicated with deviation of the foot towards one of its borders; also, there must not be any consolidation (*soudure*) between the bones of the tarsus, or in the tibio-tarsal articulation. We should not perform it until after the section of the plantar aponeurosis and of the flexor brevis digitorum pedis have proved ineffectual, in cases where there is pes-equinus with the turning under (*renversement inférieur*) of the dorsal surface of the metatarsus. I should add, that the section of the other tendons around the joint should sometimes be associated with that of the tendo-Achillis. The observations hitherto collected show, that it is applicable to all ages and to both sexes, since it has been performed with equal success from the age of two years to that of fifty, and upon women as well as upon men. By the modern processes, a month or two is sufficient to put the patient in a condition to walk, with the foot resting upon the ground throughout all its plantar surface. It is true that some patients, treated by the section of the tendo-Achillis, could have been cured without that operation. I have myself cured many by the aid of the apparatus constructed by M. Mellet. We effect the same results with the apparatus of Bruckner, Jœrg, D'Ivernois, and Dieffenbach. By enveloping the limb, while it is stretched out straight, in a mould of plaster, as M. Guerin has done, or in a dressing rendered immoveable by starch, as M. Seutin has proposed, or by dextrine, as I have twice done, while making use of the buskin (*bottine*) of M. Stoess, extolled by M. Held, we should, without doubt, be enabled, with time and patience, to render the section of the tendo-Achillis unnecessary in a great number of cases. But this operation is so simple, so little painful, so easy, and so little dangerous, and its results are so prompt and so perfect, that, unless there is a very decided repugnance on the part of patients, it deserves to be almost universally substituted for the employment of those apparatus and dressings which, up to our time, had, in truth, so imperfectly supplied its place.

c. *The Operative Process.*

All the processes I have mentioned, in speaking of tenotomy in general, have been applied to the section of the tendo-Achillis. It was the method of Tulpius which the surgeon Lorenz followed.

Sartorius made a long longitudinal incision on the posterior surface of the tendon, and it is this method which M. Reiche still prefers. The method of Delpech relates only to the tenotomy of the tendo-Achillis. It is the same with the processes of MM. Strohmeyer, Bouvier, and Stoess; M. Bouvier, indeed, says he had practised it in four different ways. At first he made use of a very narrow curved bistoury, convex upon its cutting edge, which bistoury he inserted by puncture between the tendon and the deep-seated parts, in the manner of M. Strohmeyer, but without piercing the integuments upon the opposite side. The second process tried by this practitioner consisted in a transverse puncture, which was made in the skin near one of the borders of the tendon by means of an ordinary bistoury or lancet, and into which was introduced a narrow bistoury with a blunt point. In the third process, M. Bouvier pierces the skin lengthwise with a straight or curved bistoury, having a narrow blade, which he glides flatwise between the tendon and the integuments, and which is then turned to divide the parts from the skin towards the deep-seated tissues. His last process is composed of two stages. A longitudinal puncture, of one or two lines in length, being made with the point of a lancet, or a simple bistoury, on the side of the tendo-Achillis, allows of introducing therein a blunt-pointed tenotome, which then divides the tendon from behind forwards, or from its superficial towards its deep-seated surface. The tenotome that M. Bouvier now uses is a kind of cutting needle, a line in breadth at its base, a little narrower and rounded at its point, and shaped (*disposée*) nearly like the cystitome of the cataract case. We see that the processes of M. Stoess and M. Duval belong to the same order as those of M. Bouvier, and that all have been designed for the tendo-Achillis. M. Scoutetten, (*Cure Rad. des Pieds-Bots*, p. 75,) who operates like M. Duval, insists strongly, but erroneously, as I think, that the puncture should be made inside and not outside the tendon.

The Operation. Whatever may be the method adopted, it is advisable to place the limb on its tibial surface, and in such manner that the foot, remaining free, may be inclined by an assistant charged with holding it, in this or that direction, according to the pleasure of the operator. The surgeon having the posterior surface of the limb before him, places himself opposite to the plantar surface of the foot. With the right hand, armed with the lancet, with a straight bistoury, or a straight needle like the ancient cataract-needles, he pierces the skin on the external or internal side, and in a direction parallel with the tendo-Achillis. If he has used a bistoury or lancet, he immediately seizes one of the tenotomes of which I have spoken, and glides it by slight movements forward and backward (*va et vient*) under the skin, grazing (*rasant*) rather the surface of the tendon than that of the teguments, until he arrives upon the opposite side, carefully avoiding wounding the skin in this last direction. At this point of the operation, the surgeon, who had held his instrument flatwise, turns the cutting edge upon the axis of the limb. It is then that it becomes advantageous to

lower the heel. We in this manner give such a degree of rigidity to the tendon, that its section is, to a certain extent, made of itself. Gentle saw-like movements with the bistoury then quickly complete it, and the operator marks the moment that it is finished by a crackling sound, and by a sudden separation, which he instantly perceives. Turned back again, flatwise, the instrument is withdrawn through the puncture by which it entered, so as to make no additional wound of the skin.

If there should be any particular difficulties in the way, to prevent our passing between the teguments and the subjacent parts, the operation would differ from the preceding only in this, that after the puncture we would cause the bistoury to glide flatwise upon the anterior [*i. e.*, the deep-seated or internal—*T.*] surface of the tendon, which would then be divided from before backward. I need not add, that the operation would be the same, if, in place of a special instrument, we should prefer employing the straight bistoury, or the ordinary blunt-pointed (*boutonné*) bistoury. The wound in the integuments being longitudinal, closes of itself by the adjustment of the foot; being reduced to the state of a simple puncture, it generally disappears in twenty-four hours. The slight ecchymosis, also, which is sometimes seen under the skin, should create no apprehensions.

When the tenotomy is finished, we straighten, and may without danger readjust the point of the foot in such manner, that the two ends of the tendon are separated at least an inch asunder. If, in order to replace the foot at a right-angle upon the leg, it should be necessary to carry this separation to more than an inch and a half, prudence would dictate that we should not proceed any further for the moment, and that we ought not to endeavor to increase this separation until after ten or fifteen days.

Moreover, the buskins and apparatus for straightening the foot may be applied as Lorenz and Sartorius have already done, immediately after the operation. MM. Bouvier, Duval, Lenger, and Scoutetten, (*Cure Radicale des Pieds-Bots*, p. 90,) who have adopted this course in a great number of cases, have proved by their success that the scruples of Delpech on this point, and the fears of MM. Strohmeyer and Stoess, are not well grounded.

Patients who have undergone the section of the tendo-Achillis, begin to walk, with a certain degree of freedom, from the tenth to the twentieth day, and they are nearly perfectly cured in the course of the second month.

3. *Club-Foot turned forward, or Talus.* Club-foot with the foot turned upward towards the front part of the leg, is rare. I have seen it twice in fœtal monsters. I have not, as yet, seen any examples of it in living persons. M. Duval says he has seen two cases of it, (*Pivain, Thèse citée*, p. 7,) Delpech, (*Orthomorphie, &c.*,) M. J. Lafond, (*Difformités du Corps Humain*, Paris, 1829, in-4°, p. 300,) and M. Stoess, (*Dissert. sur le Pied-Bot*, p. 3,) each give an example of it, and M. Scoutetten, (*Cure Radicale du Pied-Bot*, pp. 27, 28, pl. v.) appears also to have seen several cases. Though

one of the patients mentioned by M. Duval was cured by means of plugs (*tampons*) of lint and simple tractions, it is not the less probable, that in individuals more advanced in age, the section of the tendons would be the best, and perhaps the only remedy for talus. In these cases, the infirmity is imputable evidently to the retraction of the tibialis-anticus only, or to that of the tibialis-anticus and peroneus-tertius, or that of the extensors of the toes.

I have not learned that the tendons of the extensor-communis and of the peroneus-tertius have, up to the present time, been designedly divided to remedy any deviation of the foot. It would, however, be an easy operation, and of little danger. We might perform it either above or below the anterior annular ligament of the tarsus. It would be much better above, inasmuch as the tendons below, being already more or less separated, could not be so easily divided with the same stroke of the bistoury. The anterior tibial artery, or the commencement of the dorsalis-pedis, could alone create any apprehension; but the tendons in such cases are so much the farther removed from these arteries, in proportion to the greater degree of retraction.

The leg being supported upon its posterior surface against some sort of prop, (*soutien*,) and held in this position by assistants, would allow the surgeon to place himself by the side of the foot, in the same manner as for the section of the tendo-Achillis. Armed with a straight bistoury, the operator should puncture the skin on the inside or outside of the bridle, according as he should make use of his right or left hand, or operate upon one or the other leg. Guided between the tendon and the integuments till it reaches the opposite side, the instrument should be used in other respects precisely as has been said in speaking of the section of the tendo-Achillis. If the extensor tendons of the toes only are implicated, the operation in general should be performed at the distance of half an inch above or below the instep. For the peroneus-tertius we should be obliged to do it a little lower down. After all, we must not forget that it is the tendinous projection (*relief*) which more particularly points out the place where it is most advantageous to apply the instrument. On the supposition that the tendon of the tibialis-anticus has also been divided, there would remain nothing more than to straighten the foot, then to force it, by means of buskins, (*brodequins*,) or appropriate apparatus, to acquire the proper degree of extension, and to lose its tendency to abnormal flexion. It is, furthermore, presumable that this species of club-foot would be one of the most difficult to cure radically, and one of the least favorable for the section of the tendons.

4. *Varus.* Whether it is found alone, or is complicated with pes-equinus, the varus, which sometimes exists to such degree as to compel the patient to walk almost exclusively on the external edge of his foot, very frequently requires that we should divide not only the tendo-Achillis, but the tendon of the tibialis-anticus, the tendon of the tibialis-posticus, and even those of the long extensors or long flexors of the toes.

A. *Section of the Tibialis-Anticus.*

We may conceive, from what I have said in the preceding paragraphs, that the section of the tibialis-anticus may be useful in two varieties of club-foot, that is to say, in the Talus and the Varus. This operation, which M. Held formally advises, (*Thèse citée*, p. 64,) which M. Duval appears to have practised, (*Pivain, Thèse citée*, p. 22,) and which, according to M. Bouvier, (*Mém. de l'Acad. Roy. de Méd.*, t. vii., p. 411, et suiv.,) has also been performed by M. Dieffenbach and M. Strohmeyer, might be resorted to at once, if it should appear that in the distortion of the foot forward or inward, the tendon of the tibialis-anticus was more forcibly retracted than any other. Up to the present time, however, it has not been had recourse to, until after having ascertained that the section of the tendo-Achillis was insufficient.

The Operation. Inserting itself at the posterior and inner part of the first cuneiform bone, this tendon naturally makes a considerable projection in front of the internal malleolus. It would be advisable to place the leg in the same position as for the section of the extensor tendons of the toes, taking care to turn out the foot a little in the direction of its external border. If the puncture were made under and in front (*en avant*) of the apex of the malleolus, and behind the tendon, the bistoury should proceed along the internal surface of the skin, from behind forward, and from below upward, before its cutting edge has been turned towards the instep, to effect the section of the retracted tendon. But this manner of proceeding, which should not be adopted but with the view of being enabled to avoid, with the utmost degree of certainty, both the extensor tendon of the great toe, and the arteria dorsalis-pedis, would be manifestly more embarrassing and more difficult than that which consists in making the puncture on the outer side and in front, in order to penetrate afterwards from the instep towards the tendon. By this last process, it would be almost always practicable to insert the bistoury far enough towards the inner side (*en dedans*) to be certain of not wounding either the arteria dorsalis-pedis, or the long extensor muscles of the toes.

B. *Tibialis-Posticus.*

The section of the tibialis-posticus, also recommended by M. Held, seems not yet to have been performed but on the dead body. We cannot, however, discover any advantages from it, except as an auxiliary to the section of the tendo-Achillis in the pes-equinus complicated with varus; for it would be difficult for the tibialis-posticus itself to give existence to any kind of club-foot whatever. Though tenotomy of the tibialis-anticus and of the extensors of the toes be as practicable above as below the instep, it is not so with the tendon of the tibialis-posticus. Adherent as it were, (*comme collé*) to the posterior border of the internal malleolus, and almost immediately in contact with a large artery, namely, the posterior tibial, this tendon could not be cut without danger before its entrance into the in-

ternal groove of the os calcis. It is only, therefore, near its attachment to the postero-internal extremity of the scaphoid bone, that we should endeavor to reach it. For that purpose, we should place the leg upon its outer side, (*face externe.*) A bistoury should be inserted by puncture, at some lines in front of the internal malleolus, a little under or behind the tendon of the tibialis-anticus. Carried afterwards almost directly downward, the instrument should be turned upon the tendon [of the tibialis-posticus] at about half an inch under and in front of the apex of the malleolus. Taking care not to lower the point of it too much, and to incline it as little as possible towards the plantar surface of the foot, we should be certain to avoid the internal plantar artery, the only one that can interfere with us in this region.

C. *Tendons of the Great Toe.*

The flexor tendon of the great toe has been divided upon the first phalanx of this toe, as I have already said, by M. Syme, for a retraction produced by inflammation. Michaelis appears also to have advised the section of this, as of all the other tendons, but with the injunction to do it partially only. It was reserved for MM. Strohmeyer and Dieffenbach to associate it with that of the tendo-Achillis, to remedy the pes-equinus *varus*. In that case, also, it would be more proper to perform it, like M. Syme, upon the first phalanx of the great toe, than to endeavor to accomplish it under one of the points of the internal border of the foot. The tendon, divided in its fibrous groove, would retract with as much freedom as if we had divided it in the neighborhood of the heel.

The foot, presenting its plantar surface to the operator, would give him an opportunity to raise the great toe, and to cause the instrument to penetrate from one side of the retracted tendon to the other, as has been said in speaking of the tendons of the instep. In taking the precaution to insert the instrument a little nearer the plantar than the dorsal surface of the toe, we should, as in the fingers, avoid the lateral arteries; nor can we see that this operation would be in the least degree dangerous.

The section of the *extensor*, also, of the great toe, has been performed by MM. Strohmeyer and Dieffenbach, (*Bouvier, Mém. de l'Acad. Roy. de Méd.*, t. vii., p. 411, et suiv.,) to aid, as in the case of the flexor, in the success of the division of the tendo-Achillis. It would also be evidently more easy, and could be performed upon the whole extent of the tendon, from above the instep to near the last phalanx of the toe. In making the puncture on its outer side, in order afterwards to reach its inner border, we might divide it with a single stroke of the instrument, without having to fear the wound of any important organ.

5. *Section of the Peroneus Longus and Brevis, in Valgus.* The valgus form of club-foot, in itself a rare occurrence, and rare also as complicated with pes-equinus, has, up to the present time, offered but few occasions in which the section of the tendons could be

applied to it. M. Pivain, (*Thèse citée*, p. 23,) however, cites an example of it, where M. V. Duval thought it advisable to undertake this section before proceeding to that of the tendo-Achillis. I also possess a fact which proves that we should be wrong in having any fear from it in regard to the re-establishment of the action of the muscles. M. D*** had a deep wound made in the leg by some fragments of Delft ware. The wound in the integuments, which extended from the anterior surface of the fibula to the posterior median line of the leg, a little above the heel, comprised the whole thickness of the peroneus-longus, and the half of that of the peroneus-brevis and of the tendo-Achillis. The separation of the divided tendon was near two inches in width. The integuments were united by the twisted suture, and the foot adjusted by a prepared splint, which I fastened upon the entire outer side of the limb. This severe wound, which ultimately cicatrized, was followed by a very considerable degree of feebleness in the power of abduction of the foot, for six to eight weeks; but at the end of some months the patient recovered from it, and it is now a long time since he has thought no more of it, and that the functions of the foot have been perfectly restored.

It is said in the thesis of M. Held, that M. Stoess was upon the point of performing the section of the tendons of the peronei in 1836. I do not know if this operation has, in our time, been introduced into surgical science. However that may be, it may be performed, like that for the tibialis-anticus, above or below the malleolus. In the first point, it would be better to divide the two tendons at one stroke. This could be done with most ease at about an inch above the base of the external malleolus. As for the rest, I do not think there would be any great advantage in penetrating from before backward, rather than from behind forward. I am of opinion, however, that, in going from the fibula towards the tendo-Achillis, we should render the operation a little easier, and that, in strongly raising the handle of the bistoury, at the moment of making the section of the tendons, we should have the advantage of finding a point d'appui on the postero-external surface of the fibula itself, which would be so much the more to our advantage, that there would be no risk of penetrating to the bone. Below the malleolus, we might divide the two peronei together, or make their section separately. It would be at the distance of six lines in front, and below the apex of this process, that it would be necessary to insert the instrument, if we wished to divide the two tendons at one stroke. We could reach the tendon of the peroneus-longus, by itself, at the middle of the space which separates the point of the malleolus from the external tubercle of the cuboid bone. As to the peroneus-brevis, we should have to look for it at the external border of the fleshy mass of the extensor-brevis digitorum pedis. In all cases the puncture should be made upon the inner side (*côté interne*) of the bridle to be divided, that we may carry the instrument from within outward, between the teguments and the tendon, before making its cutting edge act from the skin towards the bones.

These sections being performed, it will be necessary, as after the section of the tendo-Achillis, to make use of buskins, gaiter-boots, or bandages, to ensure their successful result, and to adopt, also, all the precautions required in respect to the cicatrix, and in what concerns the re-establishment of the movements and readjustment of the foot, to prevent these dressings from doing any injury.

[*Talipes, or Club-Foot.* A circumstance of importance, generally overlooked, and one which greatly diminishes the danger, even where the large arteries are wounded, in operations for retracted tendons or muscles in any part of the limbs, and especially for club-foot, is the atrophy or shrivelled state of the limb from defective motion and nutrition, as noticed by Dupuytren. So little was known or thought of the section of the tendo-Achillis in the United States as late as 1834, that, according to Dr. Reese, (see his last edition of *Cooper's Surgical Dictionary*, New York, 1842,) an eminent surgeon of New York had recourse that year to the amputation of the limb, in a gentleman affected with club-foot! In connection with what we shall say farther on of the American pioneers in this part of tenotomy, viz., Drs. Dickson, Smith, and Detmold, we have also to state, that Dr. C. B. Gibson, of Baltimore, has described a *fifth* variety of club-foot, in addition to the four divisions generally enumerated by authors, viz., *talipes phalangealis*, where, (according to the accounts given in the last edition of the Institutes of Surgery, by his father, Professor Gibson, of Philadelphia,) the patient stands on the dorsal face of the cuboid and cuneiform bones of the tarsus, the toes and metatarsus being turned under the heel, and the forepart of the foot beneath the axis of the limb. Dr. C. B. Gibson, and his father, the professor, attribute much more importance to the apparatus used after the division of the tendons, than is generally admitted. The first-named physician extols, for this purpose, the apparatus of Dr. Heber Chase, of Philadelphia. From an examination of its principles, we do not think it can obtain a preference over the very ingenious contrivances of this kind, for every species of deformity, osseous, tendinous, or muscular, perfected by M. Jules Guérin, of Paris, and now successfully imitated by Tieman and other surgical instrument makers of New York, after the models and patterns which Prof. Mott brought with him to this country, and which were made at Paris under the supervision of M. Guérin himself.

Dr. Detmold, (*New York Journal of Medicine and Surgery*, 1840,) by an estimate of the cases of club-foot which have fallen under his care, makes the proportion of males somewhat greater than that of the other sex, and also the number of cases where both feet were affected about equal to that of each foot separately, the right foot in the latter being rather more frequently the seat of the disease than the left. A very large proportion were congenital, and almost all of these were otherwise well formed. In the whole number of cases upon which his data were founded, (viz., at that time one hundred and sixty-seven) two only had the whole limb shortened, in one case of which the deformed leg was one-half

shorter than the other. In one, there was also hare-lip; in seven, strabismus; in one, the toes were web-footed; and one had an additional thumb on the hand corresponding to the club-foot. The proportion of hereditary cases were on the father's side, because, perhaps, as is said, club-foot females seldom marry. Of the whole number of cases, (93 being double,) two hundred and thirty of the feet were *talipes varus;* eleven, valgus; seventeen, equinus; one only of talus, but existing in both feet. For this last variety, Dr. Detmold ingeniously suggests the name of *equestris,* as it resembles the position of the foot in the stirrup in riding. In a great majority of cases, the division of the tendo-Achillis is, in his opinion, all that is required, especially in young subjects; that in most cases, this, with subsequent apparatus, generally suffices for the cure; and that the division of other tendons may be made afterwards, if necessary. Dr. Detmold is opposed to the *immediate* extension of the foot by any apparatus, and prefers waiting two or three days, till the effusion of plastic lymph is perceived between the extremities of the tendon. He prefers, also, his own improvement upon Strohmeyer's foot-board, and thinks well of Scarpa's shoe, but rejects the mould of plaster recommended by Guérin. In justice to M. Guérin, it should be added, that his admirable boot, as it may be called, in all its modifications, with all the necessary screws, straps, and steel supports, covered with leather cushion paddings, is the one which he now most uses; this surpasses, in ingenuity and practical utility, (in the opinion of Dr. Mott and others,) any thing known. In two hundred and thirty cases of club-foot, Dr. Detmold divided the tendo-Achillis in one hundred and sixty-three, and in seventeen of these, he made also the section of the other tendons and of the plantar aponeurosis. In three cases only was the tendo-Achillis divided a second time. In eleven cases of valgus, two of talus, and forty-five of varus, mechanical means only were used. Dr. Detmold has now performed more than four hundred operations on club-foot, and divided more than one thousand two hundred tendons, on Strohmeyer's plan. We have frequently seen him operate, and must do him the justice to say, that he performs these sections with admirable adroitness and astonishing rapidity. Dr. Detmold has divided, also, a large number of tendons for other deformities in the limbs, &c.

Dr. Mutter, of Philadelphia, who has, next to Dr. Detmold, treated more cases of club-foot than any other American surgeon, enumerates now two hundred patients of this description, who have fallen under his care within a very few years past. He has also treated numerous other cases of distortion, as torticollis, contracted knees, eighty of strabismus, &c.

Dr. A. G. Walter, of Pittsburg, Pennsylvania, (according to *Dunglison's American Medical Intelligencer*, May, 1840,) has made more extensive sections in the lower extremity, in the same patient, than any other American practitioner. In a case of complicated deformities of the lower extremities, he is said to have made, with successful results, the sub-cutaneous section of the tendons and muscles

of the hip, knee, and ankles, viz., the adductor-longus, gracilis, fascia-lata, sartorius, semi-membranosus, semi-tendinosus, and the tendo-Achillis and peronei of each foot. For the peronei he prefers cutting below the external malleoli. In this case, mechanical means were afterwards used. The ultimate issue is not given, though the stature of the patient had been, by the statement, increased six inches.

Dr. Little, of London, mentioned in the text of this work, and who, himself a subject of this disease, was cured by Strohmeyer, remarks, in his published treatise on club-foot, that in numerous cases of the congenital description it is frequently found associated with the concomitant deformity of a *club-hand*, and in some, as remarked by Dr. Detmold, with that of strabismus; also, in certain other cases, with congenital stammering. All these clearly indicate, in our opinion, an organic, pre-existing, contractile diathesis of the voluntary muscles.

Non-congenital cases of club-foot may lead to the clew of the causes in congenital cases. In most of the former cases, Dr. Little seems very justly, as we think, to connect them with the period of dentition, as being that when they most usually first make their appearance. He might have added, moreover, that a ready explanation is here found in the intimate, if not intense, organic or metastatic sympathy naturally subsisting (and now actively excited by the irritation of dentition) between the peculiarly sensitive mucous membrane of the alimentary passages, especially during infancy, and the organs of voluntary motion. A fact well known to practitioners, as illustrative of the last mentioned sympathy, is the violent spasmodic contraction of all the bulky flexor muscular tissues of the limbs in Asiatic cholera, responding intimately and directly with the equally violent convulsive cramps of the muscular coat of the stomach itself. This, too, is faintly seen in ordinary cholera morbus, and often, also, in the production of temporary or even permanent contractions of the flexors of the thumb and fingers, and also strabismus, which all are equally well known in childhood, more especially, to be directly imputable to chronic cases of derangements of the intestinal tube from atony, acting directly through the ganglions or indirectly through the cerebro-spinal system. And also to this are to be ascribed the permanent contractions of the flexors of the thumb and fore-finger, noticed even in adult age, and, as mentioned long since by Moseley and others, as a characteristic feature in what is known as the dry belly-ache of the West Indies. In the cases from dentition, varus, coming on gradually, is the most frequent variety. Dr. Little mentions cases, also, of club-foot in young women from habitual spasms of the gastrocnemii, and of the anterior and posterior tibial muscles from attacks of hysteria, [here too often primarily imputable to intestinal derangement, no doubt.] He properly remarks, that this deformity may thus be produced non-congenitally, from any paralytic, spasmodic, or nervous cause whatever, which permanently or forcibly disturbs the equilibrium or antagonism of the muscles of the

limb, &c. This rational etiology will, of course, properly direct the attention of the practitioner first to a judicious course of pathological treatment, founded upon the functional derangement existing in the cerebral and cerebro-spinal centres, and in the ganglionic system, as connected with the splanchnic viscera. The general medication, therefore, and mechanical means, should precede the sub-cutaneous section of the tendons.

Dr. Detmold has operated for club-foot as early as at the age of three months. Dr. Mott, and also Dr. Carnochan, of New York, have operated as early as one month or six weeks. The earlier the period of life after two months, the more successful generally is the operation, because of the pliancy of the parts.

Mr. Braithwaite, in his valuable Retrospect of Practical Medicine and Surgery, (January to July, 1840,) to illustrate the natural curative power of the tendinous tissues, mentions a case of his, in which a woman, by some violent exertion, tore off a portion of the os calcis, which, with the tendo-Achillis attached, protruded through the integuments. The bone was cut from the tendon, and the latter replaced. The parts then healed kindly, so that she walked almost as perfectly with this leg as with the other.—*T.*]

[*Excision of a portion of the Tendons of the Leg for Paralysis.*

There would seem to be no end to the admirable uses to which this branch of surgery is extending itself. Mr. James Braid, of Manchester, England, (see *Medical Gazette*, April 23, 1841,) has proposed an entirely new application of tenotomy, which promises to be of great value. The cases were as follows: In a female, the left leg was comparatively powerless for two years from a paralytic stroke; it hung dangling by the side of her crutch, and inclined to varus. After every effort at medication had failed, Mr. Braid made a *longitudinal incision* along the course of the peroneus tertius, which he elevated, and then excised a portion of it to the extent of three sixteenths of an inch, closing the wound with plaster, and applying bandages and splints to *approximate the edges of the division* and maintain them in contact. In twenty days she walked perfectly. In a boy aged six and a half years, with talipes varus ever since he was one year old, such was the relaxed or paralyzed state of the extensors of the foot, that the latter could with ease be placed against the forepart of the leg. He had no power over it. Three eighths of an inch of the tendo-Achillis were excised. On the tenth day the wounds were closed. At the end of three weeks, in consequence of a fall, inflammation and suppuration came on, which soon ceased and the wound healed. In three months he could walk perfectly well, and extended his foot with ease. Caution, Mr. Braid says, is required, that neither too much of the tendon is excised, for fear of producing too great an excitement upon the contractile power of the muscular fibre, nor too little of it, for fear of the opposite effect. Here is a new process, the reverse of ordinary tenotomy, in respect to retraction of the part, exclusion of air, and inflammation and separation of the divided

parts, yet deriving its utility from the leading principle of tenotomy—that of the division of the abnormal tendon. It is founded on sound pathology, but the operation may prove hazardous, from the necessity of laying bare the tendon.

Mr. Braid remarks, that in pure talipes equinus, with rigid contraction, it will generally be found that, besides the tendo-Achillis and plantaris, there are also implicated the flexor longus pollicis pedis and flexor longus communis, tibialis posticus and peroneus longus and brevis. He admits that powerful extension may ultimately bring the foot into its natural position, where the tendo-Achillis is divided, but this will be attended with much more torture, and not accomplished so soon, as where such of the other named muscles as are rigid are also divided. In this latter case, a sufficiently firm reunion will have taken place in four or five days to enable the patient to extend the foot, if the operation has been properly performed and the patient is a healthy subject. This division of the abovenamed muscles was suggested to Mr. Braid by seeing a patient instantly walk across the room, with his toes out and soles flat to the ground, after he had divided the tibialis posticus and flexor pollicis pedis in a case of slight varus. The division of these muscles with that of the tendo-Achillis is the more necessary, because, from their antagonists being more or less feeble, if extension only is used, the disease will often return. In equinus and all other varieties the leg should be bandaged to the knee, to keep the foot in its morbid position and to prevent the muscles contracting, and thus making the separation too great before the plastic lymph is deposited. Gradual extension should begin in two days. In varus, also, he divides at once every tendon that can possibly retain the foot in its morbid position; also, the plantar fascia and short flexors, should there be much contraction in the sole of the foot. The muscles he generally divides in varus are the Achillis, tibialis anticus and posticus, flexor longus pollicis pedis, flexor longus communis, and abductor pollicis, if required. In valgus, he frequently divides at once the peroneus longus and brevis; sometimes, also, the Achillis, peroneus tertius, and the extensor longus communis, and propius pollicis pedis. In calcaneous talipes, (i. e., *talus*,) he sometimes divides at once the tibialis anticus, extensor proprius pollicis pedis, extensor longus digitorum pedis, and peroneus tertius. In most cases of equinus, even after the restoration, the leg is found a little shortened, which must be compensated by a high-heeled sole. For adults, Mr. Braid uses a straight tenotome, one inch and a quarter long, and about a twelfth of an inch broad; the point, being cut off at an angle of about sixty, is less apt to transfix the tendon and leave any portion of it undivided than the curved or sharp-pointed blade. Also, it is less liable to make a counter-opening in the integuments. For infants and children, a much smaller blade will suffice.

Mr. Braid prefers the division to be made as follows: For the tendo-Achillis, about an inch and a half from its insertion in the adult, and proportionably less in younger patients—and he prefers

cutting from without inwards; the tibialis anticus, near its insertion in the os cuneiforme internum; the tibialis posticus, near its insertion in the os scaphoides; the flexor longus pollicis pedis and flexor longus digitorum pedis, at the point of decussation in the sole of the foot from within outwardly; and from this same wound, the plantar fascia, also, when necessary. The peroneus longus and brevis are best divided together above the malleolus externus, but separately below it, near their points of insertion; the extensor longus digitorum pedis, before the point of separation into distinct tendons; the extensor proprius pollicis pedis, a little more inwardly; and the peroneus tertius in the same line, or near its insertion, as may be preferred in the respective cases; all these latter from within outwardly.

Instead of Strohmeyer's foot-boards and Scarpa's shoe, which are rather too costly for the poor, Mr. Braid recommends for extension a sole-piece of hard-wood deal, about three eighths of an inch thick, and to be of the length of the foot and breadth of the sole at its greatest width, with an edge two inches and a half deep to rest upon the inside of the foot. The two pieces are fastened together with screw nails, and a notch cut in the sole pieces anterior to the malleolus externus, and in the side piece behind the root of the great toe, to allow the bandage the better to embrace the foot and make it lie close to the wooden sandal. This should be covered with sheet wadding or a pad, and be bound firmly on the foot with a roller, or with two or three straps and buckles. A piece of wood, from two to three inches wide, and sufficiently long to reach from the foot to a little below the knee, with a notch at the bottom corner, and with an arm extending forwards to about three quarters the length of the foot, is now to be made fast to the foot and sole piece, by means of a bandage passing from the front of the leg piece under and round the sole piece and foot, and then under the posterior notch from without inwardly and over the dorsum of the foot, passing again round the foot and sole piece, and placed at an acute angle with the sole, so that it may have sufficient leverage to elevate the foot when the upright stem is carried back to the side of the leg. An assistant is now to be requested to place a little wadding or pad at the inner edge of the leg piece, and carry it back against the top of the tibia, the surgeon regulating the extension to the degree that the patient can bear by allowing the bandage to give way in the mean time more or less, as he judges necessary. He is now to pass the bandage round the foot, ankle, and leg, from the foot upwards, embracing, also, this lever, with such a degree of tension as he may judge requisite to secure and maintain the necessary degree of extension the case requires and admits of.

The above is a combination of the lever and inclined plane, and is capable of great power. It is applicable to every variety of talipes. It should at first be undone and applied once or twice a day, and the foot bathed with spirit lotion. Afterwards it is to be kept on a longer time.

Mr. Braid, in recommending the above practical precepts, says he does so with the greater confidence, from having tested their utility in a more extended practice in talipes than any other person in the United Kingdom.

As permanent rigid contraction of the muscles and tendons produces exhaustion of the muscular and nervous energy of the limb, coldness, and loss of feeling, so is their division immediately followed by an increase of temperature, not only in club-foot, but especially in the hand and arm; and in such cases such has been the almost miraculous restoration of strength, that patients over thirty years, who have not been able to raise their arms in five or six years, have in two or three minutes been enabled to lift them to their heads. A patient aged seventy, who had paralysis of the right side, and had been dumb for three years, was, in eight or ten minutes after the operation, enabled to raise the arm pretty freely, and on the following morning spoke for the first time since his paralytic seizure. As connected with this subject and Mr. Braid's new process of curing paralytic limbs by excision of the relaxed or elongated tendons and muscles, (already referred to,) he mentions the case of a boy aged ten, with a dangling paralytic leg, and his head hanging down on the shoulder, and general muscular weakness, requiring crutches, and whose Achillis he had divided for talipes. The patient made out to walk in three weeks, soon after to support himself on his leg and raise his head, and finally threw away his crutches and walked with a stick. "I could," says Mr. Braid, "adduce other instances where weak and withered arms, almost from birth, have thus been restored both to power and increased size."

Under this point of view, Mr. Braid notices three varieties of paralysis—1. Where one class of muscles was in constant rigid contraction; 2. Where there was not morbid tension, but morbid relaxation of one or more muscles; 3. Where there was a morbid relaxation of the whole member, say a leg or an arm, with wasting of its substance.

In cases of withering of the muscles and paralysis of the limb for years, Mr. Braid also speaks of another extraordinary remedy which he has discovered besides excision. It is merely a continued friction for a short time by rolling a smooth cylindrical body (as a strong ounce vial) over the limb, from the roots of the nerves and trunks of the blood-vessels in a direction towards their extreme branches, establishing thus a free use of the limb in some cases in the space of ten minutes! The cases he gives seem almost incredible; and his treatment is based upon the pathology of a deficient supply of nervous fluid, which he by this process forces into and accumulates in the part.—(Vide *Edinburgh Med. and Surg. Jour.*, Oct., 1841.)

Professor Gross, of Louisville, United States, (see his edition of *Liston's Elem. of Surgery*, Philadelphia, 1842,) deprecates what he calls the rage or monomania for tenotomy, "carving of the tendons," &c., and seems to agree with Dr. Chase, of Philadelphia,

that, in two thirds of the cases under two or three years of age, an apparatus properly constructed and applied is quite sufficient for the cure. It happens that orthopedy, tenotomy, and myotomy, in Europe, have, in the hands of such masters as Strohmeyer, Guerin, Dieffenbach, Bouvier, Duval, &c., on the continent, so immeasurably surpassed their advancement in all other countries, even in England, that the profession, so to speak, with some one or two rare exceptions, perhaps, in our own country, and which will be found in the proper place, have been left behind the rapid march of this department of science abroad. Many, therefore, with a natural feeling, decry or disparage such revolutionizing innovations as fearful; and as an illustration of this, it may be remarked, that even in what are termed standard and perfect works on surgery, published up to the present moment, either in England or America, the subject is scarcely adverted to; or in such a trivial way, we must be allowed to say, as to have rather a tendency to cast doubts or ridicule upon, than to inspire confidence in its efficacy. This is a radical and unpardonable error. For, to believe such authors, it were only necessary to make a few slight reminiscences of, and devote some five or ten pages to, club-foot and torticollis, and enough is done to satisfy the inquiring minds of the present generation on a subject which is in every one's mouth for its brilliant results, and which already covers an immensity of space, to say nothing of its kindred discovery, Anaplasty. The truth is, that the study of the whole subject of the surgical anatomy of the muscles, tendons, aponeuroses, fasciæ, ligaments, capsules, &c., which had hitherto been almost slurred over as a waste of time, has to be thoroughly gone into by medical men of the present day to make them capable of comprehending properly the nature of this great department of operative surgery. Hinc illæ lachrymæ!

Professor Fergusson, of London, (*System of Practical Surgery,*) says of the operation for club-foot, that, in the young subject, the tendons and muscles are all so near to each other that either of the tibial arteries may occasionally be wounded, and that he is under the impression that in children they are frequently wounded, in which he has been confirmed in his own practice by the subsequent flow of blood. He adds, that a little pressure with a pad and bandage has effectually restrained the hemorrhage, as I have also had occasion to see in the case of a child, in which one or both these arteries were unquestionably wounded in this operation. Pressure, he remarks, is equally effectual in divisions in the sole of the foot. In adults, the wounding of the tibials might cause more trouble. In every case the arteries should be carefully avoided.

In the apparatus afterwards to be used, and which is an important part of the cure, Mr. Fergusson has sometimes found a common pasteboard or wooden splint, placed along the outside of the leg, more effectual, or at least more manageable, in children than any other contrivance. He would not apply any apparatus immediately after the operation, if it caused much pain, or was done at

the risk of laceration or inflammation; but he believes the sooner it can be applied the better.

In accidental ruptures of the tendo-Achillis, Mr. Fergusson has seen the parts, kept in proper contact, become united as firmly and appear as strong, even in very heavy individuals, as any other portion of the tendon.—*T.*]

f. *Tendons of the Leg.*

The flexor tendons only of the leg are those which have been charged with producing a deviation of this limb, and whose division has attracted the attention of surgeons. What I have said above, however, in relation to the rectus-femoris and the ligamentum-patellæ, would authorize us to undertake the same operation in front, (*en avant,*) if the qaudriceps extensor muscle should in reality become the seat of a permanent retraction. As the operation in that case would be more easy, and fully as effective, and expose us to less risk of opening into the articulation, below than above the patella, it would, in consequence, be the ligamentum-patellæ, rather than the tendon of the rectus-femoris, that we should divide, either from before backward, or from behind forward, but always by one of the modifications of the process of Dupuytren.

Indications. Tenotomy in the ham should not be undertaken, except where the joint at the knee is not anchylosed, the flexion of the leg free from luxation, and the infirmity dependent in reality upon a retraction of the muscles, rather than upon an alteration of the ligaments, or a paralysis of the quadriceps extensor muscle of the thigh. Examined under this point of view, the unnatural flexion of the leg has not been sufficiently studied to enable us to know precisely whether it is one of the tendons of the ham only, rather than the others, or all of them combined together, that generally produce it. This, however, presents no difficulty in the operation, since the surgeon limits himself to dividing those tendons only which prevent the natural mobility of the limb. Many practitioners, doubtless fearful of thereby destroying the internal and external muscles of the thigh, would still hesitate to perform it for a simple deformity which does not prevent the patient from walking either with crutches or on a wooden leg.

The two cases taken from Paré and Boucher, which show that in one case these tendons, when divided and then reunited by means of suture, and in the other in spite of the loss of substance they had undergone, have both, nevertheless, reacquired their functions, ought to have been quite sufficient to have given us confidence on this subject, in addition to that which practitioners might also derive from the details into which I have entered, upon the reproduction of tendons and their mode of cicatrization. Science, at the present time, possesses facts of a still greater value. MM. Michaelis, Strohmeyer, and Dieffenbach, (*Bouvier, Mém. de l'Acad. Roy. de Méd.*, t. vii., p. 411,) have for a long time applied their methods of tenotomy to the tendons of the ham. M. V. Duval (*Bullet. de l'Acad. Roy. de*

Méd., t. ii., expér. t. ii.) gave, in 1837, positive proof that this operation may be practised with as much success about the knee as upon the tendo-Achillis and the other tendons of the foot. The memoir addressed by this orthopedist to the Royal Academy of Medicine, contains facts which do not any longer permit a doubt upon this subject. The seven persons thus operated upon, and of whom M. T. Duval (*Thèse*, No. 342, Paris, 1838) speaks, were all cured or relieved.

The Operation. The patient, lying upon his belly, has the thigh extended and supported by assistants. Placed on the side of the tendons to be divided, the surgeon, who has already examined them, inserts a straight bistoury, by puncture, on the outer side of the thigh if it is the biceps, or on the inner side when the tendons of the pes-anserinus are more particularly retracted. After having conducted his instrument to the opposite side of the tendon to be divided, either by grazing along the internal surface of the skin, which always seems to me the best mode, or by passing in front (*au devant*) of the stretched cord, he causes the aid to extend the leg of the patient with a certain degree of force. Turning then the cutting edge of the instrument downward, (*en bas*,) or upward, (*en travers*,) he divides, as I have said of the tendo-Achillis, the whole thickness of the shortened tendon. The section of the biceps would be then terminated, and there would be nothing remaining but to withdraw the bistoury, and proceed to the dressing.

On the inner border of the ham, the operation would be more complicated. There we may have to divide the tendon of the gracilis muscle, the semi-tendinosus, and the sartorius, successively. Nor ought the semi-membranosus itself, as it is the largest, to be spared in this case, if it was in reality retracted. We should do wrong, on the other hand, to cut those four muscles, if they were not all diseased. The section of one of the first three, or of the whole three together, would not in reality be much more dangerous, nor perceptibly more difficult, than that of the biceps. Provided the bistoury should not be carried too far towards the popliteal space, or the posterior surface of the femur, it would incur no risk of wounding any important organ, the popliteal artery, vein, and nerves, being too deeply seated to be reached in this way. The internal saphena vein and nerve alone would run some risk; but we know how easy it is to avoid them. Unfortunately, it is not the same with the semi-membranosus muscle. Being very near to the posterior surface and internal border of the femur, as far up as its termination, this muscle would require that the instrument, introduced by a puncture between its posterior surface and the tendons which I have just mentioned, should be held so as to divide it from within outward, and from behind forward, going at the distance of an inch at farthest above the internal condyle of the femur. I ought, however, to add, that by introducing through the puncture in the integuments a blunt-pointed bistoury, or one of the blunt-pointed tenotomes which I have already mentioned, there would in fact be little risk incurred in the neighborhood of the popliteal

vessels and nerves. It is, after all, at this height, or a little lower, that it is advisable to perform the section of the tendon of the biceps and of those at the pes-anserinus, (*patte d'oie.*)

The operation being performed, we immediately give the leg a certain degree of extension. If, in straightening it completely, there should not be produced a separation of over two inches between the ends of the divided tendon, we ought not to hesitate to do it. In the contrary case, it is better to increase this extension by degrees, than to risk the formation of a cellular cicatrix only, by being too hasty. In the place of the dressings and apparatus, more or less complicated, which the orthopedists employ in such cases, the surgeon may use a long splint provided with a cushion, which is to be applied upon the forepart of the thigh and leg, and which serves as a point d'appui for the turns of bandage intended to draw the limb into a state of extension. A roller bandage, with the interposition of a long strip of pasteboard, upon the posterior or anterior surface of the part, which bandage should be rendered immoveable by dextrine, and should be left to harden while the leg is being stretched to the proper degree of extension, is, however, the dressing most to be preferred in these cases. In order to increase from time to time the extension of the limb, we may soften the dressing by moistening it with tepid water on its middle portion, or renew it every six or eight days. It might probably be advisable, also, to stretch the limb, either suddenly or by degrees, into as great a degree of extension as possible, and to keep it so from one to two months, in order to secure it more effectually from all consecutive retraction.

[*Division of the Tendons at the Ham.* In the division of the tendons at the ham, as when retracted in white-swellings, and where there is no anchylosis, Prof. Fergusson enjoins here, also, great caution, especially in young subjects, for fear of wounding the popliteal vessels and the posterior tibial nerve. He considers Amesbury's double-inclined plane a very good apparatus for the gradual extension. He severely censures the recommendation of M. Louvrier to stretch out the limb by actual force applied within the space of a few minutes, and that of Dieffenbach, to do the same immediately after the operation. He considers that this violence, of bringing the foot suddenly up to the hip, and then as suddenly straightening out the limb, might fracture the femur; and asserts that death has been thus produced by the excessive inflammation and suppuration which had ensued, while amputation has been required in other cases.—*Pract. Surg., loc. cit.*

Mr. B. Phillips, of London, recently effected a perfect cure of extreme and permanent flexion of the leg on the thigh, which had existed for years, in a woman aged twenty-nine, from rheumatism affecting the knee-joints and hands. A straight blunt-pointed knife, introduced through a small wound flatwise between the tendon of the biceps and bone, divided those cords, and an inch of separation was obtained. A modification of Amesbury's apparatus was used for aiding extension, and in a short time a perfect cure

was effected, and the leg slowly recovered its motions.—*Medical Gazette and Edinburgh Medical and Surgical Journal*, 1840.—*T.*]

g. *Tendons of the Head.*

Like the limbs, the head is sometimes drawn into an unnatural direction by the retraction of some of its muscles. The deformity which results from this, and which is generally known under the name of *caput obstipum*, *wry-neck*, and *torticollis*, is of such frequent occurrence as to have caused it to be noticed by authors of the highest antiquity. Most surgeons, however, have neglected to define the cause of it. Some of them had already remarked, that torticollis might arise from a retraction of the platysma myoides, the trapezius, the scaleni, or the sterno-cleido-mastoid muscles. But it is now almost demonstrated beyond dispute, that this last muscle, if not the only cause, is at least by far the most frequent source of it, (*le point de depart.*)

Whether the *torticollis* be congenital or accidental, recent or ancient, spasmodic, convulsive, intermittent, or permanent, this is not the place to examine the relative value of the different modes of treatment that have been devised to effect its cure. The internal remedies, and the different topical applications which the ancient surgeons were in the habit of using in such cases, are not, in truth, of any value in the treatment of an ancient and permanent torticollis. The massage, still recently extolled by M. Séguin, (*Revue Med.*, 1838, t. ii.,) the sudden movements forcibly and unexpectedly applied to the head of the patient, as in the young girl, who, in her eagerness to look out of the window at some fireworks, was suddenly cured by violently turning her head to the side opposite to that of her torticollis, could not succeed but in a very small number of cases. There is generally, therefore, where we do not wish to abandon the infirmity as incurable, no other remedy but a surgical operation which can remove it.

A. *Indications.* This operation, already repeatedly performed in the seventeenth century, and which some surgeons had continued to make mention of, remained, nevertheless, out of general practice until in these latter times. Embarrassed (*arrêtés*) by the idea of a concomitant deformity in the cervical region of the spine, or of even a consolidation of the vertebræ, and believing, also, that the atrophied or shortened muscle, when once cut, could no longer act on the head or chest, practitioners were induced to regard this operation as useless, and one of considerable danger. Such apprehensions have now passed away. Positive facts have proved, that the section of the muscles of the neck allows of the head being easily straightened, however ancient may be the torticollis. I have seen M. Bouvier, at the Royal Academy of Medicine, divide the sterno-mastoid muscle on the dead body of a girl aged twenty-two years, and who had had a torticollis from birth. The head could be straightened immediately, and the vertebræ were scarcely in the least degree altered. It is nevertheless true, as M. Guérin has par-

ticularly endeavored to prove, "that in ancient torticollis there exists, in a direction opposite to that of the inclination of the head, an inclination of the whole cervical column upon the first dorsal vertebra." But it was not this slight deviation of the spine, which, moreover, disappears either spontaneously or under the influence of the proper kind of apparatus after the section of the muscle, which had embarrassed surgeons. We now have cures of torticollis by the section of the sterno-mastoid tendon in individuals deformed for more than twenty years; so that it is a question definitively decided.

The history of the section of the muscles or tendons of the neck, in cases of torticollis, is that of tenotomy in general; it was, in fact, with this operation that surgeons commenced. The observations published in Holland in the seventeenth century all relate to this. It is the only one which was spoken of before Thilenius, Michaelis, and Sartorius. The facts mentioned by Tulpius, Job à Meckren, Blasius, Tenhaaf, and Chesselden, all relate to torticollis. Nevertheless, in spite of what has been said of it by Richter, M. Richerand, and Boyer, and notwithstanding the operations performed by Dupuytren, M. Dieffenbach, M. Syme, and M. Strohmeyer, tenotomy, in cases of torticollis, scarcely attracted attention until MM. Guérin and Bouvier, in 1838, reawakened the public mind upon this subject. But the last modification (*phase*) of this operation, which goes back only to 1820, had already reached to the highest point of perfection and simplicity of which it is susceptible; while the section of the tendo-Achillis, though it was first practised in 1784, was not enabled to attain the same perfection until 1837.

B. *Operative Methods.* All the processes of tenotomy have been applied to torticollis. The operation of Tulpius, and that of other Dutch surgeons, was performed in the following manner. A caustic was applied upon the skin; at a later period the bistoury was used to divide the muscle above the clavicle. Others occasionally dispensed with the caustic, or with the bistoury, and had recourse, some to a transverse incision, which should include both the teguments and the muscle, and others to a scarification (*escarification*) of the parts. It appears that no other than this method was practised up to 1821, and that Dupuytren, for still using it at that epoch, was strongly censured by M. Ammon, (*Parallèle de la Chirurg. Française et la Chirurg. Allem.*, etc., Leipsic, 1822.) Recently, also, there are distinguished surgeons who have still thought it advisable to follow this mode. M. Amussat had adopted it in a case which he communicated to the Academy, with this difference, that, like Michaelis, he contended for a partial section of the muscle. In 1836, M. Roux also divided the teguments transversely before dividing the sterno-cleido-mastoid muscles. It appears that M. Magendie, who, after the manner of Sartorius, made first a longitudinal incision in the skin, thought it necessary, in order to reach the muscle more readily, to change this wound into a crucial incision, (*Expériences*, t. i., pp. 511, 541, 542.) It is easy to recognise in the midst of these facts that the incision has been sometimes made

upon the body of the muscle, and at other times towards its extremities; that it has occasionally comprised the whole, and at other times only a part of it, without there having existed in this respect any fixed plan of proceeding in the minds of the operators.

The second method, and which M. Guérin has thoroughly investigated, is composed of three essential particulars—1. To divide the tendon of the muscle, and not the muscle itself; 2. To divide only one of its portions (*faisceaux*) when, as frequently happens, they are not both retracted; 3. To perform this section by puncture, and not through an incision of the integuments.

Heister (*Institut. Chirur.*, t. ii., p. 673) had already indicated, in a formal manner, the place where it would be proper to cut the tendon of the sterno-mastoid muscle; he has even had the precaution to mark this point in figure 12 of plate 21 of his book. So also has Joeger. M. Chelius, (*Traité de Chirurgie*, trad. par Pigné, Paris, 1835, t. i., p. 463,) who also designates it, recommends that it should be at an inch above the sternum, and that the incision should be transverse. On the other hand, Richter had said that in torticollis it sufficed to cut the portion of the muscle which is attached to the sternum, and that we should proceed to the section of the second portion, when that of the first did not appear to answer, (*Expér.*, t. i., p. 539.) Every thing, also, shows that Dupuytren (*Coster, Manuel de Méd. Opér.*) had used in 1822, and with entire success, the process of puncture for the section of the sterno-mastoid muscle.

The operation which Dupuytren performed in this manner, in 1822, was not published by him; but the account of it was given in France by M. Coster, (*Ibid.;*) in England by M. Averill, (*Treatise on Operative Surgery*, 1823;) in Germany by M. Ammon, (*Paral. de la Chir. Franç. et de la Chir. Allem.*, 1823;) and then by M. Froriep, (*Notizen*, &c., t. v., p. 142.) M. Michaelis also mentions it in the Journal of Graefe and Walther. According to these different authors, Dupuytren, operating on a young girl, made a puncture into the skin on the inner side of the sterno-mastoid muscle, and through that introduced upon the posterior surface of the muscle a blunt-pointed bistoury, the cutting edge of which he afterwards turned forward to divide the retracted muscle from its deep-seated to its cutaneous surface. Dieffenbach, (*Rust's Handbuch der Chir.*, t. iii., p. 629,) who knew this method, announced, in 1830, that he had followed it with success in an entire series of cases, and that with him the division of the sternal portion only of the muscle had been generally found to answer. A surgeon of Edinburgh, M. Syme, (*Edinburgh Med. and Chirurgical Journal*, t. xxxix., p. 321,) having imitated Dupuytren, published all the details of his operation in 1833. It appears, also, that M. Strohmeyer (*Expérience*, t. i., p. 511) had had recourse to the same method in 1835. I have recently seen, by a letter dated June 1, 1838, that M. Dieffenbach has for ten years performed tenotomy upon the neck after the method of Dupuytren, and that he has, up to the present time, had thirty-two cases of it. M. Bouvier affirms, on his side, (*Ibid.*,) that he

had put it in use at Paris in the course of the year 1836. It is nevertheless true, that this operative process, applied to the tendons of the neck, had hardly attracted attention at the period when M. Guérin proposed it as a new method, sustaining himself upon facts and reasonings that produced entire conviction.

The text of the authors who have first spoken of this operation is not sufficiently clear to authorize us to maintain that Dupuytren confined himself to a single puncture. The narration of MM. Coster and Froriep (*Ibid.*, p. 590) would admit of the belief, that, after having inserted the point of the bistoury upon one side, he had also perforated (*traversé*) the skin with it on the other side. M. Guérin, (*Expér.*, t. i., p. 589 to 592,) who strongly insists that we should confine ourselves to a single puncture, has, moreover, modified the operation in two other points. In place of incising the tendon from behind forward, like Dupuytren and his imitators, he divides it from before backward, or from the skin towards the deep-seated parts. In fact, he first makes the puncture on the outer side of the tendon, in order to penetrate under the skin from without inward. In reality, this discussion is a matter of very little importance; although the process of M. Guérin, in fact, is preferable to the others, when the teguments are sufficiently pliant to permit of its employment, it cannot be denied that in operating like Dupuytren, or M. Dieffenbach, or M. Syme, that is, in perforating the skin on both sides, (*qu'en traversant la peau des deux côtés,*) and in dividing the tendon from behind forward, we should obtain a result almost fully as advantageous. I should add, that there must be cases where each one of these processes would be found more particularly applicable, and that it would be absurd to wish to adopt one to the exclusion of all the rest. Who does not, also, see that these modifications in the operative process, for tenotomy of the neck, resolve themselves into a simple repetition of what has been done and said upon the occasion of the tenotomy of the leg, and more especially of the section of the tendo-Achillis?

In conclusion, the sterno-mastoid muscle, like the tendo-Achillis, ought to be divided whenever by its retraction it produces an abnormal deviation. When we are to divide it, it is advisable to ascertain if it is retracted by one of its portions, or by both at the same time. On the supposition that in the vicinity of the clavicle there should be adhesions, morbid cicatrices, or any circumstance whatever that might interfere with its section in this place, it would be advisable, as M. Dieffenbach informs us was done in a case operated unsuccessfully upon by M. Graeffe some time previous, to divide the body of the muscle itself: but I do not think it would be proper to divide this muscle in its upper part, as M. Bouvier has recommended, nor to make a previous incision in the skin which covers it, either after the Dutch method, or in adopting the mode of Sartorius, as M. Magendie still did in 1838, at the Hôtel-Dieu. Nor has the process of Delpech any greater claim to be adopted for tenotomy of the neck.

As to the processes by puncture, I have already said that that

of Dupuytren could be adopted, if it should appear impracticable to divide the whole breadth of the retracted muscle without penetrating (*atteindre*) the skin on the opposite side. Otherwise the process by simple puncture, in the manner MM. Stoess, Bouvier, and V. Duval, have for a long time employed it for the tendo-Achillis, would be preferable. For myself, I should also, unless there were particular difficulties in the way, adopt the improvement made in this process by M. Guérin; that is to say, I should prefer to make the bistoury pass under the skin than along the deep surface of the tendon. Also, I regard as a decided improvement, the precaution of dividing sometimes the sternal branch only, and sometimes the clavicular branch, and in other cases both these two branches at one stroke, according as the retraction comprises a part only, or the whole of the muscle. We see, indeed, that M. Strohmeyer (*Arch. Gén. de Méd.*, 1838, t. ii., p. 94) found himself obliged to perform, successively, the section of the sterno-mastoid muscle, then that of the clavicular bundle, (*faisceau,*) and finally that of the clavicular portion of the trapezius muscle, and, in addition to all these, a cellular bridle, which extended from the sterno-mastoid to the scalenus muscle.

As to the question, whether if after the operation it is proper to employ the apparatus or bandages, either to adjust the head or prevent a new retraction, and which appears, in fact, to have occurred in some patients of M. Dieffenbach, and as has doubtless happened also with others, I do not think it can be decided upon with absolute certainty. A young girl operated upon by M. Fleury, (*Ibid.*, p. 78,) and whom I saw, was not subjected to that treatment, and yet recovered promptly. If the reunion of a divided tendon should in consequence of a suppuration result in the formation of an inodular bridle, these mechanical means would be indispensable, not only to carry on the cure, but, as M. Guérin recommends, to complete it. Should the deviation of the cervical portion of the spine prove an impediment to the perfect straightening of the head, mechanical expedients in this case, also, should be had recourse to, after the operation.

In short, the operation having been performed, those mechanical contrivances should be made use of as often as it should seem difficult for the head to sustain itself in a proper position by the spontaneous action of the muscles. In the contrary case, we may dispense with them without any risk, and even with advantage.

C. *Operative Process.* The sterno-mastoid muscle, in its whole length, is surrounded with organs which we could not avoid the danger of wounding. In its upper half we could not divide it, without implicating many branches of nerves of the cervical plexus. On its middle third there would be danger of wounding the external jugular vein, and some filaments of the same plexus. Its lower fifth is in the neighborhood of some small veins, which there cross its insertion as they course under the skin; then, deeper still, it is approached by the sub-clavian and internal jugular veins, without taking into account that the carotid and sub-clavian arteries, also,

are not far distant. It is not, therefore, a matter of indifference to perform its section on this or that point of its length. In selecting the lower portion, we have not only the advantage of being enabled to cut its two roots separately, but of also easily ascertaining through the skin the condition of that portion of it which we wish to divide. We have, besides, a kind of hollow, or void, which separates it from the large vessels which I have spoken of, and which in depth corresponds to the entire thickness of the clavicle. Without, however, participating in all the fears of M. Bouvier, (*Expér.*, 1838, t. ii., p. 275,) we ought not to be ignorant of the fact, that the arrangement of the veins of the shoulder or neck which come to this region, to open either into the internal jugular or into the sub-clavian, is liable to very great modifications, so that it is impossible to say at first that we shall not wound any of them. In this point of view, therefore, the section of the sterno-mastoid muscle is an operation of rather more difficult character than that of the tendo-Achillis.

We begin by causing the patient to lie down, unless we should prefer to seat him on a chair, taking care to keep his chest in a state of semi-flexion. The surgeon, placed in front, or on one side, makes with the right hand for the left side, and the left hand for the right side, if he adopts the process of M. Guérin, a puncture on the outer border of the sternal tendon of the muscle, at the distance of six or eight lines above the sternum. Then, gliding the instrument flatwise under the skin, as far as to the inner border of the muscle, he turns its cutting edge backward, and thus divides the tendon from the teguments towards the deep-seated parts. If it is useful to relax the muscle a little while gliding the instrument under the skin, it is advisable to extend and stretch it at the moment of making the section of the tendon itself. As the bistoury acts on a firmly-stretched fibrous tissue, the cessation of resistance soon informs us when there is nothing farther to divide, and thus guards us from inclining the cutting edge of the tenotome too far in the direction of the deep-seated vessels of the neck.

For the clavicular portion, it would be necessary to make the puncture at an inch to an inch and a half farther to the outside, and rather close to the clavicle, than at a distance from it. As this portion is wider (*plus large*) than the other, it would be necessary, also, to insert the bistoury farther in, from without inwards. This tendon, which should be divided as thoroughly upon its inner as upon its outer border, upon its cutaneous as upon its deep-seated surface, is surrounded, but at a greater distance than the sternal portion, by the veins and large arteries.

If, in place of thus dividing the muscle by beginning on its subcutaneous surface, we should prefer dividing it from behind forward, it would be more convenient, but not indispensable, to make the puncture of the tegments on the inner side of each tendon, and the puncture being made, I should consider it a matter of great prudence to substitute the blunt-pointed tenotome or bistoury, for every kind of sharp-pointed instrument, in order that we might with greater certainty avoid the veins in that region. Afterwards, cutting

from behind forwards, with gentle saw-like movements, we should have to watch the successive separation of the divided tendinous bundles, in order to run no risk of coming through the skin itself.

This precaution, also, it would be well to take, even when we adopt the method of passing the instrument from the outer to the inner border. We may also perceive, that in dividing this muscle from before backward, there would be but little inconvenience in inserting the instrument from its inner to its outer border. The best course in all this, is first to make a puncture with a lancet, then to introduce into this puncture a tenotome, or a narrow blunt-pointed bistoury, and which could glide flatwise between the skin and the tendon, or between the tendon and deep-seated tissues, without incurring the risk of perforating the vessels or the skin itself.

As soon as the tendon is cut, it leaves a void on a line with the separation which takes place between its two extremities. The head may then be straightened without difficulty. Among the accidents mentioned as consequences of tenotomy in the neck, is ecchymosis, which exists sometimes to a considerable extent, but which, in the patients treated by M. Guérin, was always promptly relieved. M. Dieffenbach, (*Expér.*, Août, 1838, t. ii., p. 276,) who says he has performed this operation thirty-seven times, has failed in only one single case. The young girl, of whom M. Fleury speaks, fell into a state of nervous delirium, of a very peculiar character, which lasted three days, but from which she afterwards very rapidly recovered. We see, also, that the young man operated upon December 2d, 1837, by M. Guérin, (*Gaz. Méd. de Paris*, 1838, p. 529,) experienced some of the symptoms which appeared to indicate the introduction of air into the veins, but without any unpleasant consequences resulting from them. The small wound has always cicatrized in the course of a few days. Up to the present time, there has been no mention made that it has suppurated or caused inflammation underneath. The effusion and fluctuation which M. Dieffenbach speaks of, (*Expér.*, t. ii., p. 276; *Gaz. Méd. de Berlin*, 1838,) and which he overcomes or prevents by compression, is no cause for any alarm.

As to the mechanical means to be employed, if these should be necessary, I should advise the simple dividing bandage of the neck to begin with, and would not proceed to an apparatus, properly so called, until after being convinced of its being indispensably necessary.

[Dr. Mott divides the sterno-cleido-mastoid at the junction of the two roots. It is narrowest there.—*T.*]

[*Torticollis.* The sub-cutaneous section of the sterno-cleido-mastoid muscle, whose retraction is the almost exclusive source of this well-known deformity, has yet been but seldom practised in America. But few have had the courage or experienced tact of a Guérin to operate by the sub-cutaneous section in the dark, in a region so dangerous; and although Dr. J. M. Warren, of Boston, and Dr. N. R. Smith, of Baltimore, have performed it in several cases, Dr. Mott of New York, notwithstanding the now general con-

demnation of the old method, or open transverse incision through the integuments, and after all that he has been an eye-witness to at Paris, of the admirable skill of Guérin in the sub-cutaneous section, still adheres to that ancient, and, as he deems it for the generality of practitioners, safer practice. As a professor of surgery, Dr. Mott believes it to be his conscientious duty, not so much to teach what *can* be done by adroit manipulation, as what *may* be done by ordinary operators to extend the usefulness of their profession. He has divided the sterno-cleido-mastoid muscle twelve times for torticollis, incising cautiously the whole breadth of the retracted parts from without inward, and keeping the lips of the wound carefully apart by lint, and by the position of the head moderately inclined to the opposite side, until the wedge-shaped fissure is filled up with granulations. This mode has certainly one great advantage over the sub-cutaneous, viz., that it never or very rarely requires to be repeated, as the sub-cutaneous often does, from the tendency, in this last process, of the extremities of the divided muscles to reagglutinate.

Professor Syme of Edinburgh has recently published some very interesting observations upon this subject. The first case of sub-cutaneous section of the sterno-mastoid in Great Britain for wry-neck, was performed by that gentleman with perfect success, on a boy aged six, at Edinburgh, Nov., 1832. (See *Braithwaite's Retrospect*, No. 7.) The tenotome was inserted on the tracheal margin of the sternal portion, an inch above the clavicle, and the hard cord instantly divided with a loud snap, and perfect and immediate restoration of the head to its place. M. Syme justly remarks, that lateral deviations of the spine are produced by wry-neck from muscular retraction of the sterno-mastoid, the dorsal vertebræ on the retracted side assuming a corresponding convexity, and the lumbar bending in an opposite lateral direction to preserve the balance of the trunk. The operation for the torticollis readjusts the column, unless the disease has continued so long as to alter the shape of the bones, which alteration generally consists in a compression of the bodies of the vertebræ and projection of the sternum. In these cases, however, the division of the sterno-mastoid gives great relief, and the spine may recover its natural condition in time, if the patient is not arrived at maturity. Professor Syme gives a recent instance of this kind in a young lady upon whom he had operated in 1841, and where the back and ribs were much distorted, and the constitution so much affected that he scarcely hoped for success. In two years, however, she became, from being a pale, sallow, and crooked looking girl, a hale, ruddy, healthy looking young woman.

There is another case he mentions of wry-neck and lateral curvature of the spine, where the sterno-mastoid appeared soft and relaxed until the patient attempted to straighten his head. The division was effected, and the next day the patient's back was comparatively straight.

Thirdly, caries at the occipito-vertebral articulation, that is,

between the occiput and atlas, generally a fatal disease, must not be mistaken for wry-neck. (*London and Edinburgh Monthly Journal of Science*, April, 1843.)

M. Liston, on the other hand, (Vid. his *Elements of Surgery*, London,) imputes most cases of wry-neck (erroneously, as we conceive) to some vice in the bones, as curvature from softening, attended with deformity of the trunk or of the limbs, the twist in such cases being generally to the right side, the ear approaching the shoulder. He therefore in such cases recommends the use of apparatus, to restore the perpendicularity of the vertebral column, before, as we understand him, as well as after the sub-cutaneous section of the sterno-mastoid.—*T.*]

h. *Section of some other Muscles of the Neck, in cases of Deviation of the Head.*

There is no doubt that most of the muscles on the sides of the neck may become the cause of a permanent retraction, and contribute in this manner to some of the deviations of the head. Up to the present time, however, the trapezius and platysma-myoides are the only ones besides the sterno-mastoid, which in this respect have attracted the attention of surgeons.

In becoming indurated, and in retracting itself, the clavicular portion of the trapezius muscle would draw the head towards the corresponding shoulder. Thus M. Strohmeyer (*Arch. Gén. de. Méd.*, 1838, t. ii., p. 96) perceived that he could carry the bistoury by puncture under the anterior border of this muscle, and divide it from the deep-seated parts towards the skin, in a young girl in whom the torticollis had been but imperfectly removed by the section successively of the two branches of the sterno-cleido-mastoid muscle. As the object of the operator in such a case would not be to cut the whole breadth (*largeur*) of the muscle, the ordinary narrow bistoury inserted by puncture would be preferable to the blunt-pointed bistoury, and to the different kinds of tenotomes; and I do not see that it would be very important whether we made it cut rather from the skin towards the deep-seated parts, or in the contrary direction. It is an operation, moreover, whose utility it would at the present time be difficult to appreciate, as it does not yet appear to have been put in practice but in one single case.

The Platysma-Myoides, (*Peaucier.*) The platysma-myoides, expanding (*s'épanouissant*) upon the lower part of the face in one direction, and upon the apex of the thorax and shoulder in the other, might, if it should be retracted, produce a deformity of a sufficiently complex character. The lower lip and the corresponding commissure would necessarily be drawn downward and outward by means of the risorius muscle. We may conceive, also, that the lower jaw would have a constant tendency to be depressed, and consequently that the mouth of the patient might remain permanently open; the whole head, in fact, would be drawn forward, and to one side. It is a species of deformity which Gooch says he has met with. Perhaps in the patient mentioned by this surgeon, as

well as in the one that M. Lelong (*Thèse*, No. 179, Paris, 1819) speaks of, there were sub-cutaneous fibro-cellular bridles, and certain inodular cicatrices of the skin, rather than actual retraction of the platysma-myoides. Be that as it may, Gooch divided the abnormal cord transversely, was then enabled to straighten the head, and ultimately, he says, cured his patient.

If such a deformity should be met with at the present time, it would be advisable, above all, to ascertain whether it arose from a muscular retraction rather than from cutaneous bridles. In this last case, in fact, we should have recourse to transverse and repeated incisions, or to the extirpation of the bridle itself, after the manner I have pointed out in another chapter.

If the deformity in reality depended either upon a cellulo-fibrous bridle, or upon the platysma-myoides, and the skin above remained free from adhesions, the processes of tenotomy should be had recourse to. It would be advisable, especially, to raise up the integuments, in order to separate them as much as possible from the bridle, and that, the puncture being made, the bistoury might glide in the sub-cutaneous tissue to beyond the cord to be divided. This manner of proceeding would evidently be preferable to the processes of M. Strohmeyer, or those of MM. Stoess and Bouvier. The only part which could run any risk in this operation, would be the external jugular vein ; but it is sufficient to recollect this, to enable us to avoid it with certainty. The section of the bridle having been effected in one or several places, it would at least be quite as necessary here as after the section of the sterno-mastoid muscle, to call to our aid an apparatus or bandages to complete the cure, and restore to the head as straight a position as would be desirable.

CHAPTER IV.

DEFORMITIES IN CONSEQUENCE OF ALTERATIONS OF THE LIGAMENTS OR DEEP-SEATED APONEUROSES.

It having been remarked that certain deviations, independent of diseases of the articular surfaces, or of alterations in the direction of the bones, could not in any manner be explained by morbid cicatrices, sub-cutaneous bridles, or the retraction of the muscles, practitioners asked themselves the question, if the cause might not be in the shortening or rigidity of the ligaments. This is a question altogether new in operative surgery. MM. Ghidella and Froriep, who appear to have been the first who have given consideration to this subject, have not accompanied their descriptions with details sufficiently precise to know exactly to what kind of lesions they in reality directed the treatment of which I am about to speak. Nevertheless, as we do in fact sometimes meet with tetractions

which it is utterly impossible to explain, otherwise than by the rigidity of certain ligaments, and the shortening of certain aponeurotic bridles; and as it is now impossible, after one of the observations communicated to me by M. Champion, and after that published by M. Froriep, to call in doubt the power that the aponeuroses have of retracting themselves, I think we should not, in too absolute a manner, reject the practice of the surgeons of whom I have spoken. I ought also to add, that each of the three surgeons who as yet have endeavored to call attention to this point of surgical pathology, extols a different method. M. Ghidella, (*Bulletin de Férussac*, t. xiii., p. 67,) for example, recommends that we should divide all the retracted bands (*rubans*) by means of large (*large*) and numerous incisions. He gives many cases of rigidity, and one of a very ancient semi-anchylose state of the lower jaw, which were cured by this kind of operation. On the contrary, in the process of M. Froriep, (*Encyclog. des Sciences Médic.*, t. i., p. 252, *ou Gaz. Méd. de Berlin*, No. 12, 1836,) we are advised to rely upon mechanical means, when the simple incisions after the method of Dupuytren do not appear to be practicable. In fine, we perceive, by the researches of M. Nanzio, (*Bullet. de l'Acad. Roy. de Méd.* t. i., p. 60, et t. ii., p. 135, et suiv.,) professor of *hippiatrique* at Naples, that in horses, where this kind of retraction appears to be very frequent, the operation should consist of deep (*large*) incisions, which should penetrate to near the joint, and of the iron heated to whiteness, which should be applied directly to the capsule or the ligaments.

The authors who have proposed these operations are men that are known and esteemed; they relate facts and successes in support of their practice; we should, therefore, act discourteously to reject their recommendations without examination. It seems to me, however, that the method of M. Nanzio, transferred from the veterinary art to surgery, properly so called, would incur the risk of serious dangers, without authorizing us to expect from it any special efficacy; that of M. Froriep would hardly have any more chances of success in the deviations produced by retraction of the ligaments, than in those caused by retraction of the muscles; on the other hand, it would scarcely be allowable to apply the method of Ghidella, except upon the ligaments situated superficially. Nevertheless, simplified as this method has been for tenotomy, it might be made trial of without great danger, upon the articulations of the fingers and toes, the wrist and instep, the knee and elbow, as well as upon the temporo-maxillary articulation.

§ I.

In the *fingers*, this method, which had already been proposed in some cases of luxations of the phalanges difficult to be reduced, and which Bell performed with a cataract needle, might be effected with the point of a very narrow bistoury, or, better still, with a strong arrow-headed needle. Passed from one of the surfaces of

the finger to the other, as it grazes along the deep-seated surface of the skin, so as to avoid the lateral vessels and nerves, the instrument, whose cutting edge should be soon turned crosswise, would, without any great difficulty, divide the lateral ligaments of each of the phalangeal articulations, or those of the articulation of the fingers with the hand.

§ II.

At the *wrist*, where the operation would be a little more dangerous, because of the ulnar and radial arteries, it would be better, after the puncture has been made below, and upon the cubital side of, the styloid process of the radius, to cut the ligament from the deep-seated parts towards the exterior, rather than from the skin towards the articulation. It would be the same for the internal lateral ligament, although it may not be quite so near the ulnar artery as the preceding one is to the radial artery.

§ III.

The lateral ligaments of the *elbow* would be very easy to divide by this method. Nothing would prevent us from passing the needle or the bistoury between the skin and the other tissues, in order to cut the ligament from without inwards. We must, nevertheless, remember, that, in proceeding thus with the external lateral ligament, we should run the risk of partially dividing the supinator radii brevis, while, in cutting from the deep-seated parts towards the exterior, we could avoid this muscle with greater ease. The instrument, moreover, should be introduced at the distance of three or four lines below the external condyle. We could render this separation of the ligament more easy, if we could possibly keep the forearm in a state of semi-flexion during the operation. The internal lateral ligament would be difficult of division under the anterior origin of the flexor carpi ulnaris; we should, moreover, recollect that the ulnar nerve passes between the inner condyle and the olecranon.

As to the anterior ligament of the humero-cubital articulation, I do not think that any surgeon would have the boldness to attack it in such cases.

§ IV.

The section of the ligaments of the *toes*, should it ever become necessary, ought to be made like those of the fingers.

§ V.

At the *tibio-tarsal articulation*, it would be easy to divide the internal lateral ligament by passing a bistoury under the skin, and from before backwards, then turning its cutting edge soon after in

the direction towards the astragalus, in order to divide the ligament transversely at the distance of some lines below the apex of the malleolus.

The external lateral ligaments could be reached in the same way; there would be no other risk incurred in such cases than that of wounding either the tendons of the peroneus longus and brevis, or those of the tibiales; but it is yet doubtful if the indication for such an operation could present itself in the feet.

§ VI.

It is especially to the articulation of the *knee* that the remarks of M. Froriep apply. It is true, that bridles of the fascia lata sometimes take on in this neighborhood a thickness and hardness altogether abnormal, and that the necessity of dividing them has suggested itself to the mind. It is also true, that both the internal and external ligaments of the knee are situated quite superficially enough to enable us to divide them without difficulty, if they were in reality retracted. Thus, with a lancet to make the puncture, and a blunt-pointed tenotome introduced under the skin from before backwards, commencing at the distance of two fingers' width inside the apex of the patella, and extending to a level with the anterior border of the pes anserinus, and then brought opposite to the articular interstice, we could divide without difficulty the whole breadth of the internal lateral ligament. Carried in the same manner outwardly, the bistoury would have difficulty in dividing the ligament without dividing also the tendon of the biceps, since those parts are, so to speak, enclosed one within the other; but the division of both might be rather beneficial than injurious, for how are we sure at first that the ligament only is retracted?

As to the aponeurotic bands, their section does not require that we should trace out rules for them, since it must vary according to the form, seat, or degree of elevation of the bridle to be divided. It is unnecessary to say, that the ligaments of the shoulder and of the hip will probably always remain exempt from any attempt of this kind.

§ VII.

It remains to speak of the articulation of the *jaw*. I do not know to what extent the rigidity or shortening of the temporo-maxillary ligament might produce an anchylosis of the jaw. In all cases, a cataract-needle, introduced by puncture from before backwards, or from behind forwards, would without difficulty effect its division; but I ought to repeat, in terminating this article, that such operations do not offer any special remedial benefits, and we may be allowed to doubt if they will continue in practice.

CHAPTER V.

DEFORMITIES FROM ALTERATIONS IN THE SKELETON.

I SHALL divide the deformities to be examined in this chapter into two orders—those which result from an anchylosis (*soudure*) of the articulations, and those which depend upon a deformity (*déformation*) in the body (*du corps*) of the bones.

ARTICLE I.—ANCHYLOSIS.

Three kinds of operations—the fracturing of the anchyloses, the excision of one of the neighboring bones, and the establishment of a false joint—might, strictly speaking, be undertaken to remedy the anchylosis of the joints.

§ I.—*Fracturing the Anchylosis.*

When, in consequence of any disease whatever, the joints become anchylosed, there results from it an infirmity which is generally incurable; the idea, then, of breaking the anchylosis in such cases is altogether natural. Thus have there existed in all times surgeons who, in accordance with the vulgar opinion, have recommended destroying in this manner the different kinds of articular rigidities. Some ancient observations, also, would seem to encourage this practice. Fabricius of Hildanus relates the case of an anchylosis of the fingers and of the wrist, which was cured by a fracture of the forearm produced by a fall. We see, on the other hand, in Meckren, that a stiffness in the elbow, caused by an abscess, disappeared in consequence of a fracture of the forearm from a fall. Bartholine (*Trad. de Bonnet*, t. iv., p. 410) mentions the case of a patient who, having had his forearm dislocated, was seized with gangrene at the elbow to such extent as to prevent any attempt at reduction, and who, by a fall from a horse in the succeeding year, had the movements of the articulation re-established; but, supposing that in these cases there was in reality an anchylosis, we should have to oppose to them facts of a totally opposite character, and well calculated to discourage practitioners. A woman (*Arch. Gén. de Méd.*, t. xxv., p. 569) had the femoro-tibial articulation anchylosed for a year, in consequence of a white swelling, (*tumeur blanche.*) It was thought advisable to endeavor to break the anchylosis; but this rupture was succeeded by an inflammation so violent, and symptoms so serious, that death took place at the end of a few days.

The question relative to the rupture of anchyloses will always be difficult to solve in a definite manner. If, in some cases, every

thing indicates that the mobility of the joint might thus be re-established, it is also certain, that, in performing it, we are exposed to an inflammation which might seriously endanger the life of the patient, or at least compel us to amputate the limb. As an anchylosis, moreover, in no way prevents the patient from enjoying good health, it appears to me that, in a general point of view, the practice of which I have just spoken ought, from prudential considerations, to be proscribed.

§ II.—*Excision of the Bone.*

If the anchylosis should be accompanied by a deviation too fatiguing for the diseased limb, perhaps it would be practicable to apply to it an operation which has not hitherto been proposed, except by M. R. Barton, (*American Jour. of Med. Sciences*, Feb., 1838,) and of which I wish to say only a few words. I will suppose an anchylosis of the knee, with deviation of the leg; would it not then be allowable to lay bare the point of the femur nearest to the skin, and to remove from it by two cuts of the saw a fragment, which should have the form of a wedge, or of a slice of melon? Afterwards bending the leg in an opposite direction from the articulation, we should obtain the consolidation in this position by means of an immoveable dressing. The leg, thus adjusted, would permit the foot to come in contact with the ground, (*de regarder le sol.*) It is true that the limb would, in that case, take, to a certain extent, the form of a Z; but, besides that this double curvature would be but little noticed, if it was made very near the knee, it would not deprive the patient of the use of his foot. We see, also, that in place of selecting the thigh, we could operate on the tibia itself, directly under the knee.

I do not disguise from myself the inconveniences of such an operation; but I have tried it upon the dead body, and it does not appear to me to be of very difficult execution. I therefore believe it practicable in certain deviations of the foot, and those of the knee, wrist, and also of the elbow.

A. *The Foot.*

If a pes-equinus, for example, arose from a tibio-tarsal anchylosis, I do not see why we should not attempt the removal of a wedge from the tibia and fibula. For that purpose there would be required a longitudinal incision extended from the anterior edge of the internal malleolus to three inches above. After having isolated the bone from all the soft parts, we should shove the latter apart on each side by means of a blunt hook, which an assistant should at the same time force backward or outward. A half-circular (*en crête de coq*) saw, directed transversely, would divide the bone perpendicularly for the upper cut, obliquely from below upwards for the lower cut, to the distance of some lines from its posterior surface, and in such manner as to circumscribe a wedge, whose base, of

greater or less width, according to the degree of deviation in the foot, would be turned forward. After having repeated the same operation on the fibula, we should succeed in breaking the bones of the leg by acting on the foot. This latter being then raised up, would put the two surfaces of the section into contact, and give a horizontal direction to the plantar surface of the distorted foot. The dextrine dressing, as in fractures of the leg, should be immediately applied, and we should, moreover, attempt the immediate reunion of the wounds. As this operation has nothing to do with reestablishing the mobility of the joint, we may without any actual danger include the tendons of the region in the flap of the soft parts.

B. At the *Knee*, the section of the tibia would give every possible prospect of success: a semilunar incision, with the convexity downwards, and extending from the lower part of one of the condyles of the tibia to the other, would allow of circumscribing a large flap of integuments which would include in its base the extremity of the ligament of the patella. This flap being raised up by an assistant, the surgeon would saw perpendicularly through the head of the tibia, a little above the tuberosity, until he reached near the neighborhood of the ham. Bringing back the saw to an inch or an inch and a half underneath, he would direct it obliquely from below upwards, in order to strike the posterior terminus (*le fond*) of the first section, and thus separate a wedge from the bone. We should thus avoid wounding the anterior tibial artery, and the necessity of operating upon the fibula. The fracture would be easily completed by making tractions upon the leg. The void created in this manner would enable us to restore to the limb a great portion of its natural perpendicularity, without either shortening or deforming it to any considerable extent.

The immoveable dressing for complicated fractures, and the approximation of the lips of the wound by means of the suture or strips merely of adhesive plaster, would be immediately had recourse to. The recurrent artery of the knee is the only one which runs any risk of being wounded when we operate in this manner, and upon this a ligature may become necessary.

In the event that it would be required to saw the femur rather than the tibia, we should have to select that part of the thigh where the operation would offer the greatest number of advantages and the fewest dangers.

The most suitable place in that case, would be immediately above the knee. A semilunar incision, with its convexity downwards, and the free border of which should come down to half an inch above the patella, would allow of cutting a flap which should be raised from below upwards, and which would lay bare the anterior surface of the bone. The saw would then separate from it a fragment shaped like that which I have described in the preceding article. Then adjusting the leg, the notch in the bone would be made to disappear by approximating the lower plane of the cut of the saw to its superior plane. The flap of the soft parts, then brought down

and retained in its place by means of the suture or agglutinative bandages, would immediately cover all the parts; and there would remain nothing more to do than to surround the limb with an immoveable dressing.

M. Barton (*Arch. Gén. de Méd.*, Juin, 1838, p. 357) has recently made an application of this method to the lower part of the thigh for an anchylosis of the knee. M. S. Deaz, the young physician who submitted to it, May 27, 1835, wrote on the 6th of November, 1837: "I have the satisfaction of saying that the operation which you performed on my leg has completely succeeded. I walk well, attend to my affairs, mount my horse, and sometimes travel from thirty to fifty miles a day without any fatigue; the entire sole of my foot touches the ground, and I scarcely limp any."

The author cut upon the soft parts a triangular flap, the apex of which corresponded to the antero-internal part of the ham, and terminated at its base on the outer part of the same region. Having thus laid bare the anterior surface of the femur, he exsected from it, by two cuts of the saw, a cuneiform fragment, as in the cases of straightening which I have supposed above. M. Barton (*Southern Med. and Surg. Journal*, vol. ii., p. 471, March, 1838) proceeded also in the manner I have described, as relates to the reunion of the wound. For myself, I should prefer in this case the semilunar flap, described in the preceding paragraph, to the triangular flap of M. Barton; I will also add, that the immoveable dressings used with us, would render the subsequent treatment and success of this operation infinitely more simple.

We could, it is true, lay bare the femur on another part of its length; but at a greater distance from the knee, the straightening of the leg would make too projecting an angle upon the thigh, and a considerable shortening of the limb; whilst immediately above or under the condyles, the straightening is effected to a certain extent without a new deviation.

C. If the *thigh* only was anchylosed, and at the same time inclined forward or inward, perhaps it would also be possible to attempt its readjustment. It would in that case be immediately below the quadratus femoris, that I should advise the operation to be performed. The semilunar flap, mentioned in the two preceding cases, should have its base on a level with the root of the great trochanter, and the middle of its free border at two inches below. [Dr. Mott suggests a straight incision on the outside of the thigh.—*T.*] This flap should be extended transversely from the outer side of the great trochanter, to a level with the tuberosity of the ischium; but in making it, we should carefully avoid wounding the great sciatic nerve. The bone, once laid bare, should be sawed upon its outer and posterior part, if the limb was in a state of adduction as well as flexion.

If there was only a simple flexion, without any deviation inwards, it might be useful to detach the fibres of the triceps adductor muscle, then to crowd all the soft parts inwards and forwards by means of a plate (*plaque*) of horn, pliant wood, or tin, in order

to remove the wedge directly from the posterior surface of the femur. We would complete the fracture of the bone by drawing the thigh backward, the flap of the soft parts would be brought down, and supported as in the preceding case, and the whole limb be immediately placed in an immoveable dressing.

The advantages of the operation I describe are not as obvious in the upper as in the lower limbs.

D. In the *fingers*, for example, it could hardly be practicable, except on the dorsal surface. But I do not know which is the most annoying, flexion or extension, when there is an anchylosis of the phalanges; and we should also recollect, that the straightening of a finger is not a restoration of its movements. If, however, it should happen that one or more of the fingers are bent like hooks, (*en crochet*,) so as to destroy the functions of the hand, there might, I think, be some utility in practising on the dorsum of the angular (*coudée*) phalange the kind of exsection which I have proposed to apply to the tibia and femur, since it might be possible in this way to bring the deformed fingers into an intermediate position between flexion and extension.

E. For an anchylosis with extreme flexion of the *hand*, the operation should be performed at three fingers' width above the wrist. The radius would be laid bare in this place, immediately above the deep-seated muscles of the region, by an incision of two inches in length, and parallel to the direction of the bone. The two lips of the wound being properly separated, and each protected by a piece of pasteboard, would allow of the surgeon removing a cuneiform fragment from the radius, by means of the semicircular saw, as I have said in speaking of anchylosis of the foot.

We should proceed in the same manner with the exsection of the ulna. We should afterwards adopt, in respect to the straightening of the limb, the union of the wounds, and the consolidation of the fracture, the same mode which I have described above. A semicircular incision, to form a flap, which should include all the soft parts on the dorsum of the region, would render the operation more simple, and ought to have the preference, if the tendons have lost their mobility.

F. The anchylosis of the *elbow* is not of a nature to require this species of excision of the bones. If the forearm is in flexion, it is the least inconvenient position that it can take; if it were found in extension, we could not remedy it but by dividing either the humerus or the bones of the forearm in front; which doubtless no person would have the hardihood (*courage*) to do for a simple deformity. Nor do I see any contingency that could require the cuneiform excision of the bones in the neighborhood of the scapulo-humeral articulation.

In conclusion, the *cuneiform excision* is not, as it appears to me, suitable as a remedy in anchylosis, but for re-establishing the flexion or extension of some part of the limbs.

G. In place of attacking the body of the bones, we may carry the saw upon the articulation itself, and remove from it a semi-

lunar or cuneiform fragment. This process, which might be applicable to the knee, and even to the fingers, where it would have the advantage of not producing any new deformity, while it would happily admit of correcting the old one, would not, however, be always suitable. The soft parts, besides being generally altered in this point, are almost always unfavorable in such places to the formation of flaps. If suppuration should take place at the bottom of the wound, the dangers would be manifestly greater in the articulation than on the continuity of the bones.

I would not like, moreover, to practise such operations, unless all irritation and every trace of inflammation had, for a long period before, disappeared from the anchylosed joint; also, it would be necessary that the curvature should be excessively annoying, and that the patient himself should have a strong desire to be partially relieved of it.

§ III.—*Supplementary Articulations.*

Another operation, which has been suggested to my mind by that of which I have been speaking, would consist in establishing artificially an articulation above or below that which is anchylosed. It would be no longer, then, for the purpose of straightening a distorted limb, but for restoring the movements of the part. We perceive, therefore, that its object then is the relief of anchylosis, even when the direction of the limb is as little disturbed as possible.

To perform this operation, it is necessary to lay bare the bone in such manner as to interrupt its continuity. In order to prevent its consolidation afterwards, we should take care, from time to time, to impart to it gentle movements, and to employ all those means which could contribute to the production of a false articulation. In the course of time the two ends of the bone partially mould themselves to each other; the moveable end is rounded and blunted, and the other, as it enlarges, becomes slightly excavated; the muscles soon adapt themselves to this new joint, which ultimately allows the patient to use it to some extent in the manner of the old one.

At the first glance, nevertheless, the operation will be rejected, both because it seems dangerous, and because we do not see that it could produce the result which the surgeon would desire. Do not false joints, the consequences of *ununited* fractures, it will be said, put it in the power of practitioners to estimate their value and to justify their rejection? Nevertheless, if we reflect, that ununited fractures are composed of pieces whose ends are uneven and slide over each other obliquely, whilst here the bone is divided transversely, we soon perceive that we ought not to judge of one of these cases by the other. Then, also, do there not exist examples of accidental articulations, which have ultimately ended in re-establishing a great part of the functions of the limb? M. Larrey (*Caron, Thèse*, No. 83, Paris, 1826) mentions a patient who had a false joint of the thigh, the result of a fracture, but who, nevertheless, walked with it without crutches. M. Sanson told me

he had met with a similar case; and I have myself seen a woman, who walked with a cane only, though she had had for fifteen years a false joint near the middle of the femur. [Dr. Mott has operated for ununited fractures in the femur, by the seton, in three or four cases: in one, the false joint had existed for more than a year, and was cured.—*T.*] A tailor, whom Saltzmann (*Reissessen, De Articul. Analog.*, chap. ii., § 5) makes mention of, and who easily moved the foot backward and forward, limped only in consequence of the shortening, though he had a false joint (*pseudarthrose*) in the middle of the thigh. Sue (*Sur quelques Mal. des Os*, 1803) says the same of a patient in whom he had not been enabled to effect the consolidation of a fracture in the femur.

As to the dangers, they would be infinitely less than those of amputation or exsection of the bones. At the present day, the establishment of an artificial joint, with the view of remedying an anchylosis, is no longer a mere speculation; two examples of it, at least, have already been performed upon man.

There are, however, only certain portions of the limbs which might require it. I do not think, for example, that it is suitable for the foot or the toes; I doubt, also, if it could be of any great utility for the shoulder; but there are some anchyloses of the fingers and of the elbow, of the knee and the hip, which might sensibly be benefitted by it.

A. *The Upper Extremities.*

If the phalangeal articulation was anchylosed, without the neighboring tendons having lost their mobility, nothing would prevent our laying the bone bare on its dorsal surface, sawing transversely through it near its middle, afterwards uniting the wound by three stitches of suture, which should include both the skin and the extensor tendon, then leaving this wound sufficient time to become cicatrized, and not commencing the artificial movements of the two fragments of the phalanx until at the end of eight or ten days.

If the movements of the fingers were not destroyed by the anchylosis of the wrist, we might also endeavor to establish a new articulation at some lines above the styloid processes of the forearm. An opening on the radius, and another on the ulna, would, in fact, allow of their being divided by passing the chain-saw around them.

For the elbow, the operation should be performed by preference immediately above the joint. We should make an incision from two to three inches long on the external border of the humerus, and then, after having separated by a proper dissection the brachialis-anticus and the triceps, we should pass around the bone the chain-saw, which, being well guarded and carefully directed, would easily effect its section. I do not know that I deceive myself, but it seems to me that this operation would be neither very difficult nor very dangerous, and that it presents real chances of success.

B. *The Lower Extremity.*

It was for the abdominal limb, and, so to speak, for that exclusively, that the idea of an artificial articulation first suggested itself. An American surgeon, Mr. R. Barton, (*Western Med. and Phys. Journal*, vol. i., p. 108,) is the true inventor of it; it was on the 22d of November, 1826, that he performed it for the first time. On his patient, the young Coyle, aged twenty-one years, M. Barton incised and detached all the soft parts which surround the great trochanter; he afterwards effected the division of the femur by means of a small saw. The wound being brought together by suture, the limb was placed in the extension apparatus of Desault. The cicatrization of the soft parts required two months to be completed; and the boy died nine years afterwards from pulmonary disease, after having made use of his limb for five or six years. This boy, abandoned to drunkenness, and giving himself up, says M. Barton, (*Amer. Journal of Med. and Surg. Sciences*, February, 1838,) to all kinds of excesses, was attacked with a pain in the thigh, and with an anchylosis in the new articulation, two years before his death. The examination of the dead body afforded an opportunity of proving that there had taken place the anatomical arrangement which I have spoken of above.

A surgeon of New York, M. Rodgers, performed the same operation, November 24th, 1830, in presence of Doctors Mott and Stevens. At the end of six or eight days, some serious symptoms supervened; but six weeks later the wound cicatrized, and the patient left the hospital, completely cured, four months after the operation. This man, whom, from some incorrect information, I had in the first edition of this treatise represented as having died, was still in very good health in June, 1833, the epoch at which M. Rodgers had the goodness to transmit to me the history of the case. In that part, therefore, where it would seem the most difficult and the least capable of succeeding, the operation for an artificial articulation has been attempted, and in both cases with success.

[Dr. Gibson of Philadelphia (See *North Amer. Med. and Surg. Journ.*, July, 1842) performed a similar operation to that of Dr. Barton, in a case of angular anchylosis of the knee joint, and with equal success.—*T.*]

I ought not, however, to conclude this article without making the remark, that in the lower extremity such operations should be performed but seldom. An anchylosis of the knee, even an anchylosis of the hip, if the limb preserves its rectilinear position, inconveniences the patients, but does not actually prevent them from walking, and gives them no suffering. The establishment of a new articulation may, on the contrary, endanger their life. Supposing even that the operation has every possible success, the artificial joint would not probably in many cases afford any great security, either in standing (*la station*) or walking. Such articulations, also, must have a great tendency to become reconsolidated. The case of M.

Barton is conclusive proof of it. While admitting, therefore, that it should be retained, we should guard ourselves against adopting, with too much enthusiasm, this new conquest in surgery.

Article II.—Deformities from Deviation in the Body of the Bones.

It is not the place in this work to treat of torsions and deformities in the body of the bones, developed under the influence of mollities ossium or rachitis. It is from orthopedy, and not from operative surgery, that such diseases demand relief; but it may happen, that in consequence of fractures badly consolidated, the limb remains deformed, either by being too much shortened, or by deviation from its axis, or from the arrangement of the callus. Hence operations have been proposed and put in practice to remedy this kind of deformity. Among the operations suggested for this purpose, there are two whose merits it appears to me I ought to examine: the one consists in breaking the deformed bone anew, in order to restore to it a better direction; in the other, we confine ourselves to excising a portion of the angular bone, in order to straighten it, and afterwards effect its consolidation by means of the ordinary dressings.

§ I.—*Breaking of the Callus.*

The breaking of the callus in fractures badly consolidated is a very ancient practice, which has long divided the opinions of surgeons. Though, after the recommendation of Hippocrates, we find that it was, to a certain extent, adopted by Celsus, (lib. viii., cap. 10,) we soon after see that Galen, Paul of Ægina, and Avicenna, scarcely venture to sanction it. Guy of Chauliac, who advises it, does not appear to have been satisfied of its advantages, nor Vigo, Paré, nor Fabricius ab Aquapendente, who consent to its trial only in the first months of the fracture. Fabricius of Hildanus also formally proscribes it; and whatever Munnick may have thought proper to say of it, Petit and Heister so strongly objected to it, in the beginning of the last century, that Hevin, and afterwards Boyer and Callisen, easily succeeded in causing it to be generally proscribed. There is scarcely any other person than M. Richerand, among modern writers, who believes in its utility; even this practitioner also confines it to cases in which the deformity is excessive, and to those in which it is urgently demanded by the patients. It seems, then, that it is an operation definitively adjudged. So that, in spite of what MM. Jacquemin (*Thèse*, No. 140, Paris, 1822) and Torchet (*Thèse*, No. 271, Paris, 1830) have, upon the authority of Dupuytren, felt themselves warranted in saying in its favor, M. H. Bérard, nevertheless, concludes, in the words of Fabricius of Hildanus: *Ergo non diffrigendum callum habemus*, (*Reformandum-ne Callum Vitiosum?* Paris, 1827.)

If with us a verdict like this has been without appeal, it has not been so in Germany. A surgeon of that country, M. Oesterlen, (*Rup-*

ture du Cal, trad. par Maurer, Strasbourg, 1828,) in his endeavor to demonstrate the advantages of the rupture of the callus, has collected in his book more than forty examples of it, derived from his own practice, or from that of surgeons in neighboring cantons. In analyzing the observations of M. Oesterlen, relatively to the adjustment (*redressement*) of the callus, I have found that there are eighteen for the femur, seven for the leg, three for the arm, one for the forearm, and one for the clavicle. In every case, we see that the operation, which, according to the author, is quite easy to perform, and one which the famous Ignatius Loyola was not afraid of submitting to, was unattended with danger, and almost constantly succeeded. M. Jacquemin, who borrows similar facts from De la Motte, Guillon, and Desgranges, and who takes four of them from the practice of Dupuytren, proves on his side that the dangers of these kinds of operations had been singularly exaggerated.

M. Riecke (*Journ. Analitique de Méd.*, Septembre, 1828, p. 466) goes still farther. An incision, which extends from the great trochanter to the external condyle of the femur, enabled him to lay bare a callus of the size of the head. The saw, gouge, (*gouge*,) and mallet, (*maillet*,) were then put into requisition. There was a shortening of eight inches, and yet the dressing by permanent extension, nevertheless, succeeded afterwards in restoring to the limb its natural length.

In supposing a callus which had not existed over three months, the breaking of it would not in reality be either very difficult or very painful. The ends of the bones, by means of the fracture bandages newly introduced into practice, being adjusted, and their extremities placed in coaptation with each other, would almost inevitably become consolidated, without exposing to more dangers than a simple fracture. If the morbid callus was of much longer duration, we should, without doubt, experience greater difficulties in breaking it, and the consolidation, moreover, would have fewer chances of success, than in the preceding case.

It is important on this subject to divide the deformities into two classes, according as they are merely a shortening of the limb, or where the bone is consolidated with an angular deformity. The rupture of the callus in the first case, should not be attempted after the third month of the fracture. At a later period we should have to fear the fracture of the bone in a sound portion as well as in the diseased part, and we may well conceive that there would then result no advantage from it. Supposing even we should succeed in separating the two fragments, so as to be able to destroy their lapping over, (*le chevauchement*,) we should at least have to fear that their extremities formerly cicatrized would be incapable of becoming cemented (*se coller*) together, and of reuniting by a genuine consolidation. In such a case, however, at the present time, when we have the improved immoveable dressings, I should not hesitate to break the callus.

When the callus is angular, to the degree of interfering to a considerable extent with the functions of the limb, I see no reason

why we should object to breaking it, however ancient the consolidation may be. For this kind of deformities, in fact, we are always in time for breaking the bone, and always have it in our power to fracture it at its most angular point. Numerous apparatus and various processes have been contrived to arrive at this result. M. Oesterlen has given a figure of one of them, which would fulfil the indication very well; but it is too complicated. It almost always answers, in such cases, to fix the deformed limb on its concave part to a solid plane, while we suddenly press down upon it with the knee or the two hands placed upon its convex part. Having effected the rupture, we must extend the part as much as possible, or until it has acquired its natural length. The limb should afterwards be kept in a dextrine dressing until it has consolidated anew. In conclusion, this rupture of the callus, which has originated rather from pathology than from operative surgery, does not, as it appears to me, expose in reality to but very little danger. The skin not being divided, there results a fracture in every respect analogous to simple fractures; and it is certain, whatever may be said of it, that the bones newly consolidated are much more easy to break where the callus is, than on either side of it. It is also proved that these new fractures in general consolidate more easily and more promptly than the primitive fractures. In a patient whom I had had for two months under dressing for a simple fracture in the body of the femur, and who in a fall broke the thigh afresh eight days after, a month longer only was required to obtain a new consolidation. Another individual, who left one of the hospitals of Paris with a shortening of five inches from a very oblique fracture in the femur, broke his limb a second time in his efforts to walk. Admitted into La Charité, ten months after this accident, he was submitted to a readjustment and re-extension of the limb by means of a bandage saturated with dextrine, and required but two months only to obtain a perfect consolidation, with only an inch of shortening.

§ II.—*Excision of the Angular Callus.*

It may happen that the bones, during the consolidation of a fracture, become cemented together at a very acute angle. The kind of deformity which results from it, is sometimes of such extent as to give the patient considerable trouble. Up to the present time, no one had suggested a remedy for it; but a distinguished surgeon of Rochefort, M. Clémot, has made known an ingenious method, which it appears to me ought to be preserved in practice, and which promises another triumph for modern surgery. M. Clémot's operation was performed the first time on a young child, and the second time on an adult. In both cases it was a femur bent into an angle in consequence of former fractures badly treated. The surgeon laid bare the osseous projection by an incision sufficietly extended, removed by two cuts of the saw a wedge from the femur, as I have said in the article on anchylosis, completed

the breaking of the bones by tractions, readjusted the limb, reunited the wound, and afterwards applied the ordinary dressings for fractures of the thigh. The two patients recovered perfectly, (*Archiv. Gén. de Méd.*, 2e série, t. xi., p. 235.) In such cases, no doubt, the method of M. Clémot should be adopted; this operation appears to me to be a valuable resource, in every respect worthy of being adopted in general practice, more especially now, since the immoveable dressings have been simplified in such manner as to assume any form or direction we may require.

[It must not be left out of sight, however, that this operation of M. Clémot is, in strict truth and in principle, nothing more nor less than a close imitation of that devised and originated, and first performed by our countryman, Dr. Rhea Barton, of Philadelphia, to whom, in fact, as will be seen in the preceding pages, the author had previously, with his accustomed ingenuousness, frankly conceded all the honor and importance which this rich conquest for surgery is entitled to. The *wedge principle* is precisely the same, whether to remedy a permanently angular or flexed position of the limb from an anchylosed joint or badly-treated fracture.—*T.*]

Article III.—Appendix.

Should I not say, in conclusion, that this long chapter on deformities—a chapter which modern surgery has the right to claim entirely as its own—might allow at the present day of our grouping and classifying a crowd of isolated facts, which, up to this time, have remained without any connection or explanation in science.

Valleriola (*Obs. Méd.*, lib. ii., obs. 4; et *Saucerotte*, *Mél. de Chir.*, t. i., p. 225) speaks of a permanent flexion produced by convulsions, and which resisted for six years all remedies applied to it, but of which the patient was one day cured by leaping from his bed in a fit of anger.

In an invalid, says Wurtz, (*Chirurgie, &c.*, p. 368,) the limb remained flexed, in consequence of a wound in the knee; but being suddenly under the necessity of running, the patient was cured of it immediately. One of the women of the calif Haroun-al-Raschid had, it is said, a retracted arm, which she could not use. A physician offered to cure her. Having caused the woman to make her appearance in the court of the calif, he stooped down as if in the act of lifting up her dress, in a manner that shocked her modesty; the patient threw out her arm violently, to prevent this outrage, and the cure was complete! Might we not attribute cures thus obtained, to the rupture of certain tendons or retracted ligaments, or of imperfect anchyloses?

My intention was to avoid all discussion of priority, in speaking of the section of tendons, and to confine myself to the pure and simple narration of dates; but I see, in a journal in which M. Little gives an account of four cases of section of the tendo-Achillis, and one of section of the flexor tendons of the leg, (*The Lancet*, January 27, March 13 and 31, May 19 and 26, 1838,)

that he claims, in opposition to the French surgeons, the totality of sub-cutaneous tenotomy for M. Strohmeyer. M. Dieffenbach, (*Lettre à l'Académie des Sciences*, 10 Septembre, 1838,) who had at first generously ascribed it to its true source, has also changed his mind, and at present claims the invention for himself. Now the progress of this operation ought to be understood, as follows:— 1. Bell divides the ligaments of the fingers through a puncture in the skin; 2. A. Cooper does the same for bridles in the palm of the hands; 3. Brodie operates in this manner for varicose veins; 4. Dupuytren applies this process to the tendon of the sterno-mastoid; 5. M. Strohmeyer transfers it to the tendo-Achillis; 6. From thence it is applied to other tendons by MM. Strohmeyer, Dieffenbach, Stoess, Duval, Bouvier, and Guérin. That is its history.

APPENDIX ON TENOTOMY TO THIS AMERICAN EDITION.

[*A Critical Examination of the late Discussion in Paris on Tenotomy.*

Professor Velpeau has transmitted for our consideration, for this American edition of his work, a learned brochure on this subject by M. Vidal, (*de Cassis,*) published during the past year (1843) at Paris, in the *Annals of French and Foreign Surgery*, vol. vii., edited by MM. Begin, Marchal, (*de Calvi,*) Velpeau, and Vidal, (*de Cassis.*) Though a treatise upon this subject of a purely controversial character would not properly enter into a practical work on operative surgery, there is in this so much valuable historic matter appertaining to the progress of the now brilliant discoveries in tenotomy, and so much other new and practical material bearing directly on the present actual state of that department of operative surgery, and the most approved processes now adopted, that we consider it a duty to the medical student, as well as to the profession at large, to avail ourselves largely of these very interesting and recent details.

Etiology of Deformities.

M. Vidal, in stating that the causes of deformities are exceedingly numerous, says the ultra (*absolus*) partisans of tenotomy have attached too much importance to *muscular retraction* as one of them. M. Gerdy, in his discourse on the etiology of deformities, makes *fifteen orders*, which he has afterwards grouped under *four* heads: 1. Primitive vicious formation of the bones; 2. Ulterior alterations in the formation of these textures; 3. Fibrous or fibro-cellular indurations; 4. Muscular retractions.

M. Vidal agrees in the opinion that *muscular retractions* are coincident with the greatest number of deformities, especially those that are congenital. In allusion to a recent discourse of Professor Velpeau, M. Vidal says he has shown himself a perfect master of the subject, and enabled us to put a proper estimate upon illegitimate pretensions when compared with unerring dates and facts.

In allusion to passages in the discourse of M. Bouvier, on the doctrine of muscular retractions, especially in relation to club-foot, as broached in publications in 1821, 23, 32, and 34, by MM. Rudolphi, Strohmeyer, and Dieffenbach, we have in M. Vidal's article a quotation on this subject from Delpech, wherein he claims priority in point of time for Béclard. This illustrious French pathologist in a long memoir endeavored to prove that monstrosities and deformities, including club-foot, were imputable to diseases and lesions of the cerebro-spinal system. He expressly points out (*Bulletin de la Faculté*, t. v., p. 517) the club-foot among these deformities, and all his investigations show that he considered the *nervous centres* the point of departure for the numerous deformities of the human body.

Before MM. Strohmeyer and Dieffenbach, (says M. Vidal,) M. Lafond, in a great work published in 1827–29, endeavored to show the connection between deformities and the perverted action of muscles, especially in curvatures of the spine. In these latter he considered the *extensors* the most powerful cause, and he advises, where there is the least deviation of the spine from the right line, to search diligently for some local affection of the muscles on one side, from whatever cause arising, and by which this deviation in front or behind, or on one or the other side, is temporarily produced, (*Recherches sur les Principales Difformités du Corps Humain*, p. 36, 1827.)

The same author, M. Lafond, (at p. 177,) speaking of torticollis, says: "We have never perceived that this disease was caused by the bones; *the muscles are always its first cause.* It is especially the sterno-mastoid which we must charge with this deformity."

To explain the spontaneous luxation of the femur during intra-uterine life, "it is sufficient," says M. Lafond, "to recollect that the most powerful of the muscles surrounding the upper articulation of the femurs, tend constantly to carry the head of this bone upwards," (p. 203.)

He also says permanent flexion of the thigh upon the abdomen is caused by the muscles, (p. 260.)

So in torsions of the legs, when the knee is turned inward, the cause is the biceps muscle, and when outward, it is chiefly the semi-membranosus. Other muscles concur a little, (pages 271, 272.) So also he remarks that the muscles are always the first organs affected in permanent flexion of the leg upon the thigh. So in club-foot, says M. Lafond, the muscles alone, and especially the gastrocnemii, (*jumeaux*,) with their common tendon, are the determining cause of the disease, (page 283.) but that it is not to be denied that this shortening sometimes affects also the plantaris, tibialis posticus, and peroneus longus. That the shortening or retraction (*racourcissement*) of the muscles may commence with the embryo, (p. 284,) and that "*facts authorize us to believe that the convulsions experienced by the fœtus in utero may give rise to the congenital production of club-foot,*" (p. 300.)

In 1836, before M. Guérin had made known his doctrine on deformities, and when he had in this same year reflected so little upon special tenotomy that he addressed to the Academy remarks on a *new manner* of treating club-foot, (*Gazette Médicale*, 1836, p. 268, 620,) we have a thesis supported June 20, 1836, at Strasbourg by M. Held, who, after referring to Duverney and M. Lafond on club-foot, says, "the turning of the foot inward is evidently caused by muscular contraction," "that in the pes equinus the inequality of force exists from the beginning, and the inequality of length is consecutive;" in other words, that the disease is at first *dynamic*, and at a later period *organic*. That, although club-foot is the product of inequality of the antagonist muscular forces originally, and that it may possibly originate in enervation at some point in the spinal marrow, or a dynamic or organic affection of this substance, it frequently happens that while the cause disappears, the effect remains. In cases of shortening of the limb from fracture, luxation, or congenital defect of length, the club-foot arises from *voluntary* muscular contraction, whereas in the preceding cases it is *convulsive*. So in club-foot the consequence of various wounds, ulcerations, abscesses, and burns, situated in the foot, leg, thigh, &c. To prevent the pain, the patient at first avoids putting the heel or the points of the toes on the ground, but, as in the preceding cases, this retraction of the muscles soon becomes permanent, and the inflammation of the muscles themselves is generally accompanied with a contraction which may remain after the cessation of the phlogosis, or lead to suppuration, adhesion, and consecutive atrophy of the inflamed muscle, and thus cause club-foot in two ways (*d'une double manière.*) That which the contraction (*contracture*) of certain groups of muscles effects, may in like manner be produced by the paralysis or debility of certain other muscles. In ordinary cases this paralysis is imputable to affections of the spine, and the club-foot may exist though the paralysis ceases. "Thus, therefore, the causes which produce an interruption to the equilibrium of the antagonist muscular forces, whether by augmenting their contractility and determining the contraction of the muscles, or by paralyzing the action of their antagonists, and abandoning them to an organic contractility, by virtue of which they constantly tend to an approximation of their extremities, are capable of finally producing the shortening of the muscles, and therefore club-foot," (*Held*, p. 26.) Such generally are the causes which give rise to accidental club-foot. In speaking of the causes before birth, he asks (p. 29) if the muscular action which keeps the feet in a state of torsion during intra-uterine life, is not the same which produces spontaneous club-foot during that period. A fact which confirms this is, that at the moment of birth, when the muscles are neither extended nor atrophied, the foot is restored with the greatest ease to its natural position. M. Velpeau therefore concludes, that whatever may be the apparent contradictions in some parts of M. Held's thesis, he

has distinctly stated muscular contraction as a determining cause of club-foot.

M. Held, in speaking in more general terms of tenotomy, says: "We are of the opinion that an operation so simple and trifling will be generalized, and applied to all cases of deformity dependent upon the contraction or shortening of the muscles, and that it will ultimately become one of the most important conquests of modern surgery." M. Velpeau asks if any thing published since 1838 can be more clear or explicit than this.

In another passage (p. 62) M. Held speaks of tenotomy for various deformities analogous to that of club-foot, as naturally suggested by the brilliant operation for the tendo-Achillis. He there particularizes the cases of sections of the various other tendons of the leg. Finally, he concludes (p. 65) in general terms, "not only do we believe it (tenotomy) applicable to all the muscles, but we ask also, if, in a great number of deformities, it is not preferable to the employment of mechanical apparatus, (*des appareils mécaniques.*")

Besides what has already been given from Béclard, in proof that he recognised the character of club-foot and other deformities, M. Velpeau cites other passages wherein, speaking of acephalous monsters, he considers that some accidental disease which they have experienced during the period of intra-uterine life has caused the atrophy or destruction of the medulla oblongata, (*de la moëlle allongée,*) and of the upper part of the spinal marrow, and that *all* the apparent *irregularities* which it presents are the natural and more or less direct result of this accident, (p. 516 and 517.) To show that this subject was long since appreciated, M. Velpeau also quotes a passage to this effect from Benj. Bell:—The limbs are deformed in various ways. The causes of this accident are numerous. The bones may be diseased, or the muscles in a state of contraction, or the bones and muscles may be both affected. Nevertheless, the most frequent cause of the vicious conformation of the limbs is the contraction of the flexor muscles of the leg and fore-arm.

M. Velpeau goes still farther back, and cites a passage from Morgagni, (his 27th letter, art. 33,) wherein, speaking of the doctrines of Glisson and Mayow, he says: "As to the second, (that of Mayow,) you will understand it if you admit that the muscles which are found on the left side increase less than the bones, or contract more than the muscles on the right side; whether this contraction depends upon convulsions or upon a greater degree of force, which enables the muscles of the left side to preponderate over those of the right; a state of things which exists from birth, or which results from the diminution of force in the muscles of the right side from paralysis, or *any other cause whatever.*

"Also, though I do not deny that the first cause may sometimes exist of itself and produce the gibbosity, I think, however, that this latter is more frequently the effect of the second, that is to say, of the contraction of the muscles."

M. Velpeau then cites an author still more ancient, viz., *Mèry*, in the Memoirs of the Academy of Sciences, 1706. The substance of these citations is, that though it might be thought quite easy to explain the curvature of the spine from the vertebræ being a little thicker on its convex than on its concave part, this thickness, however, is not sufficient to cause a curvature in an opposite direction; and the shortening of the muscles of this column can alone explain it, for both the relaxation of the extended or elongated muscles, and the greater or less degree of thickness of the vertebræ, can be *caused only* by the muscles that are shortened. When the muscles act equally, the spine bends only in a straight line backwards; but if all the muscles on the right side are in contraction and those of the left relaxed, the spine is bent to the right side, and *vice versâ*. So that the irregularities of the spine, and the extension of its relaxed muscles, and the thickness of the vertebræ on one side more than on the other, "*are all solely the effect of the contraction of its shortened muscles.*" The shortened muscles of the spine, by their *permanent contraction* holding it *inflexibly bent* to one side, retain the opposite muscles in a state of perpetual extension. Repeating the same idea, M. Mèry says: "The *permanent* and *involuntary* contraction of these muscles is therefore the *sole efficient cause* of the *extraordinary curvature of the spine.*"

In respect to curvatures of the limbs, M. Mèry says that the weight of the body and the softness of the bones can only be occasional causes, and that it is only the contraction of the muscles of the thighs and legs to a greater degree in one direction than in another, which can determine the femur, tibia, or fibula to become bent backward rather than forward. He adds, with much force: "The curvature of the bones of the arm, in which it is evident that the weight of the body can have no part, is a clear proof of this truth; whence, *in fine*, *I conclude*, that the *more forcible contraction of the muscles* upon one side than upon the other, is the *only efficient cause of the curvature of the bones.*" On the contrary, "when the antagonist muscles (says he) of a part act with equal force, they maintain the bones in their natural shape, in spite of their softness and the weight of the body."

In thus grouping together authorities from those epochs in which M. Guérin contends that tenotomy was *exclusively empirical*, and not an *etiological* or *rational science*, M. Vidal cites above all of them the great surgeon Delpech, as having pointed out the source and recognised and generalized the effects of these contractions. M. Vidal quotes also a remark of M. Bonnet, (a friend of M. Guérin,) in his treatise on tendinous and muscular affections, (p. xvi.,) wherein he says of Delpech, that the moderns have only confirmed or developed many valuable opinions of that great surgeon in his work on *orthomorphy*, and adds that Delpech also insisted on the part which the spinal marrow and nerves had in the production of deformities of the bones through the intervention of the muscles, and that thus an irritative action in a principal nervous trunk and its branches may be transmitted to the muscles it supplies, and,

causing in these latter a permanent shortening, change the mutual relation and inclination of the bones, (*Orthomorphie*, p. 84.) So, says Delpech, may an affection not only of the nerves, but of the spinal marrow at the origin of those nerves, produce the same effects on the muscles of the trunk as on those of the limbs to which they are distributed. Delpech also remarks, that such morbid conditions would produce still more serious deformities when occurring in infancy, exemplifying this by convulsions so common in infancy, and which he considers may have important relations with some lesion of the spinal marrow, or of the origins of the dorsal nerves, or of the arachnoid membrane or pia mater, producing ultimately a contraction of certain muscles and a deformity of the spine. The same author (*Orthomorphie*, t. i., p. 99) says it is difficult for him to separate the idea of these deformities from that of a preceding abnormal condition of one of the great vital centres, as, for example, the spinal marrow.

M. Vidal, using the expression of Delpech himself, where that author illustrates his views by the contracted state of the muscles of the calf as they appear on dissection in club-foot, accords to him the honor of having discovered the *key of the whole doctrine of tenotomy*.

M. Gerdy had also established a crowd of articular deformities that do not arise from muscular retractions, to wit, those from sub-cutaneous bridles, and certain alterations of the ligaments.

In relation to the remark of M. Guérin, "that tenotomy is destined to be applied to retraction in all the muscles wherever it presents itself," M. Velpeau refers to those passages in this present work of his upon operative surgery, where it will be found that he (M. V.) says the same thing under a great variety of forms, and in a number of different chapters, and had, in fact, generalized the subject of muscular retraction and tenotomy before M. Guérin had treated of it.

Characters of sub-cutaneous Wounds.

M. Vidal proceeds to show that the great principle which has given birth to the most rational processes of tenotomy, that is, the sub-cutaneous section, had been well understood by John Hunter, who pointed out the true source of the healing up of wounds without inflammation to be the exemption of such lesions *from exposure to air*. Hunter showed that this adhesion by first intention would take place, not only in most internal lesions that had no communication externally, but also in many that had such communication.

M. Vidal denies emphatically the assertion of those who pretend that sub-cutaneous wounds are always exempt from inflammation. He cites Hunter's Lessons on Surgery to show where this author distinctly states, that to produce adhesion in two surfaces, coagulable lymph may be poured out in sufficient quantity to make it unnecessary for either to be in a state of inflammation. In the reparation, therefore, Hunter notes the agency not only of inflammation,

but of another act which is not inflammation, nor a morbid process, but a phenomenon purely physiological. So M. Estor, the skilful translator of J. Bell into French, says: "*What J. Bell says*, (of the consolidation of recent divisions by a process absolutely analogous to that of the growth of parts,) *is applicable* especially to divided parts *still covered with their natural integuments, and which become united together while protected from contact with the air, and without any of the ordinary symptoms of inflammation.*" Mr. Estor even foreshadowed in another note the idea, that the process here, too, was analogous to that of *nutrition.*

From all these facts, and the well-known popularity of Hunter's doctrines at Montpellier, and the admiration which Delpech entertained for them, M. Vidal comes very naturally to the great historic event, that Delpech was the first in France who proposed and performed the section of the tendo-Achillis, in *leaving the skin which covers it entire.*

Tenotomy in general.

M. Vidal ingeniously and very naturally traces from the above recited facts and sound principles of pathology, the source of the zeal of M. Serre, successor of Delpech at Montpellier, in behalf of *immediate reunion* of wounds as the necessary result of the principle of *dressing by occlusion*, as it was called by Dupuytren. Hence arose the scrupulous care to make the external wound of the smallest dimensions possible, and as far as possible from the part whose inflammation was to be dreaded, in order to prevent the air from traversing such part. Dupuytren did injustice to the school of Hunter, but nevertheless perfectly understood its principles, his reputation in fact being associated (vid. text of this work) with the sub-cutaneous method. From the doctrines entertained by the school of Hunter, it is easily explained why he divided the tendo-Achillis with a cataract needle, and Bell, in certain irreducible luxations of the fingers, advised the lateral ligaments of the fingers to be divided with a cataract or spear-pointed needle, (*en fer de lance,*) and by a simple puncture of the skin; why Brodie, so long as twenty to thirty years since, and after Bell's operation, (just named,) adopted the sub-cutaneous method for the division of varicose veins; why Delpech avoided wounding the skin which covers the posterior part of the tendo-Achillis, and why Boyer proposed and practised the well-known process for the opening of abscesses by congestion.

According also to M. Goyrand, Sir Astley Cooper, in 1835, adopted the Hunterian plan for the tendo-Achillis, in dividing sub-cutaneous bridles in the palm of the hand. (See a note, infra, from Professor Fergusson's Surgery, confirming this.)

Delpech distinctly says, (*Maladies reputées Chirurg.*, t. ii., p. 170,) that the section of the tendons is not dangerous, if it is practised under the skin and excluded from the air.

M. Gagnebé, a young physician, in 1830, (see *Thesis*, No. 5,) with

the same view describes the sub-cutaneous operation for ligature of varicose veins.

M. Bonnet, a friend (says M. Vidal) of M. Guérin, thus classifies the persons who made the first steps in tenotomy:—

1816—Delpech divides the tendo-Achillis by two lateral incisions, leaving untouched the skin behind the tendon.

1831—Strohmeyer substitutes two narrow punctures for the incisions of Delpech.

1836—The second puncture (that is, on the point opposite to the entrance of the tenotome) is dispensed with *simultaneously by several surgeons.*

That there was an interval of *fifteen years* after Delpech, and that it then became, after being revived by Strohmeyer, universally adopted.

It still became necessary to give confidence to the timid by proving the safety of such wounds, and this M. Guérin has unquestionably greatly contributed to do by his experiments on living animals and on man; having carried the sub-cutaneous section farther, and performed it a greater number of times, and that on the same person, than any other individual: (vide a note infra on this subject.) M. Vidal, however, inveighs against the abuse of a good remedy, and seems to think the day may come when the evils produced by incisions too numerous, deep, and extensive, will cause a reaction against tenotomy.

As a farther proof that the importance of excluding the air was long since well known, M. Vidal mentions the fact which had been noticed of the cure, almost without marked symptoms of inflammation, of severe comminuted fractures by the immoveable apparatus of Larrey, that for occlusion of the air by Dupuytren, and the dextrine bandage of M. Velpeau. He mentions also a successful case of his own which he treated at La Pitié. He thinks, however, that this treatment of the above-named surgeons, and of Seutin and others, may be too often followed by fatal gangrene of the deep-seated parts, confirming the observation of Hunter, that such fractures may produce such consequences, especially when the mischief is deep-seated. This, however, is far from being a parallel case to the slight superficial wounds of tenotomy. But these, even in the most skilful hands, may produce dangerous consequences. M. Vidal calls for a frank avowal and description of these.

On the other hand, he thinks there are many errors that have retarded the progress of tenotomy:

1. The exaggerated danger of punctured wounds, notwithstanding the innocence of the severe puncture made in depressing cataract had been so familiar to every one.

2. The supposed danger of wounding tendons, as the ancients also had thought, from their confounding them with nerves. This notion prevailed also universally among the moderns, though Hun-

ter had shown that most cases of ruptured tendons healed kindly when not exposed to the air.

3. A third error grew out of the above, and the tardy progress of pathological anatomy, which, not making a distinction between wounds exposed and not exposed to the air, supposed that the functions of the tendon were destroyed, and the cicatrix necessarily deformed, adherent, &c.

M. Vidal then resumes his quotations from the discourse of M. Velpeau, which latter on this subject says: Up to the present time almost all physiologists and surgeons considered that a divided or ruptured tendon thereby forever lost its functions, and that these wounds were exceedingly dangerous. Tenotomy advanced slowly against such obstacles, though Lorens in 1782, Ant. Petit in 1799, and Michaelis and Sartorius in 1809 and 1812, endeavored to dissipate this prejudice. Delpech in 1816, and again in 1823, still cautions that the tendons should be cut under the skin, when Dupuytren, in 1822, giving a new blow to the ancient doctrines, laid, as M. Velpeau conceives, the foundations of modern tenotomy. But it was by the facts established by Strohmeyer, between 1831 and 1834, that those ancient errors were definitively annihilated. Thus escaping from its imprisonment, tenotomy at once became generalized in France and in Germany, England, Belgium, and America, by the operations of MM. Stoess, Duval, and Bouvier, and by almost all the surgeons of French hospitals, before (says M. Velpeau) M. Guérin had spoken a word of it.

Naturally tenotomy began with the tendo-Achillis, as the most prominent and important distortion to be relieved, and for the rupture of which such endless combinations of complex apparatus had been devised in all times. M. Velpeau had shown in 1833, and since proved, how little dangerous this rupture was, and how easily it could be cured by resting the limb for some ten days in an immoveable dressing, and afterwards by not allowing the patient to walk without this dressing for the space of a month. The principal apparatus formerly employed had in fact contributed to give a dangerous character to these wounds. The success of tenotomy on the tendo-Achillis being established, the transition was easy enough to the ham, neck, &c.; and M. Velpeau sees no particular merit as to any fundamental claims of discovery, in cutting here or there additional tendons that have heretofore not yet happened to have fallen under the action of the tenotome.

M. Vidal, quoting from the pathological portion of M. Velpeau's discourse, alludes to an important practical observation of the latter, deducible from what takes place in the formation of the new tendon: (see text of this work, supra.) It is this: that the sub-section will be more successful in proportion as the neighboring parts are more abundantly supplied by cellular tissue. "If (says M. Velpeau) the reproduction of a divided tendon is effected as I have described it, that is to say, by means of a cellular sheath, lamellæ, filaments, and cellulo-vascular tissues, which serve, so to speak, as the atmosphere of the divided organ; that all these tissues, imbi-

bing a liquid at first, and becoming the seat of an abnormal afflux, thicken, approximate, and vascularize in a blended mass, and by degrees harden and solidify, it is easy to comprehend where tenotomy will be more or less efficacious, or not succeed at all."

In regard to the opposite opinion, entertained by MM. Ascher, Held, Duval, and Guérin, that all that is necessary (after the ideas of Hunter) is an effusion of plastic lymph, either pure or slightly mingled with a little blood, M. Velpeau says they do not take into consideration that wherever this plastic matter is effused it must contract adhesions with something, and that in the fibro-synovial sheaths of the fingers, the ends of the tendon, lost in this matter, and which must necessarily adhere to inflexible parts, would no longer have any relation to each other; and that if these ends were brought in contact by flexion of the fingers, reunion would not take place. Hence, wherever tendons are surrounded by sheaths or tissues, either purely cellular or fibro-cellular, tenotomy would have the greatest chances of success; but, in regions where the tendons are surrounded only by synovial net-works, or fibro-synovial sheaths, the chances would be less. In these respects the *tendo-Achillis* is most favorably situated; then come the tendons of the ham, the biceps flexor cubiti, the two branches of the sterno-mastoid, the peronei, tibiales, extensors of the toes, above and below the malleoli, &c.

The tendons most unfavorably situated, are the tendons of the flexor longus digitorum pedis at the point of the foot, the tibialis posticus, the flexor longus pollicis pedis, the peronei laterales at their passage behind the malleoli, the flexor sublimis and profundus in the palm of the hand, and more particularly on the palmar surface of the phalanges. In the palmar face of the hand, in fact, between the aponeurosis and interossei muscles, there is nothing around the tendons but synovial, or rather exceedingly dense and slightly vascular fibro-synovial net-works. As, however, the neighborhood of the lumbrici muscles, and of the filaments which traverse the palmar aponeurosis of the interosseous muscles, may furnish, by the attenuation of those various parts, a sort of new riband going from one end of the tendon to the other, there is reason to believe that certain movements of the fingers would be re-established after the section of the tendons of the flexor, or of the profundus in the palm of the hand. On the fore-part of the phalanges, success would be much more problematical; the fibro-synovial or osteo-fibrous sheath which exists there, represents an encasement (*étui*) formed behind by the phalanges themselves, and in front by transverse or longitudinal fibres, closely condensed together, and of a completely fibrous character. As the interior of this sheath represents rather a simple synovial surface, than a membrane susceptible of being flattened out, (*solée*,) it follows that when the tendon is once cut it finds nothing which can re-establish its continuity, and that its action on the finger runs great risk of being destroyed.

The doctrine of M. Velpeau exacts that the greatest possible care should be taken in the sub-cutaneous section, to avoid making

too great a wound of the sheath or tissues nearest to the tendon. We thereby have the best chances of a reparation more nearly approaching to the normal condition of the parts. While, on the other hand, too extensive a division of the tendinous sheath, and with it lesion of the tissues which are connected with it, produce an irregular, wide cicatrix, adherent to the neighboring organs, and consequently incapable of giving actual continuity to the tendon, and of propagating the movements of the muscle belonging to it; for, in order to effect that, the tendon requires a certain degree of freedom, which it has lost. These movements do not, in that case, go beyond the upper end, and every thing in relation to the lower end is as it were paralyzed.

The tenotome, therefore, (continues M. Vidal,) should act more by pressing than sawing, so that a combined movement may result, in which the tenotome acts on the tendon and the tendon on the tenotome; in fact, that the cutting edge and the parts to be cut should act upon each other, and that these parts should be more stretched in proportion to the force with which the instrument is applied to their deep-seated surface.

M. Guérin challenged M. Velpeau to show him, in any work, the principle of a voluntary physiological contraction as a means of favoring tenotomy. M. Velpeau says, if he means to deny thereby that this extension should be made to increase the stiffness and prominence of the part to be divided, whether it be by the will of the patient or otherwise, he denies what is considered requisite in every operation of tenotomy.

M. Gerdy, also, in reply to M. Guérin, says that it would have been a *truism* too trite not to have drawn down ridicule, to have enjoined this preliminary proceeding, which is acknowledged by M. Guérin himself to be absolutely indispensable to the division of a tendon or muscle. Strohmeyer (says M. Gerdy) never spoke of it, nor looked upon it as a discovery. M. Vidal, furthermore, puts the question to M. Guérin, if the retracted muscles, especially those for a long time retracted, or paralyzed, and fibrous bundles which are not muscles, possess this *voluntary physiological contraction?*

M. Gerdy (in conformity also to the opinion of M. Vidal, and contrary to the now prevailing opinion of MM. Dieffenbach, Guérin, and most English surgeons) is in favor of making two or more stages to the operation; that is, that in order to avoid making unnecessary or uncalled-for divisions, we should cut the different retracted tendons successively at different epochs, according as the first sections do not appear sufficient.

M. Vidal approves, however, of M. Guérin's method, borrowed, he says, from M. Scoutetten; that is to say, when there are many tendons to cut, that they should be cut at different points and distances, as the simultaneous concentration of many sections upon one point would make too large a cicatrix, and blend the cords together, or incur more risk of exciting inflammation, and each tendon, moreover, being deprived of its appropriate connections,

could not preserve its independent movements, while its functions would be executed with less precision, or be entirely abolished. He urges, also, the use of apparatus afterwards, as we may thus, after certain sections have been made, economize our operations, and dispense with any more of them.

Tenotomy of the Wrist, Hand, and Fingers.

M. Vidal quotes from a late treatise by M. Bonnet, wherein the latter says, that up to the present time, in all the sub-sections for the fingers, these organs, though they have been straightened, have lost their movements of flexion. M. Doubovitsky judiciously observes of the two extremities, upper and lower, that tenotomy is equally applicable to each; but that in the lower, the form of the limb is the principal point aimed at, for in regaining that, we generally re-establish the use of the limb; while in the upper, form is secondary, and use the principal object. In the hand, he adds, use should not be lost sight of, in restoring the form, (*Annales de Chirurgie*, Février, 1841.)

MM. Bouvier and Velpeau have expressed the same idea, both as to the flexions of the hand and the foot, and that in this last, the important point is to bring the sole in close apposition with the ground, even though the toes should remain immoveable. It follows, therefore, in their judgment, that the section of the flexor longus digitorum pedis, whether on the plantar surface of the phalanges, on the sole of the foot, or in the groove of the os calcis, should not be neglected, if any deviation whatever of the foot should seem to require it.

M. Bonnet, in his late work, to which we have just alluded, furthermore remarks, that failures in the section of the flexors of the fingers are imputable to the presence of synovial sheaths, in the interior of which the ends of the tendon cannot reunite. Hence, says he, the failure of the operation in dividing the flexors of the fingers on the phalanges, which happened twice to Strohmeyer and Dieffenbach, and once to M. Guérin, in the case of M. Doubovitsky himself. M. Bonnet, also, in thus dividing the four tendons of the common flexors on a line with the first phalanx, found that he could straighten the fingers, but their flexion was to a great degree destroyed, even for grasping small bodies. M. Larrey, junior, he says, failed in the same way, in dividing the flexor muscles in the palm of the hand, though there are there no synovial sheaths. Therefore, says M. Bonnet, in order to preserve to the flexor muscles of the fingers their normal action, they should be divided at the forearm; but other reasons prevent this from being done, as we incur, at the lower part of the forearm, the risk of wounding the median nerve, while at the upper no good result could ensue on account of their numerous adhesions with the surrounding parts, and the extent of their insertions on the bones.

M. Bonnet comes to the conclusion, therefore, that the section of the flexor muscles and tendons of the fingers is useless, and that

the only case in which it could be useful, would be where the retracted finger, by its abnormal position, had interfered with the motions of the others. In this case, he has divided the retracted tendon on a line with the second phalanx. The finger remained extended, and incapable of flexion, while the others thus regained their liberty. When, however, the flexors only of the hand are retracted, tenotomy is indicated. So also for retracted toes, the division is often of the utmost importance and benefit, for the reasons just given.

On the 3d of October, 1842, and immediately subsequent to the publication of the above treatise of M. Bonnet, M. Bouvier read a discourse to the Academy of Medicine, giving the results of his orthopedic experiments on dogs. They are as follows:

1. The section of the flexor carpi radialis, flexor carpi ulnaris, and flexor digitorum sublimis, in the foreleg, was followed by adhesion of these muscles to one another, and the loss of their individual action, without the flexor profundus participating in either effect.

2. After the section of the same muscles, and also of the flexor profundus, there was formed a common cicatrix, adherent to the ulna, whereby the toes lost their movement of flexion.

3. By dividing the tendons of the flexor sublimis and flexor profundus, on the metacarpus, there were produced adherent cicatrices between them and with the bones, causing almost total loss of flexion of the toes.

4. After the section of the flexor profundus, on the second phalanx, there was in one case no trace of reunion of the two ends, but adhesion of the lower end with the flexor sublimis, and loss of motion in the third phalanx.

From these facts, M. Bouvier concludes that:

1. The cicatrices of tendons are isolated and exempt from adhesions only in those cases where they can be divided separately, and where there continues to remain around them, and between them and the organs in closest vicinity to them, a sufficient quantity (*épaisseur*) of cellular tissue which has not been disturbed.

2. That as the greater separation of the muscles at the wrist in man, permits those conditions to be fulfilled better than in dogs, the results of his experiments cannot be applied without restrictions to man, particularly in what concerns the flexor carpi ulnaris, and the palmaris longus and palmaris brevis.

3. That the section of the sublimis and profundus, on the metacarpus, ought to involve, as in dogs, a greater or less degree of destruction of the movement of the second and third phalanges.

4. That after the section of one only of these muscles at the same place, the cicatrix of the divided tendon would without doubt become adherent to the unwounded tendon.

5. That the division of the tendons in their fibrous sheaths, on the phalanges, would cause the loss of their action from the failure of their reunion or from their adhesions.

6. That if, therefore, there should be an indication to divide the

flexor carpi ulnaris and the palmaris longus and palmaris brevis, or though we might attempt even the section of the sublimis at the forearm, still the simultaneous section of the sublimis and profundus, in the palm of the hand and opposite to the phalanges, from the loss of motion which follows this section, would make the employment of mechanical means generally preferable in this case to tenotomy; which latter should be restricted in its application to the cases where, from orthopedy having failed, the hand or the fingers were left in such a state of deformity or feebleness, that the patient might derive advantage in regaining a regular conformation by means of the operation, notwithstanding the loss of motion which would result from it.

At a subsequent sitting of the Academy, these conclusions were vigorously attacked by M. Guérin, who objected that tendinous sections in man afforded different results from those of dogs; and exhibited a statistical table of operations on the forearm, hand, and fingers, to show that these were sometimes followed by the destruction, and at other times by the preservation, of the functions of motion of the divided muscles. He imputes the loss of motion in M. Bouvier's experiments to some defect in his process, which had alike been the cause of failure also with other surgeons; that success could, on the contrary, be generally attained by following the rules which he traced out, of which the case of M. Doubovitsky was an example, motion having been re-established from three to eight days after the operation.

M. Bouvier replied that he had always acknowledged from the beginning, that his results from sections on the forearm were not rigorously applicable to man, and that he had only rejected, in the majority of cases, the section of the flexors of the fingers at the hand. M. Bouvier went on to establish proof of failures, by textual quotations from the works of MM. Strohmeyer, Dieffenbach, Phillips, and Bonnet, and a statement of the case of M. Hipp. Larrey. He went on to show that there was a perfect identity in the results of the cases on man, and his experiments on dogs, so far as related to the hand and fingers; and that the rules which the surgeons whom he had named had followed, did not differ from those that M. Guérin had traced for the hand, or from those that he (M. Bouvier) had also followed, and which M. Guérin himself had practised in the very cases even wherein he had failed; that they were incapable of preventing the loss of motion; that by dividing separately the sublimis in the palm of the hand, and the profundus on the second phalanx, we might prevent the osseous adhesions of the first-named muscle, but not its adhesion with the profundus; that the separation of the ends, to which the non-union of divided tendons in their sheath had been attributed, was not greater in dogs than in man; in fine, that the case of M. Doubovitsky, published by himself in the *Annales de Chirur.*, (tom. i., 1841,) could not be interpreted as it had been, since the author himself, (M. Doubovitsky,) who had watched over his case with the greatest care, made no

mention of this alleged occasional re-establishment of the motions, and even repudiates with warmth the supposition of the temporary existence and subsequent rupture of the cicatrix in the ununited tendons.

M. Guérin contended, nevertheless, that the flexor tendons at the wrist, hand, and first and second phalanges, could be cut and their motion preserved. Among other members M. Velpeau, the most formidable opponent of M. Guérin, and who had disputed his claims to the establishment of any new principle whatever in tenotomy, did not deny the possibility of success to a certain extent in the tenotomy of the hand and the fingers; but as he could not conscientiously say that the patients exhibited by M. Guérin afforded satisfactory conclusions, he desired that there might be a new investigation.

M. Gerdy denied nothing *a priori*, but wished to have broad daylight upon the subject. Among other objections, however, he said that the tendons of the sublimis and profundus were not, as was generally supposed, two flattened cords which slide upon one another by two uniform plane surfaces. The tendon of the sublimis, at the upper part of the first phalanx, is bent into a groove convex in front, (*se courbe en gouttière convexe en avant,*) and concave behind, so that it embraces at first the tendon of the profundus. Towards the middle of the phalanx, it is divided into two tonguelets, (*languettes,*) which curve outwardly and backwards, forming by their reunion behind the tendon of the profundus, a fibrous tube, which this last-named tendon traverses. It results from this arrangement, that at the lower part of the first phalanx, the tendon of the profundus becomes anterior to the lateral reunited languettes of the sublimis, (*superficiel.*) The consequence of this remarkable arrangement is, that if we cut perpendicularly from before backwards, at the lower part or lower third of the phalanx, we first divide the tendon of the profundus, here more superficial than that of the sublimis; that if we cut in the same manner at the middle of the length of the phalanx, we cut at once both the languettes of the sublimis, and also the tendon of the profundus; that if we cut still higher, we divide at first the middle of the convexity of the tendon of the sublimis, and that we reach that of the profundus before having completed the transverse section of the half-tube which the sublimis forms in front of the profundus.

M. Velpeau replied in substance:

That when the fingers are retracted, if the tendon of the sublimis is alone contracted, it raises, chafes, and separates imperceptibly the sheath which envelops it, and is thus removed from the phalanx, to which it becomes to a greater or less degree perpendicular, and completely abandons the flexor profundus, which in its normal condition it encases. This latter, moreover, is retained by means of a solid bridle and a most ingenious contrivance, on the anterior surface of the first phalanx. In the patient whom I operated upon, the finger was so powerfully retracted that its extremity rested against the root of the thenar eminence, and the tendon of

the flexor sublimis formed there a cord so straight and so perfectly isolated, that its section was unattended with the least difficulty. Whatever M. Gerdy may think, this section of the sublimis would be easy, and would present yet more chances of success at the root of the finger near the palm of the hand, than near the anterior extremity of the phalanx.

I would say, then, that on the palmaris longus and brevis, and on the flexor carpi ulnaris, tenotomy offers every desirable prospect of success; that it is nearly the same with all the extensor tendons, beyond the point where they traverse the fibro-synovial sheaths of the head of the radius; that in the palm of the hand it will also frequently succeed, though in a less perfect manner, and that the palmar face of the fingers is the region which presents the fewest advantages for it. I will add, however, that it may even still render some service there, under the circumstances pointed out. Moreover, are there not cases where the deformity is such, that its removal should be paramount to every other consideration? When a finger is glued to the hand, for example, it is not only an inconvenience because it is of no service, but also because it deprives us of the power of grasping any instrument or foreign body, and thus abolishes the functions of the entire hand. In straightening a finger of this kind, though it were to remain completely incapable of motion afterwards, we should still render a service to the patient. Nothing, at least, prevents our straightening it to the extent of three-fourths or half the distance, so that, representing an arc of a circle, it may, if required, sustain a body or give some support to it.

Thus, in the case of a gentleman whom I have recently had under my care, and who for many years past has been annoyed by a very painful retraction of the fingers of one of his hands; if tenotomy was performed in this case, the patient might certainly be relieved of an inconvenience which may ultimately make life almost burdensome. This patient, who is troubled with an almost constant tremor, and whose spinal marrow appears to be diseased, has the fingers so strongly drawn back, that two of them have ulcerated the palm of his hand. Is it not evident that we ought to desire, above all, to deliver him from such suffering, though it were even impossible to attack the cause of his general tremor? And can any one deny the utility of tenotomy in such a case?

M. Guérin replied to M. Gerdy as follows:

1. A question having arisen incidentally, on the subject of the section of the flexor sublimis in front of the first phalanx, and M. Gerdy, pretending that I had laid down this process as a principle, has persuaded himself and asserted that on this point he had reduced me to silence. He has entirely deceived himself. There is an omission which I made in my first reply: the reasons which I gave him then have lost nothing of their value to-day. In giving in my last reply, (*Bulletin*, p. 132,) the recapitulation of the operations which I had performed on the hand, I mentioned that I had made the section of the sublimis in front of the first phalanx four times,

without explaining myself any farther. Now, these four operations were those which I performed on M. Doubovitsky; but they were not made as M. Gerdy has supposed, and as he has stated to you; but they were made *elsewhere*, *otherwise*, and *in other conditions*. Being perfectly aware, and having long since taught, that the two tendons traverse each other at a certain point of the first phalanx, I performed, as I have said to you, the section of the sublimis, *elsewhere*, *otherwise*, and in *other conditions*, than has been supposed by M. Gerdy. Thus, *elsewhere:* I have not divided it at the point where the tendon of the sublimis is traversed by the profundus, but higher up, and on a line with the upper portion of the first phalanx. But the profundus only traverses the sublimis farther down, at the middle of the phalanx. At the point, therefore, where I have divided it, I have been enabled to reach it without necessarily coming at first in contact with the profundus. I have performed this section *otherwise, and in other conditions*, than has been stated to you. In fact, in M. Doubovitsky I had previously divided the flexor profundus in front of the second phalanges; this tendon was not then prominent, it was at that time shrivelled, (*affaissé*,) and separated from the sublimis, which latter remained raised up and stretched. I was then enabled to feel the tendon of the sublimis, isolated and stretched under the skin; I had it therefore in my power to reach it without cutting the profundus, which would have escaped before the instrument; in fine, I thus avoided the danger which M. Gerdy had supposed inevitable.

To enable the Academy to convince themselves of the justness of the remarks which I have just made to them, I have brought a prepared hand, upon which I am going to divide, under their eyes, the two orders of tendons as I divided them on M. Doubovitsky. It is to be remarked, that the point where the two tendons traverse each other corresponds nearly to the middle of the phalanx; there is then between this point and the apex (*sommet*) of this last, (the phalanx,) a space of about two centimetres. I first divide the tendon of the profundus in front of the second phalanx; there, you see, it is relaxed, while I stretch the tendon of the sublimis. Finally, I shall now divide this last, and you will observe that the profundus is in no way implicated. (At this moment, M. Gerdy, seated behind M. Guérin, denies that he has divided the tendon of the sublimis at the point where he said he had: he had divided it higher up.) You see, gentlemen, that in the second, as in the first experiment, there exists still a very perceptible stump (*moignon*) in front of the point where the sublimis gives passage to the profundus; also that the profundus, in the two cases, has been completely avoided, (*menagé*,) and that ought to be so, for if the blade of the instrument had been carried upon it, the state of relaxation in which it was, would necessarily have impeded the action of the cutting edge. [Among others who were present at the operations upon Professor Doubovitsky of St. Petersburgh by M. Guérin was Dr. Mott, who vouches for the skill and elegance with which they were performed.—*T.*]

M. Gerdy does not absolutely reject, he says, the section of the sublimis and profundus flexors above the wrist and at the palm of the hand, because he is far from participating in the fears of M. Bouvier in relation to their reciprocal adhesion; but he asserts that he would have extreme repugnance to attempting the tenotomy of the sublimis at the first phalanx, according to the process of M. Guérin, because it is impracticable. As a better method, M. Gerdy proposes gliding the tenotome, at the lower part of the first phalanx, behind the tendon of the profundus, and in front of the reunited languettes of the sublimis; then in turning the cutting edge backward to divide the reunited languettes of the sublimis upon the phalanx. M. Gerdy says he has sometimes succeeded by this method.

In *thirty-four* cases in which M. Guérin performed the section of the flexor tendons in front of the fingers and in the palm of the hand, he failed, by his own acknowledgment, either wholly or partially, in *sixteen* instances. M. Vidal, from all the facts on this subject, comes to the conclusion that tenotomy in the palm of the hand, is far from possessing the same efficacy that it has in other regions of the body.

M. Velpeau, also, felt authorized in saying, that tenotomy on the flexor tendons of the fingers has, in the operations of M. Guérin, failed in more than half the cases.

M. Bouvier admitted that one single case of actual reparation of the flexor tendons of the fingers would satisfy him.

M. Guérin then presented two patients operated upon by him, and which he thought should remove all doubts on the subject.

M. Bouvier then proposed a commission to examine these two cases, and to report to the Academy. M. Guérin having objected, M. Bouvier alone soon made an examination of the state of the two children, and thus reported:

The young girl, Clémence Delamain, aged from fourteen to fifteen years, who has undergone the section of the flexor longus pollicis, and of all the tendons of the sublimis and profundus, has entirely lost, not only the flexion of the second phalanx of the fore-finger, which M. Guérin has spoken of, but every movement of flexion of the second phalanx of the thumb, of the second phalanx of the little finger, and the third also of this finger and of the middle and ring finger. These two last alone have retained the movement of the second phalanx. This patient had lost the third phalanx of the fore-finger. The little finger appeared to derive the flexion of its second phalanx merely from being drawn by the ring finger under which it was situated.

The right hand was the part afflicted, and though the patient could sew with difficulty before the sections, she could now no longer do so, being obliged for that purpose to use the left. The thumb and fore-finger having flexion only at their base, can no longer be applied together so as to hold the needle. The immobility of the three third phalanges disables the patient from handling the wheelbarrow. M. Bouvier considers the operation in this case

a new misfortune, less complete, but not less real than that of M. Doubovitsky, and then depicts what it would have been in this poor peasant girl, if she had been an artist, painter, musician, &c. He censures the omission of the previous use of proper orthopedic mechanical means, especially as the case was not of long standing. It is true a very imperfect one had been used before she applied to M. Guérin, but without effect.

The other child, Clémentine Mouchy, aged nine to ten years, in whom there were no other sections made but those of the tendons of the sublimis and of the tendon of the profundus of the fore-finger, and of the flexor longus pollicis, preserved the flexion of the second phalanges, except to a little less extent of motion in the second phalanx of the fore-finger. The flexion of the third phalanx was very feeble in the little finger, a little less restricted in the ring finger, and still a little more extended in the middle finger, though perceptibly less than in the normal state. The third phalanx of the fore-finger was entirely incapable of motion; M. Guérin had recognised it, and explained it by the unintentional section of the two flexors in the palm of the hand. The use of the hand was greatly restricted in part by the effect of the sections, and in part by a paralysis which had existed previously.

M. Bouvier then contends:

1. That the section of the sublimis and profundus of the fore-finger in the palm of the hand, in C. Delamain, produced the same loss of motion observed in the experiments on dogs, and in the case of M. H. Larrey.

2. That the section of the profundus opposite to the second phalanx, also had the same effect on the three fingers, the destruction of motion in the small phalanges, (*phalangettes,*) as in the experiments in question.

3. The division of three tendons of the sublimis only, in the palm of the hand, in C. Mouchy, was followed by the adhesion of this muscle to the profundus, as had been predicted by M. Bouvier would take place under such circumstances. The adhesion was shown by the little extent of motion in the three phalanges, &c.

4. The same section joined to that of the profundus in the other patient, has left undisturbed on two fingers the flexion of the second phalanx, and abolished it on the third. The flexion of the third phalanges had been destroyed by the section of the profundus. Thus two movements out of six have been preserved, whereas in the cases previously known of the section of the two tendons, nearly all were destroyed.

5. The flexor longus pollicis, divided in the two patients, reacquired its movement in one case, but not in the other.

In conclusion, M. Bouvier thinks the condition of the two patients confirms the deductions which had been made from other cases, and he shows that the section at the hand of the flexors of the fingers, is an operation which must be put in the second class, not to be resorted to until after having exhausted the resources of orthopedic mechanism—and then not to be decided upon till the

advantages of restoration of form are well considered in connection with loss of motions, &c.

M. Guérin now felt himself obliged to submit to a commission, and was allowed the privilege to name the members himself—his friends, of course, says M. Vidal.

The commission, composed of MM. Amussat, Blandin, Bousquet, Paul Dubois, and Ribes, reported unanimously on the two cases as follows:

Clementine Mouchy.—1. Appearances of pre-existing paralysis in the hand, especially on the muscles of the thenar and hypothenar eminences, which were almost completely atrophied, and exhibited no prominence under the efforts of contraction. Temperature of the hand reduced.

2. Motions of flexion in all the articulations of the fingers and thumb, as follows:

A. *Movements of the Thumb.* Flexion on the hand remains, but very limited, owing to the paralysis and atrophy of the flexor pollicis brevis and other muscles which move this articulation. Flexion of the phalangette on the phalanx, normal.

B. *The Fore-Finger.* Flexion in the three articulations—complete at the metacarpo-phalangeal and phalango-phalangeal—very limited at the articulation of the second with the third phalanx.

C. *Middle Finger.* Flexion of the finger on the metacarpus, normal; second phalanx on the first, the same; third on second, the same.

D. *Ring Finger.* Flexion of the finger on the metacarpus, normal. Second phalanx on first, same; and third on second, nearly so.

E. *Little Finger.* Flexion of the finger on the metacarpus, normal; second phalanx on first, normal; third on the second, nearly so.

3. Besides the paralysis, she has some retractions of the extensors, which interfere more or less with all the movements of flexion of the fingers and phalanges. This retraction is especially observable in the extensor secundi internodii pollicis, and the corresponding head of the middle finger.

Use of the Hand. Used the hand with difficulty before the operation; could not hold her spoon and carry it to her mouth; could not cut bread, &c. Now uses it much better; holds her spoon, carries it to her mouth, and cuts bread; but the ordinary uses of the hand are limited by the paralysis. Although there are no means of ascertaining now what, under the influence of the paralysis, was the state of the movements of the hand not examined in this note, every thing induces to the belief that these movements have been preserved such as they were before the operation.

Clemence Delamain.—1. Appearance of the hand, regular. The third phalanx of the fore-finger is wanting, and that of the ring finger has been shortened one-half by the destruction of its free extremity.

2. Movements of flexion exist in all the articulations of the fingers, and of the thumb, but in very different degrees in some.

A. *Movements of the Thumb.* Its flexion on the hand, very extensive; that of the phalangette on the phalanx, very limited, but very appreciable.

B. *Fore-Finger.* The third phalanx wanting. Flexion of the phalanx on the metacarpus is about two-thirds its normal extent. Second on the first, very limited, but manifest.

C. *Middle Finger.* Flexion of the finger on the hand, normal; of the second phalanx on the first, the same; the third on the second, difficult and limited, but manifest.

D. *Ring Finger.* Flexion of the fingers on the hand, normal; of the second phalanx on the first, the same; of the third on the second, a little difficult, but manifest, and reaching almost to the normal degree, in spite of the mutilation.

E. *Little Finger.* Flexion of the finger on the hand, normal; of the second phalanx on the first, very obscure and very limited, but appreciable; of the third on the second, the same as at the preceding articulation of the same finger.

Use of the Hand. Before the sections, the use of the hand was very imperfect and very limited. She sewed with great difficulty with the right hand; she now does it very well. After having sewn in our presence, she was enabled to take the scissors and rip out the stitches, which she could not have done before. She had been obliged to learn to sew with the left hand; she sews since with the right hand: she had become for the most part left-handed; she is now again become right-handed: she drew the barrow with difficulty, as the labor gave her pain in the retracted muscles; she does it now more easily, for a longer time, and with much less fatigue to those muscles. She could not use her hand to dress or comb herself, or pick greens, or sweep, or make her bed; she now performs all those exercises. She can now do most kinds of housework. There is especially one kind of occupation which she can now do, that she could not before the operations. The parents deal in turf; she could not in any way assist them in this occupation, which consists in selecting, digging out, and piling up lumps of sward. At present she performs all those exercises very well.

Paris, December 2, 1842.

(*Signed*) PAUL DUBOIS, RIBES, AMUSSAT, BOUSQUET, F. BLANDIN.

M. Vidal, after passing some few censures both on M. Bouvier and M. Guérin, comes to the conclusion, from the above report, that the facts are very difficult to appreciate, especially in the heat of an academic discussion. He admits, however, that, after these sections, a species of reunion may take place. But for practical purposes, we ought always to know—1. What was the state of the parts before the operation, and how far their forms were altered, and their functions perverted or lost, and what were the services that these parts could still render; 2. If mechanical means, well

directed and for a long time applied, had produced no good results; 3. Whether, on examination, and after being perfectly assured of the insufficiency of these means, the operation might not do more harm than good.

M. Bouillaud vehemently urged a new commission, which M. Guérin peremptorily objected to. All the details of this discussion may be found in the *Bulletin of the Académie Royale de Médecine*, t. viii.—*T.*]

[NEW OPERATIONS IN TENOTOMY AND MYOTOMY IN EUROPE.

Extensive and Simultaneous Division of Numerous Important Muscles and Tendons by M. Guerin.

Myotomy of the Muscles of the Back in lateral Curvature of the Spine.

As early as July, 1840, (*Gaz. Méd. de Paris*, and *Méd. Chir. Rev.*, July, 1840,) M. Guérin of Paris says he had, in nearly fifty cases, divided, more or less completely, most of the muscles of the back and spine for lateral curvatures of the spine. The muscles divided were the trapezius, rhomboideus, levator anguli scapulæ, sacro-lumbalis, and longissimus dorsi. In each the wound of the muscles was from three to four inches in length, and sometimes from one and a half to two and a half in depth, as when the sacro-lumbalis and latissimus dorsi were completely divided; in those cases where the trapezius and rhomboideus were entirely cut across, the bistoury traversed at least from four to five inches or more under the skin. In almost every one, no local inflammation or constitutional feverishness supervened, and by the third day many of the patients were able to get up and walk without support. He had at that time divided successively, also, the sterno and the cleido mastoid muscles, separately or together, twenty-five times for wry-neck by the sub-cutaneous section, and the tendo-Achillis two hundred times for club-foot. In the former sections there was occasionally considerable sub-cutaneous effusion of blood, which was usually absorbed in about twenty-four hours. The total amount at that time of M. Guérin's successful sub-cutaneous sections of various tendons and muscles amounted to five hundred cases. The rapid success in all, M. Guérin imputes to the exclusion of air by the immediate closing of the small external punctures, which thus promotes first intention.

In the year 1840, Dr. Laycock of York, and Mr. G. B. Childs, also both divided the trapezius and rhomboid muscles in lateral curvature of the spine.

Division of forty-two Muscles and Tendons.

The most remarkable achievement in tenotomy on record was that of M. Guérin in 1840. In a case of most extensive deformities of the trunk and limbs, he divided *forty-two muscles* by only twenty-eight punctures. The results were as follows:—

On the trunk, the pectoralis major.

At each elbow, the biceps flexor cubiti, the pronator radii teres, the flexor carpi radialis, the flexor sublimis, and the palmaris brevis.

In each fore-arm, the isolated tendons of the flexor carpi ulnaris, the palmaris longus and brevis, and the abductor longus pollicis.

At each knee, the sartorius, the biceps flexor cruris, the semi-membranosus, the semi-tendinosus, the rectus femoris, the external lateral ligament, and the fascia lata.

On each foot, the tendo-Achillis, the tibialis anticus, the extensor digitorum communis, the extensor longus pollicis pedis, and the peroneus tertius.

The operation lasted an hour, and caused very little pain. The inflammatory action supervened, and on the third day the external openings cicatrized. This universal deformity in the patient arose from a fall and shock on the nervous system during his infancy. (*Med. Times*, Sept. 19, 1840.)

Dr. Mott was present at this operation, which was performed by M. Guérin at his orthopedic establishment of La Muette at Passy. Dr. M. saw the patient several times afterwards, and found him much improved.—*T.*]

[*Tenotomy for old Luxations of the Muscles at the Shoulder and Foot.*

Professor Dieffenbach of Berlin, to whom *new* surgery, as tenotomy and anaplasty may be called, owes such priceless obligations, so long ago as in the year 1839, (see *Medicinische Zeitung*, Dec. 18, 1839, and *British and Foreign Review*, April, 1840,) when tenotomy at least was in its very infancy, performed the following important operation for an old dislocation of the humerus: Thomas Herr, aged over thirty, dislocated his right shoulder two years before by a fall from his horse. This shoulder was an inch higher than the left; the acromion formed a sharp angle, and on the outside, the shoulder was deeply hollowed, while the scapula lay flat. The head of the humerus lay on the anterior side of the chest, close to the clavicle, and two inches from the upper portion of the sternum. The arm stood out far from the body, and was useless, except for some motion in the hand. He complained of a sensation of cold in the limb, and the arterial pulsation at the wrist was feeble. The head

of the bone lay buried in a dense wall of ligament, which it had made, and motion gave great pain. Sheets were tied around the hand and upper part of the humerus and under the axilla, with numerous assistants at each. Those at the axilla and hand making gradual and firm extension and then stopping, the professor passed a small scythe-shaped knife through the skin, and divided the most tense portion of the pectoralis major close to its tendon. Then introducing the knife at the posterior border of the axilla, he successively divided the latissimus dorsi, teres major, and teres minor. The usual crackling noise was heard in all. He next passed the knife into three places by the head of the humerus, and divided, under the skin, the dense and hard false ligaments which formed the new joint, and now lessening the extension, loosened the head by a few rotations. Powerful extension being again made, the professor easily slipped the head into its place. There were only a few drops of blood from the punctures. The shoulder, breast, and arm, were enveloped with bandages, soaked with paste, which soon dried and rendered the parts immoveable. In nine days the dressings were removed, and the natural appearance and motions perfectly restored, sooner, in fact, than in old luxations, as there were no contracted muscles now to contend with. M. Dieffenbach has also successfully reduced, in the same manner, a luxation of the foot backwards of a year's standing, by dividing the tendo-Achillis.

Dr. Mott, in his lectures, recommends, but has not yet had an opportunity of trying, the section of the *triceps extensor cubiti*, in recent dislocations of the ulna backwards, accompanied with fracture of the coronoid process.—*T.*]

[*The Sub-Cutaneous Section for Synovial Tumors, Ganglions, &c.*

To M. Barthélemey, of the hospital of Grand Caillou at Paris, are we indebted for a new and most important application of tenotomy, viz., to the destruction of synovial tumors. He slides a longish, narrow-bladed scalpel under the integuments, and cuts the tumor fairly across in the middle, so that all its contents shall be extravasated into the surrounding cellular tissue; the knife is then withdrawn by the small puncture, and compression made for a few days. This practice was pursued in three cases with perfect success, (*Gaz. Méd., and Medico-Chir. Rev.*, July, 1840.) M. Malgaigne has tried this process successfully, also, in one case in ganglions, or synovial swellings over different joints. He suggests its applicability to some cases of *hydrocele*, (*Ib.*)

In 1841, (see *Dublin Medical Rep.*, April 21, 1841,) we find the above practice of M. Barthélemey was successfully repeated at Dublin by Professor Williams, on several chronic tumors of the bursæ mucosæ and synovial sheaths of tendons. In one, over the knee, the cataract needle was passed into the tumor, and the entire thickness of the sac divided by several parallel and longitudinal incisions. A portion of the fluid escaped into the cellular tissue,

but the greater portion found an exit externally on the withdrawal of the needle. The knee was then strapped with adhesive plaster, and the limb kept at rest. Dr. Houston of Dublin has repeated the same operation with equal success, though, from accidentally having a needle too short for the size of the tumor, he was obliged to introduce it by five or six different incisions, (*Ib.*)

A most ingenious and important application (if it succeed perfectly) of the ideas of M. Barthélemey, is the thought which seems to have suggested itself simultaneously to M. Goyrand of Aix, and Mr. Syme of Edinburgh, without either being aware of it, (see *British and Foreign Medical Review*, April, 1841.) It was the application of the process to the dislodgment of foreign bodies in joints. The loose body in the knee joint was pushed by M. Goyrand into the synovial pouch above, and to the outer side of the patella, beneath the vastus externus muscle, and, while an assistant held it fixed there, he passed a narrow knife through the skin, at some distance above the joint, and through all the intermediate tissue down to the foreign body. Without enlarging the opening in the skin, the synovial membrane and adjacent tissues over the loose substance were then freely divided, till, by the pressure on the latter, it slipped out of the joint through the wound, and lodged itself in the sub-cutaneous cellular tissue, or in some of the other tissues between the skin and joint. Sticking plaster was applied to the small external puncture, and rest enjoined for several days, till all chance of inflammation had passed away. The foreign body, dislodged from the joint, forms a cyst for itself, and may be allowed to remain there, and, after a time, extracted by cutting down to it. In this case, there were two loose cartilages dislodged, one of which was subsequently removed. The relief obtained to the joint was complete. Mr. Syme has performed a similar operation with entire success.

Why could not the sub-cutaneous principle be thus extended to a great number of chronic incysted tumors, or, perhaps, to others also? What are to be the limits to useful applications of this discovery?

The application of the sub-cutaneous section to bursal tumors has more recently been again followed up with further successes at the Dublin Hospital. In a female with a large *patellar bursa*, an incision of an eighth of an inch was made along the outer margin of the tumor, and a very small bistoury introduced obliquely into the cyst, at such a distance from the superficial cutaneous incision as to prevent the escape of the fluid. The sac was then cut in several places, chiefly on the anterior surface, until all the fluid had been evacuated. A small compress was then applied, and several straps of adhesive plaster, and a roller, from the toes to the knee. A splint was also applied, which extended from the middle of the back part of the thigh to the same point of the leg.

On the 10th day the dressings were removed; considerable diminution had taken place in the size of the swelling. On the 17th day the natural appearance of the joint was restored.

The puncture into the sac should be made with care, and the internal surface of the cyst then cautiously scored, and the fluid evacuated by firm pressure, so as to prevent the ingress of air. The operation might fail, perhaps, where the sac is much thickened, its interior loculated, and the cells filled with a thick gelatinous substance. (*Dublin Medical Press*, Oct. 26, 1842.)

Dr. Mott has also recently performed this operation several times, with entire success, on bursal tumors.—*T.*]

The rationale of this treatment is explained by what takes place under the ancient and hitherto most perfect process of cure, and where there is no opening whatever made, viz., that of suddenly bursting the cyst by striking upon it with a smooth heavy body, as a large book, while the limb is stretched out firm on some solid support, and the patient unaware of your intention. The rupture of the cyst, and the diffusion of the contained fluid into the surrounding cellular tissues, are in these cases instantaneous. I have thus instantly made permanent cures of bursæ on the dorsum of the carpus; also, of one of the size of a pigeon's egg at the olecranon, which had caused much pain, and which the patient supposed would require amputation of the arm; also, of another, three inches in diameter, of oval shape, and covering the whole patella. Since the preceding part of this paragraph was written, I have, in the same manner, cured another bursa of large size on the side of the olecranon.—*T.*]

[*The Sub-Cutaneous Section in Inguinal Hernia.*

M. Guérin has applied tenotomy to a case of old inguinal hernia, after reduction. He raised up a transverse fold of the skin of the groin, pubis, and root of the scrotum, and drew it from below upwards to a level with the orifice of the inguinal canal. He then plunged in a small bistoury at the base of this fold, up to the entry of the canal above, and to the interior of the spermatic cord, which latter an assistant held aside. Through this opening he then passed a blunt-pointed convex *myotome*, having a portion of the blade not cutting. He then cut with this from behind forwards, and from within outwards; afterwards turned the blade and incised successively from above downwards, and about the angle of the pubis, the two divisions of Poupart's ligament, and the fibres of the obliquus externus, which terminate there. Lastly, he made several scarifications in the intermediate points.

The operation lasted ten minutes, no fever or reaction followed, and the cicatrization of the puncture took place immediately. On the fourteenth day the effused structures had become hardened, and were able to resist the expulsion of the hernia. At the end of a month, the patient resumed his work without a truss; no hernial protrusion took place upon coughing, nor from any exertion he now made.—(*Bulletin of the Academy of Medicine*, Paris, Sept. 1841.)

M. Bouchut goes farther, and proposes the sub-cutaneous opera-

tion in cases of strangulated hernia itself, whether the strangulation be owing to the contracted and indurated neck of the sac, or to the aponeurotic rings. The first operation he calls *intra-peritoneal kelotomy*, and is to be made into the sac, with a masked (*concealed*) kelotome, a kind of lengthened flat trochar in its canule. The other operation he calls *extra-peritoneal kelotomy*. The word kelotomy is here rather inappropriate, as the kelotome makes in this case the division of the aponeurotic rings. He has not yet tested his process on the living subject.—(*Vid. Journal des Connaissances Méd.*, Paris, Nov. 1841.)

Tenotony in Dislocations.

In that particular displacement sometimes met with in the phalanges of the second toe, from tight shoes, where at the junction of the first and second phalanges an acute angle upwards is formed by the joint action of the extensors on the distal extremity of the first phalanx, and of the flexors on the other extremity of the toe, Professor Fergusson has obtained a perfect cure by the subcutaneous section of the flexor tendons, and then splinting the toe underneath and keeping it fixed, by adhesive plasters, to the great toe. He states that Sir Astley Cooper refers to a case of a similar kind. —(*Pract. Surg., loc. cit.*)

Myotomy in Entropion.

M. Pétrequin, of the Hôtel Dieu, Lyons, having been satisfied that certain cases of entropion, as the blepherospasm of scrofulous ophthalmia, are caused by a permanent contraction of the orbicularis muscle, effected a cure in a case of this kind by the subcutaneous section, thus :—The lid being held extended, he placed the instrument on a level with the floor of the orbit, passed it under the skin and the orbicularis up to the free edge of the eyelid, taking care that no fibres above escaped division ; the instrument was then carefully withdrawn, assisting the division by pressing on the eyelid with the finger.—(*Gaz. Médicale.*)

Sub-Cutaneous Section in Entropion.

Dr. Neumann had complete success with the sub-cutaneous longitudinal division of the muscles of the lids, where all the lids were in a state of entropion from repeated attacks of strumous ophthalmia, and where the irritation of the eyelashes had rendered the right cornea quite opaque, and the left nearly so. Sight was almost entirely destroyed. A small tenotome was introduced at half an inch from the external angle of each eye, and carried flatwise to the internal angle, when its cutting edge was turned downwards and the levator palpebræ and other tissues divided. To prevent the globe from being injured, a thin plate of horn was placed between it and the eyelid. The lower lids were treated in the same

way, the tenotome being introduced into the same puncture in the temple which had been used for the upper. The eyelashes regained the normal direction. In the left eye the operation was completely successful, but had to be repeated in the right after the lapse of three weeks. The sight of the left eye was completely restored.—(*Lond. and Edinb. Monthly Journ. of Med. Sc.*, September, 1842.)—*T.*]

[TENOTOMY, MYOTOMY, AND ANAPLASTY, IN AMERICA.

Although scarcely four years have elapsed since those brilliant conquests of modern surgery, the various processes of anaplasty and tenotomy, came into general use in Europe, they are already become operations of almost every day practice in the principal cities of the United States. Both, for their parentage, go back to a remote period of time, anaplasty owing its birth to Hindoo rhinoplasty, and tenotomy tracing its first essays to orthopedy, or club foot, at an epoch not perhaps quite as distant. Both, it may be said, owe their existence, like so many other valuable discoveries and improvements in all sciences, not so much to the progress of philosophical inquiry and anatomical or physiological investigations by learned professional men, as to the accidental or contingent circumstances which concurred in producing incentives to supply a want or void that was severely felt among the masses of population, and in the common walks of society. As the not unfrequent and serious deformity of club-foot early suggested some mode of relieving so distressing an impediment to locomotion, so did the more hideous disfigurations of the face, common in some parts of Asia from the ancient cruel and barbarous punishment of cutting off the nose, thus incidentally create a yet more pressing necessity for the ingenious process of rhinoplasty.

The incidental occurrence, at a later period, of frequent mutilations or loss of the nose in the south of Europe, from the imperfect modes of treatment in syphilitic affections, led the surgeons of that time, and especially Tagliacotius, to direct their attention to the restoration of that important organ, and consequently to the improvement and adoption of the Indian operation.

Rhinoplasty, thus known for many ages past in Asia, and several centuries ago introduced into and adopted and improved in Europe, more particularly by Tagliacotius and other Italian surgeons, was at a still more recent period revived again, by the attention drawn to it by English army surgeons, who had witnessed it in India. But this also, as it seems, did not afford sufficient occasion or motives for its more general adoption, until an-

other purely incidental concurrence of circumstances, growing out of the frequent mutilations of the features among respectable classes in certain parts of Germany, by their peculiar modes of duelling, gave to anaplasty an impulse among the surgeons of that country, which soon spread in all its applications to every part of Europe. Though far fewer occasions present in Europe or in this country, (except in fights which end in biting off the nose or ear, now happily proscribed,) for such applications of the processes of rhinoplasty, anaplasty in general has had a far more extended and useful appropriation, by its employment in all the infinite variety of cases of mutilations, fistulas, and other losses of substance in every part of the body. This has now given it universal currency; notwithstanding which, it is yet far more imperfect in its results, and consequently infinitely more restricted in its usefulness, than the more brilliant and emphatic triumphs of tenotomy and myotomy, in all their forms; these latter creating of themselves almost a revolution, and an éclat and *prestige* for surgery unexampled in the history of the science, and that too, it may be said, within so late a period as the last three years. Dr. Mott, during his residence at Paris and his visit to Berlin, Dresden, etc., had carefully studied the rapid and almost magic progress of this department of surgery, to whose very birth, as it were, and almost masculine (if not too precocious) maturity, it may be said he was an eye-witness, at the great orthopedic establishments of Guérin, Bouvier, and others. And to him belongs, in great part, the credit of having immediately on his return to America, in 1841, by his publicly expressed approbation of these processes, and his repeated practical exemplifications of their utility at the clinique established by him at the University of New York, (the first in the United States,) infused among our practitioners a general knowledge and desire not to lag behind their brethren of Europe; and thus, in fact, may be said to have been most instrumental in domiciliating in our country this most important branch of surgery. Anaplasty and tenotomy require some general remarks in respect to the claims of those who were the *first* to lead the way in these operations in America.

The earliest case of tenotomy performed in America, is that of the section of the tendo-Achillis, by Dr. Dickson of North Carolina, in the year 1835. As this case of *pes-equinus* by Dr. James H. Dickson, of Fayetteville, North Carolina, was the *first operation for club-foot in America by the subcutaneous section*, and the first operation, probably, of any kind ever attempted on this continent, it is proper to give a brief abstract of it from the operator's own account, as published in the American Journal of the Medical Sciences, (Philadelphia,) for November, 1838. R—— D——, a lad aged fourteen, of delicate make, was born with his limbs and feet apparently perfect—but when he first began to creep, was observed to drag the right leg after him in a very awkward and peculiar manner. He was late in learning to walk, and had never been able to get more than the toes and corresponding metatarso-phalangeal articulation to the ground. The left side of the body, and

left leg and foot, were well developed; the right arm and leg perceptibly smaller than the left, and the right leg half an inch shorter than the left. The heel was drawn up to full three and a half inches from the ground. The tarsal bones of the right foot were very prominent, and when the patient stood erect, their dorsal surface was nearly in a line with the anterior surface of the leg. The patient's mode of progression partook at once of a hop and a walk. There was but little motion in the ankle joint, and the power of the limbs over the flexor muscles seemed entirely lost. The heel was small and narrow, and its skin, from never having come in contact with the ground, was delicate and tender.

The operation was performed at Fayetteville, (N. C.,) January 10th, 1835, in presence of Dr. Benjamin Robinson of that place. Dr. Dickson inserted a sharp-pointed narrow bistoury two and a half inches above the insertion of the tendo-Achillis and underneath this tendon, and divided the fibres from within outwards, merely cutting through the tendon, without wounding the skin except at the point where the bistoury was introduced—following the process of Strohmeyer. The foot almost immediately came down to a right angle nearly with the leg, the only dressing consisting of a bit of adhesive plaster on the small wound, a compress on each side of the divided tendon, secured by a roller, while the foot was kept in its position by a splint to the front of the leg and foot. There was so little pain produced, that an anodyne administered once or twice was all that was required during the treatment. Five days after the operation, Strohmeyer's apparatus was applied, and extension very cautiously and gradually made from day to day until the expiration of the fourth week, when the foot was found to be at a right angle with the leg. A laced boot was now substituted for the apparatus during the day, and the latter worn only at night. This was continued for a week. Dr. Dickson says he applied extension sooner in this case than he should have done, from having seen, in the Medico-Chirurgical Review, that Strohmeyer attributed his failure in one of his cases to delaying it too long. At the end of the second month, the patient could walk with very little limping, the deficiency in the length of the leg being in a good degree remedied by a high-heeled boot. The deformity was entirely removed, and the flexor muscles now became obedient to the will. When Dr. Dickson saw the patient again, in May, 1837, he walked with ease, and with scarcely any perceptible limp. The limb had become much more developed, and its muscular power greatly increased. This surgeon has informed me, if I recollect right, that he has since repeated this operation with success in other cases.—*T.*]

The next cases in America were that of Dr. N. R. Smith, of Baltimore, in 1836, and that by Dr. William Detmold, formerly of Hanover, Germany, now of New York, who has since that time, as he states, performed this operation more frequently, and as it would seem has had more experience in these sections, than any other surgeon in this country—the number of his cases

(see Reese's *American Edition* Cooper's *Surgical Dictionary*, 1842) amounting, November, 1842, to four hundred, and the number of the tendons divided, to twelve hundred. He has shown that the intermediary uniting substance is *always formed*, however far apart may be the divided ends of the tendons; also, he has demonstrated the importance of dividing other tendons concerned in club foot, besides the tendo-Achillis. He makes use of subsequent mechanical apparatus when required. He never has seen the operation followed by trismus, or other unpleasant symptoms.

Among the prominent names in American tenotomy, or rather myotomy, we must here mention that of Dr. John W. Schmidt, of New York, to whom is to be accorded the distinction of having been the first, in any country, to perform the complete section of a most important muscle, (the masseter,) with entire success, in a case of immobility in the lower jaw, which we shall give in detail in its proper place.

Myotomy, properly so called, as distinguished from tenotomy, was first performed in America, (according to Dr. Reese, in his last American edition of *Cooper's Surgical Dictionary*, New York, 1842,) by Professor Paul F. Eve, of Augusta, Georgia. The case (as reported in the *Southern Medical and Surgical Journal*, for 1838) consisted in the successful division of the adductor longus femoris, for deformity and consequent loss of motion in the thigh. The incision, five inches in length, extended from the pubis along the inner edge of the muscle, the latter being divided about three inches below its origin from the pubis. The success was complete.

Dr. Mutter, of Philadelphia, has also lately divided the adductor and the pectineus muscles, in a lady who had been deformed and crippled by their contraction for nine years.

[*Sub-Cutaneous Section of the Masseter Muscle.*

To Dr. John W. Schmidt, Jr., of New York, as we have already said, belongs the credit of having been the first, in any country, to divide the entire masseter muscle by the sub-cutaneous section, Oct. 8, 1841.

We transcribe with much pleasure his own account of this operation, as we find it in the Boston Medical and Surgical Journal for July, 1842:

"Miss S. had labored for more than twelve years under the very serious inconvenience of not being able to open her mouth, owing to a contraction and rigidity of one of the masseter muscles, which was caused by an extensively ulcerated throat when a child. The jaw was not only so closed that the end of the little finger could not be inserted between the incisors, but was also much drawn to one side. Frequent attempts had been made to open the jaws by means of an instrument, which I have seen succeed in cases of immobility of the jaw, produced from the use of mercury, and described by Professor Mott in the fifth volume of the American Jour-

nal of Medical Sciences for November; but no permanent good resulted from this instrument, for after its use the contractility of the masseter seemed only aggravated, and the jaw rendered more firmly resistant.

"The young lady being very desirous to have this inconvenience and deformity removed, after some examination of the case I determined on the following operation. On the 8th of October, 1841, in the presence of my friends Professor Mott and Dr. C. A. Porter, I passed a narrow bistoury through the mucous membrane of the mouth, immediately in front of the anterior edge of the masseter muscle, about on a line with the alveolar processes of the lower jaw. Holding the integument up from the muscle with one hand, the bistoury was passed over the masseter, between it and the integuments, and the muscle completely divided to the bone. The mouth was immediately opened to near the usual size, and the lateral distortion of the jaw much improved. Considerable hemorrhage followed, and some extravasation into the cellular substance, which gradually subsided, and the case succeeded well. To prevent union of the muscle, pieces of soft wood, wedge-shaped, were kept in the mouth during the night, and occasionally during the day.

"I am not aware that the entire division of the masseter, on the sub-cutaneous principle, has before been performed. Professor Mott, who witnessed a great many orthopedic operations by M. Guérin, has never seen him divide this muscle. I was informed, by a practitioner in this city, that the masseter had been divided by Dr. Mutter, of Philadelphia; but on referring to his paper, published in the American Journal of Medical Sciences for May, 1840, I find that he only divided the anterior fibres of the muscle, with an instrument resembling a gum lancet. The knife being introduced within the mouth, had the great advantage of leaving no scar."

In a note upon this operation, which Dr. Schmidt has had the kindness to communicate, he has called attention more particularly to the manner in which this section was and should be made, and of the precautions necessary to be taken, to avoid wounding the numerous important organs in the immediate vicinity of the masseter.

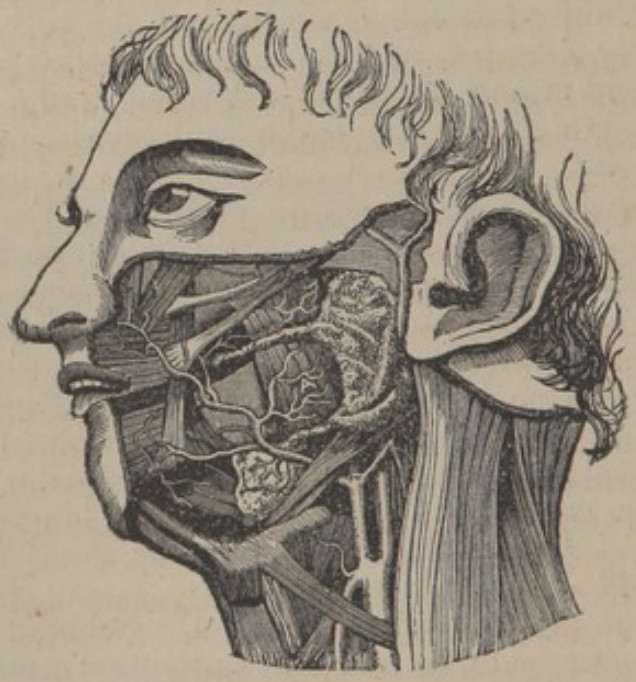
Anatomy of the Parts. The masseter is a *thick* quadrilateral-shaped muscle, composed of two planes of fibres, superficial and deep. The superficial arises, by a strong aponeurosis, from the tuberosity of the superior maxillary bone, and from the lower border of the malar bone and zygoma, and passes backwards to be inserted into the ramus and angle of the inferior maxilla. The deep layer arises from the posterior part of the zygoma, and passes forwards to be inserted into the upper half of the ramus. The muscle has, upon dissection, a tendinous or glossy appearance.

The muscle is connected, by its external surface, with the zygomaticus major and risorius Santorini muscle, the parotid gland and Stenon's duct, the transverse facial artery, the pes anserinus, and the

integument. By its internal surface, with the buccinator, from which it is separated by a large mass of fat, and with the ramus of the lower jaw. By its posterior border, with the parotid gland; and by the anterior border, with the facial artery and vein.

The points to be carefully attended to in the operation, says Dr. Schmidt, are the danger of wounding the facial artery and vein, and the parotid duct and gland. The best method of avoiding the parotid gland is to direct an assistant to embrace it with his fingers, and to press it directly backwards, the assistant placing himself behind the patient.

It must be obvious to any person acquainted with the anatomy of the parts, that a slight deviation of the knife from the proper direction, might be attended with serious consequences.



It is worthy of remark, says Dr. Schmidt, that in the case operated upon by him, the rigidity and contraction were confined only to the masseter muscle of one side, viz., the one divided; and that the jaws, at times, were so firmly closed together that it was impossible to introduce between the teeth a body of greater thickness than a dollar. The immobility had existed about sixteen years. —(See accompanying plate, illustrating these parts.)

Division of the Muscles of the Face for Chronic Spasms.

Dieffenbach has performed this operation in four cases, where the disease had existed some time. The orbicularis palpebrarum

was divided, also the muscles of the cheek, from the ala of the nose *to the anterior border of the masseter*, and lastly, the *muscles at the angle of the mouth*. A perfect cure ensued, (*British and Foreign Med. Rev.*, Jan., 1842.) It will be noticed that the masseter itself was not divided, the claim of priority for the division of that muscle resting with Dr. Schmidt. No other persons, so early as Drs. Schmidt and Mutter, or so extensively as Dieffenbach, had before this time undertaken the sub-cutaneous section of the muscles of the face.

The masseter, however, was afterwards again completely divided, in 1842, by Professor Fergusson, of King's College, London, for a permanent closure of the jaws which had existed five years. The man, in this case, could not open his mouth wider than a quarter of an inch between the incisors. About five years before, a swelling had appeared near the place of the attachment of the masseter to the lower jaw. In about two years, it burst and discharged matter for six weeks. A swelling about half the size of a walnut continued on the spot, and the patient could not open his mouth. After various unsuccessful treatment, including iodine externally and internally, Mr. Fergusson determined on the transverse division of the masseter. He first tried partial division, by cutting through half an inch of the anterior margin of the muscle. "The point of the knife was passed from the mouth through the mucous membrane and buccinator muscle, a little below the parotid duct, and having been pushed between the skin and the masseter, the fibres of the muscle were divided by carrying the edge from within outwards." In about fourteen days, Mr. Fergusson cut through the *rest of the muscle* in a similar way, being convinced, from the result of the first operation, that a permanently good result would follow. The cure was complete.—(*Lond. and Edinb. Monthly Journ. of Medical Science*, April, 1842.)

It appears, therefore, that Dr. Mutter had divided only the anterior edge of the muscle, and that Professor Fergusson also only divided the muscle partially at first, and the remainder not until fourteen days after; so that the *entire section of the muscle at one cut*, has never yet been performed but by Dr. Schmidt, who first proposed and first put it into practice.—*T.*]

[STRABISMUS.

When this present and last edition of Professor Velpeau's work on operative surgery was published at Paris, in 1839, the operation for *squinting*, or *strabismus*, whose extraordinary and successful results have naturally attracted such universal attention, and reflected so much lustre upon surgery, was, it may be said, utterly unknown. In 1842, therefore, M. Velpeau published a small octavo of near

two hundred pages, devoted entirely to the history of this operation, and of those well-known and common deviations in the position of the eye which it is designed to remedy. As appears upon the title, this work is intended as a supplement to complete what was wanting upon this subject in this great elementary treatise. We have, therefore, deemed it no more than just to M. Velpeau, to give in this place an abrégé of all the most useful and essential portions of this supplement, to which will be added whatever in the rapid march of surgical discovery at the present time (when a few years only furnish more matured results and more surgical triumphs than long centuries had hitherto achieved) is justly entitled to be deemed new acquisitions in this brilliant department of (as it may be called) *Myo-Tenotomy*. The copy from which we abridge, is one recently transmitted to us by the learned author.—*P. S. T.*]

All that has been hitherto done to relieve strabismus, by various mechanical contrivances of glasses and spectacles of different degrees of opacity, and by forced positions given to the direction of the axis of vision, has proved, with very few exceptions, totally unavailing. Now, however, surgery can remove this disease as it does cataract or fistula-lachrymalis, by an easy operation, unaccompanied by any danger, and which consists in the section of the muscle or muscles which give to the eye a morbid direction.

Those who wish to consult what ancient authors have written upon the varieties, causes, nature, and treatment of strabismus, may refer to the treatises of MM. Verhaege (on *Strabisme*, Bruges, 1841,) Florent Cunier, (*Myotom. Appliq. au Strab., &c.*, Brussels, 1840,) Dufresse, (*Strab. et Bégaiem.*, 1841,) and especially to the work of M. Bonnet, (*Sections Tend. et Muscul., &c.*, Lyon, 1841,) and that of M. Boinet, (*Journal Medico-Chirurgical*, Janv., Févr., Mars, 1842.)

Article I.—History.

Though this operation is unquestionably a modern invention, some surgeons of the last century made special mention and recommendation of it, and to all appearance it had already been several times performed before the present epoch. The famous charlatan and empiric, Taylor, frequently had recourse to it, as Hewermann in his Surgery expressly says that Taylor professed to cure strabismus by *the section of the tendon of the superior oblique muscle*. Lecat, also, in the Transactions of the Academic Society of Rouen, says, "the charlatan Taylor pierced the conjunctiva with a needle threaded with silk, and *divided with a cut of the scissors*, the membranous fold included in the noose of the silk thread; the sound eye was then covered with a plaster, the diseased eye was restored, and it was pronounced a miracle." Taylor, when asked for his reasons for the operation, replied, that strabismus was caused only

by the *inequality* of the muscles, and that to cure it one of them must be weakened.

Taylor, in fact, according to M. Giraldès, came to Paris, and everywhere announced his intention to cure strabismus by a surgical operation. He called himself oculist to the king of Great Britain, and in his advertisements claims that he had discovered *the mode of restoring the direction of squint-eyes* (les yeux des louches) *by a prompt operation, almost without pain, and without the fear of any acccident*, (*Mercure de France*, 1737, Juin, page 1180.)

M. Cunier (1st Supplement to the *Ann. d'Oculist.*, p. 258) also points out, in the Dissertation of Verheyden, supported in 1767, this surgical phrase: *strabones permultos ferro sanatos apud anglicos vidi.*

Whether Taylor really cured strabismus and divided the muscle, or not, it is certain that he indicated this operation for the cure, in the middle of the last century.

The operation, however, was forgotten until M. Strohmeyer proposed it as one that was absolutely new. Sammels of Courtray, however, (see *Memoir of Verhaege*,) claims to have performed it twice in 1824 or 1825, and *M. Carron du Villards* says it was suggested to him by a hunter having accidentally been cured of an old strabismus from a leaden shot detaching the pulley of the great oblique.

M. Cunier (*op. cit.*, p. 126) says M. Gensoul of Lyon had proposed the section of the muscles of the eye before M. Strohmeyer. But all this is mere assertion, and of no importance, and the labors of M. Strohmeyer are those alone which have really awakened attention to this subject.

In 1838 he described his operation, which until then he had only performed on the dead body. In the beginning of 1839 M. Pauli attempted it on a young girl, (*Schmidt's Jahrbücher*, 1839, vol. xxiv., n. 3, p. 351, or *Verhaege*, p. 39,) but it was unsuccessful. On the 29th of October, 1839, it was performed on living man, by M. Florent Cunier, (*Supplement, &c.*, p. 264.)

Though M. Verhaege assigns the date of M. Dieffenbach's first operations to December, and M. Phillips (*Strabisme et Bégaiement*, p. 8; *De la Tenotomie sous-cutanée*, Paris, 1841, p. 223) places them at October 26, 1839, they were undoubtedly the first that were known and that drew attention. In fine, this operation was definitively created by M. Strohmeyer, and made practically useful by M. Dieffenbach.

Before this remedy, which had been so long thought of, could be brought into use, it was necessary to establish completely the success of the section of the muscles, as for club-foot, wry-neck, &c., which was not triumphantly effected until the year 1830.

This operation was then naturally suggested to remedy the deformity in question.

Such doubts, however, still existed, that even the first letter of M. Dieffenbach (*Gazette Médicale*, 1840, p. 107) produced but a slight sensation in France. At a later period, M. Guérin having been suc-

cessful but in four cases, (*Gaz. Méd.*, 1840, p. 424,) M. Roux having failed in his two first essays, (same journal, p. 494,) and I myself having had but little success, we looked upon the announcement of *constant successes* by the surgeon of Berlin as somewhat strange. The inexactness of certain details confirmed this, as in the relation made at the Academy of Sciences, Paris, June 29, (*vid. Gaz. Méd.*, p. 424,) where a practitioner speaks of having made *four cures*, and immediately after confesses that three of the patients continued to squint.

M. Phillips, who had affirmed that the *operation always succeeded*, who at least did not mention a single failure in a hundred operations performed by him in Russia, and who has published that in *over four hundred* cases, the operation has always been successful in the hands of M. Dieffenbach, finds a decided opponent in M. Melchior, (*De Myotomiâ Oculi, &c., Hafniæ*, Mars, 1841,) and some incredulous persons also in the *Medico-Chirurgical Review.*

The residence of this young surgeon at Paris seemed to change his views, as in his last work, (*Tenotomie sous-cutanée*, p. 321,) he relates one hundred cases as performed upon by him, and attended by M. Bouvier, out of which twenty-five proved unsuccessful.

M. Baumgarten, also, (*Operative Behandlung, etc.*, Leipzig, 1841,) had admitted that of fifty-two cases, only thirty-three were cured; and of these last, ten had to be twice operated upon. Of the seventy-two operations, also, performed at Dresden by MM. Ammon, Zeis, Warnatz, and Baumgarten, forty-five only were successful. M. Guthrie, also, who in his Annals of Surgery, vol. i., p. 492, mentions his having had only *two or three* failures in *three hundred and forty cases*, afterwards speaks with less confidence of the final results of his practice.

In Belgium M. Dumont, in fact, says (*Cunier, Myot. Ocul.*, 1840) the frequent failures discouraged operators themselves; and M. Blariau declared, before the Society of Medicine at Gand, that he had never seen a single squint-eyed person *cured*, (*Cunier*, p. 42, 44.)

Finally, the authors of the exaggerated accounts themselves commenced handling each other with no little severity, as was seen in the remarks of M. Phillips (*De la Tenotomie*, p. 318) on one of his rivals, who professed not to have failed once in eight hundred cases! M. Phillips himself declares these assertions *lies.*

M. Cunier writes to M. Velpeau in December, 1840, that out of twenty-nine operated upon, he had seen twenty-one relapses, in periods varying from fifteen days to five months, and that he knew of only *six perfect cures.* Since that, he states (*Ann. d'Oculiste*, Février, 1841) that the deviation was reproduced in forty-seven cases out of one hundred and sixty-nine, and that he failed twelve times in seventy-one cases. In June of the same year, he announces that he had succeeded two hundred and thirteen times out of two

hundred and eighty-six; and M. Fleussu (*Ann. d'Oculiste*, 1° suppl., p. 308, 309) maintains, that out of six hundred cases M. Cunier obtained constant success. Out of one thousand four hundred operations, (*Suppl., etc.*, p. 288 and 312,) our confrère of Brussels scarcely admits of any reverses.

M. Dufresse, also, while calling in question the results of others, avers himself, that he partially failed only in a few cases, and that the disease returned but in three cases out of forty-seven. The same language appears in the treatise of M. Josse, (*Considérat. sur l'Opér. du Strabism.*, 1841,) and in that of M. Kup, (*Ann. d'Oculist.*, t. vii., p. 44.)

In recommending caution in pronouncing upon success immediately after the operation, M. Velpeau complains that his language was improperly interpreted by M. Guérin, in the Gazette Médicale, as meaning opposition to the operation. M. Velpeau, in 1840, October 14, (*Gaz. Méd.*, p. 87,) estimating the proportion of failures to cures, etc., lays down two important principles on this subject: to determine accurately the existence and nature of the strabismus before the operation, and to exhibit the patients as cured at the end of three months. Pompous announcements of success in political journals the day after the operation, discredit our profession and favor the extension of charlatanism. In this light, also, M. Velpeau views the asseverations of those who, in attempting to give plausibility to their exaggerations, declare that their successes depend upon the peculiar perfection of their modes of operating, and, vice versâ, the failures of others, on their awkward or vicious processes.

M. Velpeau is exceedingly severe on these self-puffing, ambulating operators. He declares that he has seen at Paris some of those who had been operated upon by these pretenders, squint outwardly after having squinted inwardly; some who squinted even after being twice operated upon, and others who were disfigured by enormous denudations of the eye, &c.

These things at Paris have brought odium upon the operation, so that its intrinsic value, after unexampled popularity, begins to be mistrusted.

Experience taught the crowds, who, misled by the reports of never-failing success, thronged the operative chambers, that they had been deceived, and that the deformity in many instances only becomes changed from one side to another. Thus, from one extreme of confidence, they have passed to the other of distrust, and the real efficacy of the operation for certain cases is overlooked, and the patient prefers his deformity to the hazard of an operation.

M. Velpeau excepts M. Guersant fils, M. Jobert and M. Bouvier, and others at Paris, as among those who have spoken and acted with frankness; also, the essay of M. Boinet, (*Du Strabisme et de son Traitement*, 1842,) and that of M. Bonnet of Lyon. After all that may be said of the inconveniences that may attend ocular my-

otomy as well as any other operation, M. V., in conclusion, says, that it will be preserved in practice, and not only does honor to human genius, but is one from which the organ of vision will derive great advantage in future time.

Article II.—Anatomy.

To appreciate the respective processes, we must examine the tissues which fill the orbit, viz., the conjunctiva, globe of the eye, its muscles, and the cellulo-fibrous tissue which forms a more or less perfect sheath to each ball.

Before strabismus attracted notice, surgeons rarely noticed the aponeuroses of the orbit. Since that, however, the researches on this subject have been extensive. Layers (*toiles*) and sheaths of various form, density, thickness, and number, have been described with a care and minuteness which leave nothing apparently to desire.

It is found that the ancients were aware of the fibro-cellular tissues in the orbit. Galen was acquainted with the layers or cellular coverings of the muscles of the eye, and Zinn described them with some care in the last century, after Colomb, Casserius, and Riolan, (*Helie, Thèse*, Paris, 1841.) It is, however, to Tenon to whom we owe the first extended article on the aponeuroses of the eye, (*Mémoire sur l'Anatomie, la Pathologie, et la Chirurgie, etc.*, Paris, 1806, t. i., p. 193.) Since this memoir, which was read to the Academy of Sciences, there has been such a total silence upon the subject among anatomists as well as surgeons, that up to 1839, in spite of the essay of M. Briggs, published in 1835, (*Boinet, Journal des Connaissances Médico-Chirurgicales*, Janvier, 1842, p. 9,) it was no longer spoken of.

Since strabismus has occupied public attention, we have seen the description of the aponeuroses of the orbit resumed in all its bearings, by M. Lucas of London, (*On Strabismus*, London, 1840,) M. Bonnet of Lyon, (*Des Sections Tendineuses, etc.*, Lyon, 1841, p. 1,) M. Guérin, (*Gazette Médicale*, 1842, p. 12, 97,) M. Dufresse, (*Treatise cited*, pages 32, 40,) M. Helie, (*Thèse*, Paris, 1841,) and M. Boinet.

M. Velpeau thinks it not surprising that in former times so little was known apparently of the lamellar coverings of the eye, inasmuch as they had no special relation to operations performed on the ball, or in the orbitar cavity, or to the diseases that may exist there.

These fibro-cellular sheaths, which surround the muscles of the eye, and the lamellæ which unite or separate them, present in their mechanism and distribution in the orbit much greater simplicity than some think.

[To the late Professor Hosack of New York, (see his *Observations on Vision*, read before the Royal Society of London, May 1,

1794,) are we indebted for the first clear and distinct notions that we possess upon the important functions of the muscles of the eye; he alone having first pointed out, in the scientific paper here referred to, not only the well-known uses of these muscles in turning the globe in almost every possible direction, but also the more important function, which he discovered belonged to them, of elongating [if not also of shortening] the axis of the eye to the different distances of objects, and thus, by means of increasing the convexity of the cornea and by pressure on the humors, increasing the distance between the cornea and retina, and aiding most materially in all the operations of vision.

To this physician, therefore, are we probably under more obligations than would at first appear, for the attention which in after years was bestowed upon the subject of the muscles of the eye, and their diseased condition, retraction, &c., which finally resulted in the triumphant surgical operation for strabismus.

Dr. Hosack states that he was first led to this investigation (being then at London) by observing that the common opinion, that the eye was enabled to see objects at different distances by the different quantities of light admitted to it by different degrees of contraction of the pupil, was altogether erroneous. As it was manifest upon a moment's reflection, that the pupil, for example, became greatly dilated when the same object in the same degree of light was brought too close for the image to converge on the retina, and, on the contrary, in viewing an object so remote and emitting so strong a light as the sun, the pupil contracted to its utmost degree of constrictive power; so also, he observes, does the pupil possess its ordinary powers of contraction and dilatation in myopes and squint-eyed persons.

Dr. Hosack proceeds to show, furthermore, the more obvious and natural function of the pupil and iris to be, to regulate merely, by dilatation or contraction, where objects are viewed, for example, in the same field of light or vision, the greater or less quantity of light required, according as the object is farther off or nearer by. But that the iris manifestly has nothing to do with the *direction* of the rays, which, as he fully explains in his learned memoir, is by far the most important optical principle involved in the faculty of vision.

Thus, other things being equal or unchanged as to the shape of the globe, and to the condition of its humors, the rays of light from an object fall upon the cornea at a less or greater angle in a direct ratio to their greater or less distance, and that consequently their power of convergence upon the retina, after passing through the cornea, pupil, lens, and vitreous humor, must be in an inverse ratio to that distance: that is, the rays forming the image of the object will converge sooner when that object is more distant, and not at all, or even behind the retina, when that object is too near.

Dr. Hosack then takes up and ably refutes the theory of vision *by Dr. Thomas Young*, predicated upon the supposed muscular construction of the crystalline lens, which, if true in reference to the great number of concentric laminæ which Lewenhoeck shows that lens to possess, (2000 coats,) would, according to Dr. Young, have no less than 12,000 minute radiating muscles and membranous tendons in constant operation—a conclusion which involves an absurdity.

Couching also, he says, shows that the crystalline lens is far from being indispensable to good vision.

With like ability the Professor demonstrates the futility of the idea once maintained, that the *ciliary* processes possess any muscular power to change the shape and situation of the lens, and to adapt it to vision by making it more or less convex. This opinion falls to the ground with the preceding.

He then comes naturally to the *situation, structure, and action of the external muscles*, which he illustrates by some very excellent anatomical dissections in the accompanying plates.

Dr. Hosack remarks as follows: "The use ascribed to these different muscles is that of changing the direction of the eye, to turn it upward, downward, laterally, or in any of the intermediate directions, accommodated either to the different situations of objects, or to express the different passions of the mind, for which they are peculiarly adapted. But, (asks Dr. H. with much emphasis,) *is it inconsistent with the general laws of nature, or even with the animal economy, that from their combination they should have a different action and thus an additional use?* To illustrate this, we need only witness the action of almost any set of muscles in the body; for example: in lifting a weight, the combined action of the muscles of the arm, shoulder, and chest, is different from the individual action of either set, or of any individual muscle."

Dr. Hosack explains this action by the very simple experiment of directing the eye, for example, upon a succession of objects situated on the same line, and in the same horizontal plane. Some important change is immediately perceived to have taken place in the visual power of the eye, for after looking at an object at the distance of six feet, and then fixing the eye on one at the distance of six inches, the image of the former is no longer felt on the retina, though its rays of light fall as before on the cornea, while the image of the nearer object upon which the visual orb is concentrated, is perfectly distinct. So *vice versâ*. But it had been shown that the rays from the more distant object converge sooner than the nearer object; therefore, in the first case the picture of the object at six feet falls before, while that of the other forms upon the retina, "*but* (he proceeds) *as my eye is still in the same place as at first, the retina has, by some means or other, been removed to a greater distance from the forepart of the eye, to receive the picture of the nearer object*," [as before explained.] "*From which it is evident, that to see the less distant object, either the retina should be re-*

moved to a greater distance, or the refracting power of the media should be increased."

The lens which has the greatest refracting medium being shown to be incapable of changing itself, Dr. Hosack, by a very natural process of inductive reasoning, founded upon the soundest mathematical principles in the science of optics, comes then to the *external muscles* as the true and legitimate means of explaining the *phenomena of vision*, so far as the important and essential principle of the distance of objects and the direction of the rays is concerned. "*Let us* (he says) *next inquire if the external muscles, the only remaining power the eye possesses, are capable of producing those changes.* With respect to the anterior part of the eye, we have seen the situation of those muscles; the recti *strong, broad, and flat*, arising from the back part of the orbit, *passing over the ball as over a pulley, and inserted by broad flat tendons*, at the anterior part of the eye; the oblique inserted towards the posterior part, also by *broad flat tendons;* when they act jointly, the eye being in its horizontal position, it is obvious, as every muscle in action contracts itself, *the four recti, by their combination, must necessarily make a compression upon the different parts of the eye, and* THUS ELONGATE ITS AXIS, *while the oblique muscles serve to keep the eye in its proper direction and situation.* [M. Velpeau, it will afterwards be seen, doubtless without being aware of this beautiful application of the antagonist action of the two different sets of muscles, recti and oblique, alludes to it in explaining certain conditions of the eye in squinting, and the section of muscles for its relief.—*T.*] For my own part, I have no more difficulty in conceiving of this combination of those muscles, than I have of the different flexors of my fingers in holding my pen. *But other corresponding effects are also produced by this action; not only the distance between the anterior and posterior parts of the eye is increased, but of consequence the convexity of the cornea, from its great elasticity, is also increased, and that in proportion to the degree of pressure, by which the rays of light passing through it are thence necessarily more converged.* But another effect, and *one not inconsiderable*, is, that *by this elongation of the eye, the media*, viz., *the aqueous, crystalline, and vitreous humors*, through which *the rays pass, are also lengthened; of consequence their powers of refraction are proportionally increased*, all which *correspond with the general principle.* It may, however, be said, that as the four recti muscles are larger and stronger than the two oblique, the action of the former would overcome that of the latter, and thus *draw back the whole globe of the eye;* but does not the *fat*, at the posterior part of the orbit, also afford a *resistance* to the *too great action of the recti muscles*, especially as it is of a *firm consistence*, and the eye rests immediately upon it?"

With the common *speculum oculi*, Dr. Hosack made different degrees of pressure upon the globe of his own eye, by which means he could alter the local distance at pleasure, and in fact, by greatly elongating the ball by a greater pressure, could plainly see and

distinguish the lines and letters of a *printed book* at only *two inches from the eye*, though without that pressure they were not at all distinguishable. In the next paragraphs it would almost seem that the author was about to stumble immediately upon the great discovery which, with the foregoing lucid exposition and deductions, and with our present knowledge, it would have appeared impossible for him to have avoided. At least he almost foreshadowed, we may say, the section of the retracted muscle in strabismus, by opening up his argument directly to this point, and, as it were, forcing himself to the necessity of hitting upon this key, and this only, as the natural one, and the only one to unravel the whole mystery, and give the power of mathematical demonstration to the whole chain of his reasonings.

"Such, then, (says Dr. Hosack,) I conceive to be the action and effects of the external muscles, and which, I apprehend, will also apply in explaining many other phenomena of vision."

He thus explains the diminution of the power of vision in old age, by the absorption of the fat in the orbit, [he might have added the flattening of the cornea,] the diminution of the humors, and the irregularity and debility of the external muscles, no longer capable of remedying the difficulties. So also he shows the influence of *habit* upon the conformation of the eye; as long sight in sailors and sportsmen—short sight, as in watchmakers, seal-cutters, &c. Then he asks—"Secondly, how are we to account for the weaker action of one eye in the *case of squinting? That this is the fact has been well ascertained;* [see this subject touched upon by M. Velpeau in this treatise farther on, but where the defect of vision is explained by him as owing to disuse of the eye.] Dr. Reid, (*Inquiry into the Human Mind*, p. 132,) upon this subject observes, that he has examined above *twenty persons that squinted*, and found in *all of them* a *defect in the sight of one eye*. Porterfield and Jurin have made the same observation. The *distorted position* of the eye has, I believe, been generally attributed to the external muscles, but *no satisfactory reason* has ever *been given* why the eye, directed *towards an object*, DOES NOT SEE IT DISTINCTLY AT THE SAME DISTANCE AS WITH THE OTHER. The state of the iris here cannot explain it, as it contracts and dilates in common with the other; nor can we suppose any muscles the lens might possess could have any effect, as they are not at all connected with the nature of this disease. But the action of the external muscles, I apprehend, will afford us a satisfactory explanation. *When the eye is turned from its natural direction, for example, towards the inner canthus, it is obvious that the adductor muscle is* SHORTENED, and its antagonist the *abductor* lengthened; consequently, as the abductor has not the same power of contracting itself with the adductor, when the eye is directed towards an object, their *power of action being different and irregular, the compression made upon the eye and its humors must also be equally irregular, and therefore insufficient to produce the regular changes, in the refraction and shape of the eye, we have shown to*

be necessary, in adapting it to the different distances of objects. The effects produced by making a partial pressure upon the eye with the finger or *speculum oculi*, before noticed, would also appear to favor this explanation.

"Thirdly, may it not in part be owing to the *loss of this combined action of the external muscles*, and the difficulty of recovering it, that the operation of *couching is sometimes unsuccessful*, especially when the cataract has been of long standing? This cannot be attributed to the iris, for it, perhaps, dilates and contracts as before; nor to the muscles of the lens, for they are removed; nor to the state of the nerve, for it is still sensible to the light; and yet the patient cannot see objects distinctly; and it is not an uncommon circumstance, even when the operation succeeds, that the sight is slowly and gradually recovered.

"Instances have occurred, Mr. Bell (see his *System of Surgery*) observes, of the sight becoming gradually better for several months after the operation."

Dr. Hosack thus, as we see, justly attaches much importance to the difficulty the eye has in recovering any certain combination of muscular actions which had ceased to be in exercise after it had been long habituated to them. The same as in muscles elsewhere, as in playing upon a musical instrument, and then laying it aside.

In conclusion, he thus sums up:

"I have thus endeavored, first, to point out the limited action of the iris, and of consequence the insufficiency of this action for explaining vision. Secondly: to prove that the lens possesses no power of changing its form to the different distances of objects. Thirdly: *that to see objects at different distances, corresponding changes of distance should be produced* between the retina and *the anterior part of the eye*, as *also in the refracting powers of the medium through which the rays of light are to pass.* And fourthly: that the combined action of the external muscles is not only capable of producing these effects, but that, from their situation and structure, they are also peculiarly adapted to produce them."

"If (says Dr. Hosack) I should be so fortunate as to succeed in establishing the principle I have proposed for explaining the phenomena dependent upon this more important organ of our body, (if any part possesses a pre-eminence in nature,) *I also hope it may, in abler hands,* ADMIT OF SOME PRACTICAL APPLICATION IN ALLEVIATING *the diseases to which its delicate organization* so particularly exposes it."

[Was not this desired practical application, so prophetically foreshadowed by this illustrious physician, (whose memory I ought not less to revere as my preceptor, than as one of the most profound and clear-sighted practitioners that ever adorned the profession,) happily verified in the section of the retracted muscle or muscles, restoring the equilibrium and regularity of muscular pressure?—*P. S. T.*]

In a note Dr. Hosack remarks, that he finds the *effects* of the external *muscles* noticed by some of the earlier writers. He therefore says he claims no originality for this thought, though he was not aware of it till after he had made his investigations. "If, therefore, (he says,) I have succeeded in pointing out the *precise action of these muscles*, and its *application to the general principles of vision*, IN WHICH, I BELIEVE, I HAVE NEVER BEEN ANTICIPATED, it will be the height of my wishes."*]

§ I.—*Muscles of the Orbit.*

Of the seven muscles contained in the orbit, there are but six which serve for the movement of the eye; these alone, therefore, can be concerned in the subject of strabismus. Six of them, being attached to the bottom of the bony cavity, where they are confounded with the periosteum around the optic foramen, and on one of the borders of the sphenoidal fissure, terminate in front by a true tendon, expanded (*rubané*) on the sclerotica, which they assist in forming. Four of them—the four straight muscles—extend to within about the one twenty-fifth or one twenty-sixth part of an inch (*cinq ou six millimètres*†) of the cornea on their anterior surface; but their deep-seated surface terminates at three or four millimetres behind, so that this extremity appears a little curved and thickened like a leech, which attaches itself to the skin by its posterior extremity.

The superior oblique behind the upper eyelid, passes within the supra-orbitar foramen, through a fibro-cartilaginous ring, before it passes from before backward, and from within outward, under the levator muscle of the eyelid, in order to attach itself to the posterior and upper part of the globe of the eye. The inferior oblique muscle passes from the external side of the nasal canal, outwards, backwards, and upwards, between the floor (*plancher*) of the orbit and the inferior rectus muscle, to terminate at the outer and posterior part of the sclerotica.

It follows from this arrangement:

1. That the four straight muscles, (the recti,) when too short or

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* [It is to be hoped that these original, ingenious, if not sound and philosophical views upon vision, and which singularly enough appear to have escaped notice in the very active investigations now going on in Europe upon the section of the muscles of the eye for strabismus and other diseases of that organ, will be turned to useful advantage in those important operations, and serve as a sound basis and guide for a correct diagnosis of some of those diseases, and of the curative results that may be anticipated. In cataract, for example, if the sight is not restored after the operation, and the eye remains to all appearance sound, but for the loss of the crystalline, might it not be well to inquire *how far a division of some one or more of the muscles, recti or oblique, might be advantageous to lessen* the perhaps too powerfully elongating or compressing action upon the globe which all those muscles must possess, after the eye in its vertical diameter or axis, that is, its breadth, has been, as it would seem it necessarily must be, weakened by depriving it in that direction of the support of so firm a substance as the lens is?—*P. S. T.*]

† [A metre (French measure) is 39.37 inches; a centimetre is 0.393 inches; and a millimetre is 0.039 inches.—*T.*]

too contracted, tend to shorten the transverse and vertical diameters of the sclerotica, and at the same time to give prominence to the cornea, from whence we have one cause of short-sightedness, (*myopie*,) and the idea of dividing these muscles to elongate the field of vision.

[This does not directly militate against the theory of Professor Hosack, (supra,) inasmuch as that theory implies a normal condition of the muscles, and, therefore, an elongation of the globe of the eye by their healthy contraction, and consequently a shortening of the vertical axis.—*T.*]

2. The inferior oblique, in contracting itself singly or disproportionately, (*avec prépondérance*,) turns the eye outward and upward, which gives it a certain influence in the production or continuance of external strabismus.

3. The superior oblique turns the eye inward and downward; at other times it aids rather the action of the external rectus muscle, and the inferior oblique, in external strabismus.

4. By their simultaneous retraction, the two oblique muscles draw the globe of the eye forward. Becoming in this manner antagonists of the four straight muscles, they may also cause the cornea to protrude, (*faire bomber la cornée*,) and produce myopie, from whence proceeded the suggestion of their division to remedy this deformity.

[It is here observable, that Professor Velpeau makes the oblique muscles not only antagonist to the recti, and a *point d'appui* for them, as Dr. Hosack does, but also co-operating with them in protruding or giving convexity to the cornea. It is clear, that the same physiological idea existed in the minds of both those authors.—*T.*]

§ II.—*Globe of the Eye.*

It is to be remarked:

1. That the optic nerve, inserted within the antero-posterior axis of the sclerotica, is much less removed from the cornea within than outward; one of the reasons, *perhaps*, why internal strabismus is more frequent as compared with external.

2. That this organ, being composed of a fibrous shell, (*coque*,) almost inert, of very little sensibility, extremely difficult to become inflamed, and of several millimetres in thickness, allows of our acting with instruments upon its external surface with the most perfect liberty, and without incurring any serious risk.

§ III.—*The Nerves.*

Of the nerves of the orbit, the *sixth pair* and the *third* only require notice. The pathetic, that of Willis, and the ciliary nerves, are not specially concerned in strabismus. The optic nerve is to be recollected as representing the axis of the orbit behind the eye,

that we may not divide it, as was done by an orthopedist of Paris, in the operation of strabismus. The nerve of the sixth pair, supplying only the external straight muscle, would, if paralyzed, cause an internal strabismus. The patient, though he could then turn the eye upward, downward, and inward, could not, though the other eye was shut, turn the pupil towards the temple.

The other muscles of the eye, being supplied by the nerves of the third pair, show how, when this nerve is diseased, it is followed by an external strabismus. In this case the eye, fixed outwardly, can neither be moved inward, upward, nor downward, and the strabismus is complicated often with a more or less marked depression of the upper eyelid.

Thus, as all these nerves are appropriate to the different muscles, and as those of the globe of the eye come from another source, it may readily be conceived that the operation for strabismus ought not to cause any nervous disturbance in the ocular functions.

§ IV.—*The Vessels.*

The vessels of the orbit are of greater volume in proportion to their *distance* from the globe; the *arteries* all arising from the ophthalmic trunk, and being situated posteriorly, and encircling the optic nerve, are so small when they arrive in the neighborhood of the conjunctiva, or the anterior extremity of the muscles, that their section at the place where the instruments should be applied in the operation for strabismus, incurs no risk of any serious hemorrhage, and is generally attended with but a very slight discharge of blood. The case of threatening hemorrhage mentioned in England, (see *Phillips*, 1841, &c.,) must have been an exception, and from a hemorrhagic predisposition.

The large veins which proceed from the internal angle of the eye, and from the eyelids and root of the nose, and which pass along the internal wall of the orbit, into the cranium, must be avoided, as must also the ethmoid bone, in convergent strabismus.

§ V.—*Aponeuroses.*

The nerves, vessels, muscles, the eye itself, and the conjunctiva, and superincumbent layers of the eyelids, are all enclosed and lined with lamellæ and layers foreign to their appropriate structure: all known under the name of the *cellulo-adipose tissue* of the orbit, and apparently complicated, but in reality simple.

I have established, in my Surgical Anatomy:

1. That the fibrous tissue is but a transformation of the cellular.

2. That all the membranous and fasciculated parts are formed in their place, and not contiguously, (*de proche en proche,*) as many

authors still seem to believe, in conformity with the figurative language of Bichat.

3. That all the moveable organs are enveloped or lined with a cellular, fibrous, or fibro-cellular layer.

4. That the interval of all the parts thus sheathed, is filled with fatty pelotons, or cellular, lamellar, or filamentous tissue.

In conformity with a great law of the organization, all the vessels and nerves have a kind of cellular sheath, independent of their own coat; there is no muscle or tendon which is not surrounded by a sheath or encasement, either of purely fibrous plates, simply cellular, or cellulo-fibrous; the same as with all the glandular or other viscera, and all the organs contained in the splanchnic cavities, and in the mouth and the orbit.

The ball of the eye, nerves, muscles, vessels, even the internal surface of the conjunctiva, and the deep-seated surface of the palpebral ligament, are all enclosed in this duplicature or pocket of slightly condensed cellular tissue, which, moulded upon the eye and optic nerve, and forming a flattened sheath on the recti and oblique muscles, and on the levator of the eyelid, and each of the nerves and vessels, becomes, from the constant motions of the parts upon each other, in every direction, more and more isolated and hardened, until it has acquired the character of true fibrous tissue, or simple cellular lamellæ, of greater or less density. These lamellæ are thus much more cellular than fibrous in early life, and much more fibrous than cellular in adult age. There is thus an aponeurosis for each part.

A. *Aponeurosis of the Eye, Proper or Globe.*

This, commencing at the cornea, is a simple, somewhat dense lining, enveloping the whole sclerotica and optic nerve. In front it is continuous with the aponeurosis of the conjunctiva, and behind with the internal layer of the sheaths of the muscles. It is interrupted by the required number of openings for the passage of the oblique and straight muscles. Its mobility, and the fine texture of the cellular tissue of its inner surface, admit of its being detached from the eye, either from behind forward, or from before backward, in the manner of a purse.

B. *Aponeurosis of the Conjunctiva.*

This is also a dense cellular tissue, which strengthens this membrane as the fascia-propria strengthens the adherent surface of the serous membranes. Setting out from the periphery (*pourtour*) of the cornea, where it is continuous (*se continue*) at a very acute angle with the aponeurosis of the eye, it proceeds backward to the conjunctival border, (*crête,*) which corresponds to the oculo-palpebral groove. It is then reflected from behind forward, to follow the palpebral conjunctiva, and to contract adhesions with the con-

vex border of the tarsal cartilage, or to terminate between this cartilage and the conjunctiva, upon the meibomian glands.

C. *Aponeurosis of the Orbit.*

This lamella, seemingly continuous with the preceding, or the upper expansion of it, passes upward at the base of the orbit, as if to line the posterior face of the palpebral ligament, and to bend from before backward, to serve as an inner layer to the periosteum, which it covers in its whole extent, so as to convert the orbit into a cavity completely closed before and behind, in which latter position the aponeurosis of which I speak is continuous with that of the muscles.

D. *Aponeurosis of the Muscles.*

The fibrous, or rather cellular and somewhat dense and lamellated encasements of the muscular system of the orbit, are composed of small, unequal, flattened sheaths, which are adherent to the muscles, and extend between them, under the form of membranes, that spread out from one muscle to another. All these sheaths, composed of an external and internal layer, reach to the sclerotica, and are continuous with the aponeurosis of the eye, where it has united itself with the aponeurosis of the conjunctiva in front, and with the aponeurosis of the same organ, as it passes backward towards the optic nerve; that of the oblique muscles, also, loses itself in the aponeurosis of the eye. There results from this arrangement, as M. Guérin has noticed, (*Gaz. Méd.*, 1842, p. 84,) a kind of compartment, (*loge*,) formed by the funnel-like expansion of each one of those sheaths for the insertion of each tendon of the muscles in question.

As to the sheath of the levator muscle of the upper eyelid, it is blended in front, and above and downwards, with the palpebral aponeurosis, rather than with the aponeurosis of the conjunctiva.

It results from this, that the oblique muscles seem to have wrought out the aponeurotic net-works, which extend from one border to the other of the straight muscles, and that they have lent to these last a part of their own proper sheath at their point of contact or crossing.

Upon the entire white of the eye, the aponeurosis of the conjunctiva rests in contact, when we look at it in front, with the anterior portion of the aponeurosis of the globe and a certain extent of the aponeurosis of the muscles. But according as the eye is turned more or less in one direction or in another, this contact diminishes or totally disappears on one side, while it proportionately increases on the opposite side. Between the aponeurosis of the globe and the straight muscles there is nothing posteriorly but fat, cellular filaments, vessels, and nerves. It is the same between the oblique and

the straight muscles, between the levator (*élèvateur*) muscle and all the others, between the whole muscular system of the eye and the aponeurosis of the orbit.

In no part, moreover, is the fibro-cellular system of the orbitar cavity as dense and complete as at the place where the tendons of the straight muscles abandon their fleshy tissue to be inserted in the sclerotica, under the oculo-palpebral circle of the conjunctiva, which latter seems to be retained there by the aperture of a large purse, analogous to that which holds the peritoneal cul-de-sac of the lower (*petit*) pelvis to the aponeuroses of the perinæum or the prostate.

Article III.—Operative Methods.

§ I.—*Method of Strohmeyer.*

In convergent strabismus of a spasmodic character, M. Strohmeyer, guided by his operations on the dead body, advises the sound eye to be covered, and the patient to keep the squint one turned out as far as possible. The operator then inserts into the conjunctiva, near the inner limit of the protuberant part of the eye, (*bulbe*,) a small double hook, which he immediately passes to the assistant, in order to hold the eye outward. The surgeon then raises the conjunctiva with a forceps, and with a cataract knife makes a vertical incision through it, so as to open into the orbit on the inner side of the bulb or globe. The assistant now draws the globe more outwardly, which immediately brings into view the *rectus-internus* muscle. Having passed a small probe (*petite son*) underneath this muscle, it is divided with the curved scissors, or with the same knife with which the incision was made into the conjunctiva.

Cold fomentations and an anodyne are then used, and the sound eye afterwards kept occasionally closed, that the motions of the other may become re-established by exercise. The operation of M. Strohmeyer is the trunk or base from which all the others branch off.

A. *Process of Dieffenbach.*

M. Verhaeghe, who was one of the first cases of strabismus operated upon by M. Dieffenbach, says the latter in his first essay, December, 1839, in following out Strohmeyer's directions, encountered much difficulty in exposing the rectus-internus muscle, as well as in seizing it. The operation, however, was completely successful. The process of M. Dieffenbach, as described by M. Verhaeghe, (*Mém. sur le Strab., &c.*, Bruges, 1841, p. 41,) is as follows:—

The instruments are composed of the elevator of Pellier, a double blunt hook, (supported by a slender handle,) in order to depress the

lower eyelid, two small sharp-pointed hooks to seize (*harponner*) the conjunctiva, scissors curved on their flat sides for the incision of this membrane, and a blunt hook to pass underneath the muscle, which is cut with the curved scissors; finally, a small, sharp-pointed double hook, reserved by the operator for cases where the eye is turned convulsively inward, to such degree as to endanger tearing the conjunctiva. The hook in that case is inserted into the sclerotica, to control the eye. A sponge and hot water complete the articles required.

The surgeon, being seated in front, and a little higher than the patient, places under the upper eyelid the elevator of Pellier, which the assistant who supports the head then takes charge of. Another assistant in front holds the depressor of the lower lid. The patient having turned his eye outward as much as possible, the small sharp-pointed hook is inserted into the conjunctiva near the caruncula-lachrymalis; the other hook he inserts in the conjunctiva near the cornea, and holds it in his left hand. While the conjunctiva is thus raised up in a fold, the operator, armed with a curved scissors, makes an incision into it, and successively divides the other tissues until the muscle is laid bare.

Then passing the blunt hook between the sclerotica and the muscle, he divides this latter with the scissors.

The eyes are examined to see if they are straight.

The only difference of Dieffenbach's process from Strohmeyer's, is that the former, instead of seizing hold of the conjunctiva with a forceps near the lachrymal caruncle, in order to stretch the membrane, as M. Strohmeyer does, employs a second hook, (*érigne.*)

B. *Process of M. Cunier*, (*Myotomie Appliquée au Traitement du Strabisme, etc.*, Bruxelles, 1840, *et Ann. d'Oculist*, Juin, 1840.)

In Belgium, MM. Van Rosbrooeck, de Meyer, Claeysens, and most of the surgeons, adopt the process of M. Strohmeyer. M. Cunier, however, one of the first, if not the first who operated for strabismus, makes some slight modifications, using the speculum of Lusardi, as well as the elevator of Pellier, and making a semi-lunar incision into the conjunctiva of the breadth of the muscle, which latter he divides at one stroke with the small blunt-pointed scissors, curved on their flat sides. He uses, also, blunt hooks, to keep apart the eyelids at the angle on the diseased side.

M. Velpeau sees no preference in this process over the German modes, and M. Cunier himself has substituted for it that of M. Phillips, using likewise M. Velpeau's *blephareirgon* and the suture of the conjunctiva. (*Annal. d'Oculist.*, 1er Supplém., etc., p. 271.)

C. *English Processes.*

England was the first after Germany to adopt the processes proposed for strabismus, as seen in the numerous operations by MM.

Lucas, Ferrall, Liston, &c., before M. Verhaeghe, in the beginning of 1841, gave vogue to it in Belgium.

M. Guthrie, junior, claims three hundred and sixteen cases before April, 1841, (*Ann. de la Chir. Française*, t. i., p. 492,) and MM. Hall, Grant, Eliot, and Duffin, had already published instructive treatises upon this subject. All operate differently, but by modifications so slight, that they cannot be separated in reality from the method of Strohmeyer.

D. *Process of M. Lucas*, (*Cure of Strabismus, &c.*, 1840.)

M. Lucas, after separating the lids, at once seizes the conjunctiva with a forceps, and dividing it, inserts through the opening the double hook into the sclerotica to hold the eye, and then divides the muscle with a curved scissors.

E. *Process of M. Ferrall.*

M. Ferrall seizes the caruncle with a sort of double hook, (*érigne double*,) and pushes it inward.

After having seized with the forceps a portion of the conjunctiva near the cornea, and divided it with a small pair of angular scissors, he lets the eye repose for a few moments.

He afterwards raises the tendon of the muscle with a blunt hook, and divides it very near the sclerotica with the angular scissors.

M. Ferrall, by applying his forceps outside, while Strohmeyer uses his on the inside, has made the operation somewhat more difficult, by thus dispensing (*deplacer*) with two of its instruments. Nor is there any advantage in the angular scissors.

F. *Process of M. Liston.*

M. Liston, using one assistant only, who raises the upper lid with his fingers or Pellier's elevator, seizes a large fold of the conjunctiva, in the oculo-palpebral groove, with a spring forceps, whose weight alone, left to itself, depresses the lower lid. This method, we shall see, is exceedingly defective and objectionable

G. *French Processes.*

The operation was first attempted in France in June or July, 1840, and first performed by M. Huard and others at Havre, the particulars of which M. Velpeau is not in possession of. After that, it was performed by MM. Guérin, (*Lettre à l'Académie des Sciences*, 29 Juin, 1840,) Roux, (*Communication à l'Institut.*, 20 Juillet,) and Amussat, by methods which completely failed, and which have not been published. Finally, in the hands of M. Simonin, at Nancy, it proved, for the first time, perfectly successful.

H. *Process of M. Simonin,* (*Du Strabisme, &c.*, Nancy, 1841, in 8vo.)

This does not differ materially from that of Strohmeyer and Dieffenbach, only in adopting the best parts of each.

I. *Process of M. Roux.*

After M. Simonin and M. Guérin, it was M. Roux, according to M. Velpeau, who was the first, he thinks, to perform this operation publicly in France ; viz., at the Hôtel Dieu in July, 1840, on two patients, who, however, continued to remain squint-eyed afterwards. His operation differed from the German, only in having the blunt hook for raising the muscle, grooved for the direction of the small bistoury that divided it.

J. *Process of M. Sédillot.*

M. Sédillot performed the operation of strabismus, at the Val de Grace, Paris, a few days after it had been performed by M. Velpeau. In order to hold the eye, he inserted into the sclerotica a hook with three prongs, instead of the double hook of M. Cunier, and the simple one of Strohmeyer, (see *Gazette des Hôpitaux*, 1841, Sept. 15.)

K. *Process of M. Phillips.*

Up to November, 1840, there still prevailed great doubt as to the utility of the operation for strabismus. Notwithstanding the *constant* successes announced at Berlin, Petersburgh, and London, it was seen that many failures occurred among the practitioners of Belgium, while in France no one obtained results entirely satisfactory. But a young physician, M. Phillips, who had acted as an assistant to M. Dieffenbach, and had himself performed the operation a number of times in Russia, having arrived in Paris, M. Velpeau interrogated him as to the cures made at Berlin, and if the failures in France were to be imputed rather to the processes followed there, than to the operation itself. He ascertained from M. Phillips that he used an érigne in the conjunctiva, not only to hold the eye outward, and which érigne was passed to an assistant, but another érigne to secure the fold in the conjunctiva near the caruncula, dividing with a bistoury between the two érignes, enlarging the wound up and down with a small pair of curved scissors, then separating the muscle from the globe by a small probe, (*curette,*) and substituting for this last the blunt hook, and lastly, dividing with the small scissors already mentioned. He is in the practice also of excising the anterior end of the divided muscle, to be more certain of preventing its reunion, which Dieffenbach was also in the habit of doing, but has now abandoned, (*De la Ténotomie Sous-Cutanée*, p. 245.)

Emboldened by the safety which they saw in the dissections of M. Phillips, the Paris surgeons obtained the same results with the German practitioners.

L. *Process of MM. Amussat and Lucien Boyer.*

They use a toothed forceps instead of the érigne to fix the eye. Two of these being held in their place by an assistant, the operator incised the conjunctiva with a bistoury, raised up the muscle by a separated hook, (*crochet à écartement,*) (the one, according to M. Phillips, invented and afterwards discarded by Dieffenbach—see *Du Strabisme*, p. 27,) and divided it by a straight pair of scissors.

M. *Process of M. Baudens.*

M. Baudens performed the operation at the close of December, 1840, and imagined he was the *first*, though he was only the *fiftieth*. His operation is the same as Dieffenbach's.

N. *Other Processes.*

It remains to speak only of the modifications made by M. Dufresse, (*Du Strabisme et du Bégaiement*, Paris, 1841;) by M. Boinet, (*Journ. des Conn. Méd. Chir.*, Mars, 1842;) and by M. Bonnet, (*Des Sections Tend. et Musc., &c.*, Lyons, 1841.) M. Dufresse raised the muscle with a flat and slightly-cutting hook. He seized the conjunctiva and muscle together by a forceps, and divided the whole of the tissues included between the two forceps, and then removed a portion of the tissues thus divided. This part of the process he borrowed from M. Velpeau himself, as adopted by him in Dec. 1840. M. Bonnet holds the eye with the forceps, and cuts the muscle with a small scalpel, (*Sect. Tend. et Musc., &c.*, p. 97–100.)

O. *First Process of the Author.*

The failures met with by some of the Paris surgeons, caused the operation to be generally laid aside, till revived by M. Velpeau in August and September, 1840, at La Charité, (see his lectures there, Sept. 11 and 12,) of which the Gazette des Hôpitaux gave (Sept. 17, 1840) but a very imperfect description.

The eyelids were separated by the elevator of Pellier and a triple blunt hook, the patient being directed to turn his eye as much outward as possible. A small double érigne was inserted in the sclerotica, and held by an assistant if it was the left eye; and with another similar érigne, a little less curved and more blunt, he seized the muscle through the conjunctiva as deeply as possible, bringing it forward with the right hand in the manner of a cord,

and with a small curved knife divided the whole at one stroke, viz., retracted muscle, fibro-cellular envelope, and conjunctiva.

The advantages of the operation are—its rapidity, the dispensing of any dissection whatever, and the very small opening it leaves in the conjunctiva, besides that of the cure being speedily effected without any inflammatory reaction in the eyes. Of ten patients, however, upon whom he thus operated in September, October, and November, only three had their eyes continue perfectly straight. In four others the disease was reproduced as severely as before.

P. *Process of M. Andrieux.*

M. Andrieux (*Gaz. des Hôp.*, 1840, Sept.) proposed to change M. Velpeau's érigne into a cutting-hook, to divide the tissues while it raised and secured them: the eye was held by a double érigne with cutting points.

Q. *Second Process of the Author.*

Having seen M. Phillips operate on the dead body, M. Velpeau immediately conceived that, in imitating him, success might be hoped for where there had hitherto been complete failure. In reflecting upon the free and bold dissections of M. Phillips in denuding the sclerotica, and which had hitherto appeared formidable to M. Velpeau, he perceived that by his own operation, numerous lamellæ might be left remaining undivided in the eye. M. Phillips soon having an opportunity to prove on the living subject that there was no danger to be apprehended, greater confidence was produced, and the question assumed a new aspect; (*Du Bégai. et du Strab.*, Paris, 1841.)

M. Velpeau now modified his process by seizing with a claw forceps, (*pince à griffe,*) a large fold of the conjunctiva, and the attachment itself of the muscle at the sclerotica, in order to hold the eye and turn it outward. If it is the right eye, he holds this first forceps in his left hand. Then with a similar forceps, but stronger, he proceeded to embrace deeper still the body of the muscle and the conjunctiva, in order to raise it and stretch it. This last forceps was immediately confided to an assistant. With a small blunt-pointed scissors, straight, or slightly curved on their flat sides, and held in the right hand, he divided the whole bridle comprised between the two forceps. After making the division, M. Velpeau inserts one of the blades of the scissors between the sclerotica and ocular aponeurosis, and freely cuts away all the adhesions there, to the extent of about four fifths of an inch, (*deux centimètres,*)—the two ends of the divided muscle, &c., being still held tense by the two forceps while this detachment is being made. He terminates the operation by excising a portion of the tissues, to wit, that portion of the conjunctiva and of the tendon

of the retracted muscle held by the first forceps, having first, with the beak of the blunt scissors shut, cleared away all the remaining adhesions on the globe of the eye, till a denuded space is made on the sclerotica, which is recognised by its smooth shining surface.

R. *Variations of the Process.*

The above process was put into practice by M. Velpeau in December, 1840, since which period he has employed it in two hundred cases. The instrument with which the eyelids are kept asunder during the operation, is termed the *blépharеirgon*. It is the invention of M. K. Snowden, as modified by M. Velpeau, and the latter gentleman prefers it to all others—the speculum of Lusardi, the elevators and depressors of Dieffenbach, M. Pellier, and others, the flat forceps of M. Liston, the dilatators of M. Cunier, &c. It is made of iron wire. The two forceps he uses are preferable, he thinks, to the érignes. His are strong and short, and have two small hooks at the extremity of one branch, and one on the other, which hooks catch into each other. Those of the anterior forceps converge a little, so that they *may not catch into the sclerotica.* Erignes expose to lacerations. On the left eye he inserts the first forceps with his right hand, and hands it to an assistant, and then holds himself the posterior or deep-seated forceps with his left hand. Generally M. Velpeau excises the portion or fold of the conjunctiva, and of the termination of the muscle in the sclerotica, which are grasped by the first forceps. He does this to prevent consecutive engorgement there. The scissors should be straight and blunt; they cut better than the curved. The first forceps are directed upon the point where the tendon of each muscle is inserted into the sclerotica, and the parts grasped in it are the conjunctiva, conjunctival aponeurosis, muscular aponeurosis, and the tendon itself. This gives the operator full control over the ball. The second forceps, which should be a little stronger and longer than the first, and are directed upon the bottom of the oculo-palpebral groove, beyond the transverse axis of the eye, and grazing the sclerotica, embrace the rectus muscle in all its thickness, with the different mucous and cellulo-fibrous layers which naturally envelop it, while pressing the lachrymal caruncle towards the nose. These forceps have this advantage, that their firm pressure on the vessels prevents hemorrhage when the section is made. The grasp of the tissues with the first forceps should rather be made below than above the transverse axis of the eye, for it is easier afterwards to dissect with the scissors the adhesions from below upward, than in the opposite direction. The whole portion of the tissues included between the two forceps, or, what is the same, a portion of the extremities of these tissues, after the division, may be excised whenever judged advisable, as was the practice of Dieffenbach.

Another modification which M. Velpeau proposes in his method is, to make at first a partial incision only into the bridle between the two forceps; then he separates the conjunctiva from the aponeurosis and muscle with a blunt hook, or the blunt scissors shut; then detaches the ocular aponeurosis from the sclerotica, and raises up the muscle, in order to divide all the fibro-cellular or muscular tissues which separate the globe from the conjunctiva, doing this without enlarging the incision just made.

S. *Process of M. Daviers.*

M. Daviers, of Angers, uses what he calls an érigne-forceps, with four hooks at the points to fix the eye, taking care to embrace in the fold the sub-conjunctival and muscular aponeuroses, and even some of the tendinous fibres. This fold is raised up as much as possible, and divided perpendicularly to the direction of the muscle, and in such manner, that the érigne-forceps remains implanted in the anterior or corneal lip of the division, and thus serves to keep the eye firmly fixed. The blunt hook is then immediately passed under the muscle, and the forceps is removed. The division of the muscle is then made with scissors of short and blunt blades, and either straight or curved on their flat.

§ II.—*Process of M. Guérin.*

M. Jules Guérin, who denominates this operation the *sub-conjunctival* (*sous-conjonctivale*) method, has two processes:

A. *First Process of M. Guérin.*

At the close of October, 1840, M. Guérin had operated five times in the following manner:—The patient lying in bed or on a table, and the lids being kept separate by proper instruments, a small érigne, single or double, was inserted into the conjunctiva near the cornea, and an aid, taking charge of this, drew the eye outward. Then, with a large forceps seizing the conjunctiva near the caruncle, he incises this membrane, dissects a flap and turns it inward, and thus exposes the muscle. Raised up by another forceps, the muscle is then immediately divided by a blunt scissors. The conjunctival flap is now replaced on the wound, and the operation is thus terminated.

M. Velpeau perceives disadvantages in this method; says it differs but little from those of MM. Ferral, Lucas, and Simonin; that in two of the five cases only was it successful; and finally, as M. Boinet remarks, that none of the other methods require a greater denudation of the muscle, or larger incision into the conjunctiva, than this does, (see *Boinet, Du Strab.*, p. 39.)

B. *M. Guérin's Second Process.*

Not satisfied with the difficulties by the last process, of detaching the tissues under the conjunctiva, M. Guérin, to date from Oct. 26, 1840, (see his letter to the Academy of Sciences,) proposed a new modification, the germ of which M. Velpeau finds in that of his own, or of M. Andrieux or M. Lucas, and the first idea of which may, M. Velpeau thinks, be traced to the sub-cutaneous method of M. Ammon, (vide *Cunier*, *Myot. Ocul.*, p. 107; 1840.)

The modification consists in puncturing with a lancet the conjunctiva, below the muscle to be divided. A small scalpel, shaped like a Z, with its cutting edge convex, is then introduced, to detach from the eye both the ocular aponeurosis and the shortened muscle. In the next, or third stage of the operation, the cutting edge of this knife is pressed forward and outward against the internal surface of the muscle, which latter is made more tense, by drawing upon the conjunctiva with the érigne in the opposite direction. Withdrawing the knife through the puncture in the conjunctiva, there remains, says M. Guérin, scarcely any perceptible wound between the eyelids, (*Gazette Médicale*, 1842, p. 148.)

Article IV.—Comparative Value of the Operative Processes.

Under the title of *methods*, M. Velpeau compares only the usual method, viz., that by dissection, or Strohmeyer's, with the sub-conjunctival.

§ I.—*The Sub-Conjunctival.*

Besides objecting to the name of this method, which M. Guérin has given to it in following out the principle of sub-cutaneous sections, M. Velpeau says it does not exclude the air, and besides, sometimes involves serious infiltration, or ecchymosis and tumefaction, both of the conjunctiva and the entire thickness of the eyelids; that it is also more difficult and painful, and that it is less certain than the other process, as the divisions are made in the dark and out of sight.

M. Guérin, on the other hand, considers its advantages to lie in these particulars: that it prevents a return of the disease, or a strabismus in an opposite direction, also an abnormal separation of the lids, and that protuberance of the eye known as *exophthalmia*. M. Guérin also esteems it the most easy and rapid process. M. Velpeau says, however, that the same accidents occur after M. Guérin's as after other methods, and that so far from his (M. Velpeau's) own method, or most of the others, exacting ten to fifteen minutes, they are generally terminated in less than a minute; besides that, the formidable inflammations, loss of the eye, &c., which M. Guérin charges upon other methods, all resolve them-

selves into a very trifling degree of inflammatory reaction. "If (says M. Velpeau) I did not know M. Guérin as well as I do, I would in truth believe that his intention, in charging other methods with so many imaginary imperfections, was in reality to mask those that are inseparable from his own. Ardently desiring, as he does, that sub-cutaneous surgery, and the sub-cutaneous section of tendons in particular, should take their birth from his peculiar ideas about muscular retraction, [see long note on the Paris Discussion upon Tenotomy, supra,] he has extended his theory also to strabismus, in a round of illusions upon which he uselessly expends his logic and talent."

The only real advantage of the sub-conjunctival method is, says M. Velpeau, that it *generally* prevents the small reddish vegetation, or species of *ocular polypus*, which is frequently formed at the bottom of the wound, at the expiration of from fifteen to thirty days after the processes of Strohmeyer's method. But this is a trifling inconvenience, and easily removed: besides, M. Guérin's method is not entirely exempt from it. It is a method, moreover, which is followed only by himself and a few other surgeons. M. Velpeau, however, does not declare that M. Guérin's method is positively bad; only that it is not in reality better, but at least as dangerous, and certainly more difficult, than the usual method.

§ II.—*Method of Strohmeyer, or by Dissection.*

Though it must be confessed, that there is no one of the methods yet devised which in the strict sense of the words may not be both practicable and successful, and that the pure process of M. Strohmeyer, having as yet been performed only on the dead body, is incomplete and but imperfectly described, still the improvement upon this by M. Dieffenbach is now the fundamental process.

A. Whether the érignes and the forceps should be applied in this or that place, or manner, either according to M. Lucas, Strohmeyer, or M. Ferral, is a matter of little importance.

B. Whether the érigne should be single or double, placed near the cornea or the caruncle, is equally unimportant.

C. Those who, like MM. Verhaeghe, Cunier, Simonin, Andrieux, and others, fix the crotchets (hooks) of the érigne into the sclerotica, have, M. Velpeau thinks, the advantage, while producing no serious wound, of holding the globe more steadily, than when the anterior érigne is inserted into the conjunctiva only.

D. M. Liston's forceps to depress the lower eyelid, is only applicable where assistants or a convenient dilatator are wanting.

E. In a very docile patient, the fingers of the assistants are sufficient to keep the eyelids apart. The two-branched depressor of Dieffenbach, the elevator of Pellier, and some other instruments of the cutler Charrière, (at Paris,) are, however, less embarrassing, and enable us to act with more freedom and certainty. The hooks

extolled by M. Cunier, for separating the lids at the angle where the operation is to be performed, might sometimes be of advantage. The specula both of Lusardi and M. Cunier are no longer in use. M. Velpeau again gives a decided preference to the *blephareirgon* of M. Snowden, but says the mode of applying it upon, or outside of the lids, is not as secure, or attended with as little pain, as under the lids.

F. M. Velpeau sees no advantage in the recumbent posture of the patient, as enjoined by MM. Guérin and Sédillot; and thinks also, in opposition to M. Guérin, that the operator should stand up, and not be seated.

G. M. Velpeau prefers the *toothed forceps* of M. Lucien Boyer to the érignes, because they fix the eye and tissues, &c. more steadfastly, and expose less to a laceration of the parts.

H. M. Velpeau, being desirous of *embracing in one grasp both the conjunctiva and tendon of the muscle* with one forceps, and the conjunctiva and body of the muscle itself with the other, found that he required forceps almost as strong as a dissecting forceps, and having one or two solid teeth at their points. He has no doubt that they will one day entirely supersede the érignes. MM. Bonnet, Dufresse, Boinet, and Daviers, have already adopted them.

I. The *incision of the conjunctiva* may be made with a cataract-knife, as is done by Strohmeyer and Dieffenbach, and the English surgeons, or by any small scalpel or bistoury that is at hand. But the blunt scissors are best for this, and also for the ulterior dissection of the tissues.

J. The *isolation of the muscle* is as practicable with a small blunt-pointed knife, the extremity of a pair of small scissors, or a curved probe, as with Dieffenbach's hook. M. Boyer's forceps to raise the muscle first before cutting it, is superfluous.

K. The *division of the muscle* may be readily made with a cataract needle, any kind of bistoury, small concave knives, the little *rondache* of M. Bonnet, the crotchet of M. Andrieux, the cutting-probe, the bistoury of Dieffenbach, or the small *serpette* which I used in the beginning, with a button to it like that of M. Van Steenkiste, revived by M. Doubovitski. The small blunt-pointed scissors is, however, most secure and most handy.

L. The *érigne slightly blunted*, to grasp the muscle through the conjunctiva, and bring it forward like a loop, causes more blood than the claw-forceps, (*pince à griffe.*)

M. The *érigne-bistoury* proposed by M. Andrieux, and having a sort of cutting-hook on its concavity, though it might sometimes divide the conjunctiva and muscle with one stroke, exposes to the risk of wounding the eye, is moved with less freedom in destroying the bridles, and may leave some of the fleshy fasciculi undivided.

N. From all this discussion it follows:

1. That a surgeon should follow his own taste and practice.

2. That the whole matter in this business is reduced to a trifling consideration, either way.

3. That the choice of the mode, among so great a variety, is a matter more of taste than necessity.

4. That, in fine, the process of M. Velpeau is, as he conceives, the most simple, easy, and sure.

Article V.—Treatment after the Operation.

In this we must prevent or subdue the accidents, and endeavor to establish a sound direction to the eye.

Practitioners have gone to two extremes; either totally abandoning their patients, or pursuing too rigid a regimen.

In the great majority of cases, the mildest kind of precautions are all that is necessary.

For the first two days, lotions with cold or warm water, according to the season, &c., are all that is requisite. They may be made more emollient with lettuce, plantain, &c., if desired. Alum water, as advised by M. Dufresse, may do at a later period. Linen kept on the eye, and wet every few minutes, as M. Verhaeghe advises, is useless. Foot-baths nightly, and made stimulating or not, as M. Simonin advises, are unnecessary, except there should be severe cephalalgia, or symptoms of congestion in the head. Tepid emollient lotions are properly substituted for plain water, after the second day. Leeches to the temples, behind the ears, or to the anus, or general bleeding, are rarely required. So of laxatives, purgatives, injections, and debilitating diet and regimen. The inflammation at the wound is a simple conjunctivitis, extending to the cellular tissue there, but rarely to the cornea.

The swelling, engorgement, and inflammation of the wounded tissues, are generally at their height on the third or fourth day. Resolvents are then better than emollients. Lead water, a weak solution of nitrate of silver, &c., are, in the opinion of M. Velpeau, of less efficacy than a collyrium made with a weak solution of sulphate of zinc in lettuce-water and mucilage; thus:—

Eau de laitue }
—— de bleuet } ..... aa. 60 grammes.
Sulfate de zinc .....20 centigrammes.
Mucilage de psyllium ..... 3 grammes.

The eye being frequently cleansed during the day with warm water, some few drops of the above are let to fall into its angle, morning and evening. In ten to twenty days all further treatment may generally be dispensed with.

In most patients the eyes should be left *uncovered*, and *exposed to the air*. The patient, however, should not use them until after three or four days, and then with caution. He should also avoid every imprudence, all fatigue, &c. In many cases no precaution is required, and the patient resumes his usual pursuits. Covering the diseased eye, or hindering its movements, would be apt to irritate and inflame the wound. Motion has also the advantage of main-

taining the pliancy of the tissues, and of preventing too close an adhesion of the divided lamellæ to the sclerotica.

The covering of the sound eye is useful only where the one operated upon still slightly deviates. In forcing the latter alone to receive the impressions of light, it is compelled to maintain its proper position in the centre of the orbit, and is much more comfortable under the action of the three muscles remaining, than under the pressure of compresses and bandage.

Article VI.—Consequences of the Operation.

The consequences are either immediate or remote. Among the first are: the incomplete restoration of the eye to its natural position, or its deviation to an opposite direction, immediately after the section of the muscle; chemosis, and symptoms of phlegmonous inflammation in the orbit, or the lids; a vegetation, to greater or less extent, at the bottom of the wound; fever, and certain disturbances in the gastro-intestinal functions. Among the consecutive accidents, are: the return of the disease; a strabismus the reverse of that which has been removed; deviation of the eye upward or downward; exophthalmia; the separation, or flaring open (*éraillure*) of the eyelids; the unequal motion of the eyes; diplopy, (or double vision,) &c.

§ I.—*Incomplete Restoration.*

This occurs more frequently in divergent than convergent strabismus. M. Phillips is in error in saying that this is always owing to an incomplete division of the retracted muscle. The smallest bridle, fibrous, cellular, or muscular, will effectually retain the eye in a morbid direction, which M. Velpeau believes to have been the cause of the great proportion of failures in the first trials at Paris; but, even since the practice of freely incising the tissues has come into use, and the proof has been given that the aponeurotic lamellæ, which go from one muscle to another, are sufficient to keep up the strabismus, he has, nevertheless, seen this accident supervene, and that, too, though he had convinced himself, by means of the blunt hook and the blunt point of a small scissors, that every thing had been divided on the strabismus side of the eye, and though more than one-third of the sclerotica had been perfectly denuded back to the optic nerve.

As to the question now of dividing another muscle, the great oblique, for example, in convergent strabismus, M. Velpeau is possessed of no authentic evidence in favor of this section, and on this subject inclines more to the opinion of MM. Bonnet and Phillips, than to that of MM. Verhaeghe, Kuh, (*Ann. d'Ocul.*, t. vii., p. 44,) and Gairal, (*Mém. sur le Strab.*, 1840,) and certain itinerant operators. M. Velpeau, where he has deemed it advisable to proceed farther with the operation, has confined himself to dividing the border of the superior and inferior recti muscles.

The difficulty he explains in two ways:—

1. By the fact that the superior and inferior recti muscles each form a small riband of about two fifths of an inch (*un centimètre*) in breadth. Two millimetres (*deux millimètres*) only of this width, represent the antero-posterior axis of the eye. The remainder necessarily exists outside and inside of this median part. Is it not probable that the inner bundle of fibres, (*le faisceau interne,*) having become identified (*congénère*) with the rectus [*internus*] muscle, may be sometimes found contracted in that part, to the degree, in that case, of partially keeping up the deformity, though the muscle which has been the essential source of the deviation, has been completely divided?

In support of this, he adduces a considerable number of cases, in which the eye was not effectually restored to its straight direction, until after the division of the inner third or half of the superior and inferior recti muscles.

2. A circumstance which has hitherto been overlooked, is the smallness of the space which separates the root of the optic nerve from the cornea on the inner side. It is, in fact, easy to show, (vide Cunier, *Myot. Ocul.*, etc., p. 49, fig. A.,) that a line which would directly prolong the optic nerve, through the globe of the eye in front, would leave much more of the sclerotica outside than upon the side towards the nose. May it not therefore result from this, that this space being naturally less, may be still further diminished from imperfect development, in individuals whose strabismus has been of long standing? The external rectus muscle, in such cases, being necessarily much longer than the internal, would exhaust its power of retraction before having brought the cornea to the centre of the orbit, and would be incapable of bringing the eye freely to the outer commissure of the lids. (M. Marchal communicated to M. Velpeau an explanation of the persistence of the deviation, founded on the nature of strabismus itself, namely, that it is the result of a spasmodic contraction, and not that of a contraction with shortening. Thus, in most of the cases, the division of the muscle modifies the nervous condition, and the spasm ceases. In others, the spasm remains, and reproduces its effect as soon as the adhesion of the posterior end to the sclerotica has taken place. This explanation is deserving of attention.)

But M. Velpeau remarks, that in some cases (in convergent strabismus) the eye will still continue to be turned slightly inward, even after the above divisions he has recommended have been superadded to the others—excepting from this remark, unnatural adhesions, cicatrices, and paralysis.

M. Velpeau cautions practitioners in these cases against too extensive a denudation of the eye at first; they would incur the risk of a divergent strabismus, flaring of the eyelids, or an exophthalmia, to remedy an inconvenience which sometimes disappears of itself, and which may be attacked in another manner. In five cases, he saw the eye, which obstinately retained a degree of convergence during the operation or the next day, perfectly restored

to a correct position in four or five days. He explains this, in some cases, by a certain spasmodic action in the muscles, excited by the operation itself; in others, the rectification has been unquestionably caused by the tumefaction of the cellular tissue and conjunctiva, in pressing from within outward and against the globe of the eye, in consequence of the resistance opposed to this tumefaction on the side of the orbit.

M. Velpeau advises, therefore, to keep the sound eye perfectly covered and at rest, and to have the inner half of the glass of the spectacles to be used over the diseased eye, made opaque. A certain species of compression, however, and certain kinds of permanent tractions exercised upon the eye, are the most efficacious.

A. *Compression.*

To effect this he uses small balls of lint, or pieces of agaric or mild plaster, collected together in form of a cone, and made to press directly on the extremity of the eyelids, at the inner angle of the eye, where they are firmly fastened by diagonal arcs of diachylon plaster, or turns of bandage properly applied. This dressing, when properly arranged, produces a compression which prevents the eye from turning towards the root of the nose. To do this, it is not necessary to compress the eye itself, which in fact it is important to guard against. We must make of the dressing a sort of dike, in the form of a fixed body, making resistance against the inner side of the orbit.

M. Velpeau speaks in complimentary terms of the neat manner of applying this dressing, by a young pupil of medicine, M. Gouraincourt. It may be left on for eight days, and need not be changed, unless it becomes displaced or produces inconvenience. If badly put on, it may cause tumefaction and inflammation of the conjunctiva and lids, and of the vascular tissues of the orbit. In one case, it thus produced phlegmonous erysipelas of the face, a most violent conjunctivitis with chemosis, and finally, purulent suppuration of the cornea. In this patient, too, the strabismus was divergent, with partial paralysis of the upper lid, and incipient paralysis of the three remaining recti muscles.

B. *A noose of thread* passing through the conjunctiva, or the root of the divided muscle, naturally suggested itself to effect tractions upon the globe. This mode, which originated with M. Dieffenbach, and was brought to Paris by M. Phillips, has been used by M. Velpeau with success. Thus, in internal strabismus:

1. He seizes with his claw-forceps a fold of the conjunctiva, and of its cellulo-fibrous lining, near the cornea, and passes through it a fine needle armed with a double thread, which he immediately forms into a noose. This is attached to the cap, or elsewhere near the ear, in such manner as to keep the eye fixed as near to the temporal angle of the orbit as may be desirable.

2. Or, having in the same manner passed the thread through the root of the divided tendon or as many of the lamellæ of the tissues

remaining on the sclerotica as possible, the noose is fastened under and outside of the chin, or to the eyebrow above. If it were made to pass over the surface of the cornea, it would chafe it, or ultimately render it opaque. To avoid this, we must place small pieces of linen or agaric, or a rouleau of lint or diachylon, on some point of the circumference of the orbit, to serve as a fixed pulley, (*poulie de renvoi.*)

With care, the difficulty of maintaining an equal degree of traction all the time, is overcome, and this need not be continued over two to five days, as the thread usually, by that period, cuts through the included tissues.

The same rules apply, in a converse sense, to divergent strabismus. If this mode prove unsuccessful in either form of the disease, all other treatment must be renounced, and then the question arises as to a second operation.

§ II.—*The Eye turned too much Outward.*

Because the eye, upon the day after the operation for convergent strabismus, may slightly diverge outwardly, this is no reason for the immediate division of the rectus externus. In some cases, I have seen this soon disappear without any treatment: nor is compression, though applicable in divergent strabismus, as efficacious here as for preventing the convergence of the eye; but, on the other hand, the application of the thread is more easy and effectual, and the opposite side of the bridge of the nose furnishes an excellent point of attachment for the noose.

§ III.—*Other Accidents from the Operation.*

The laceration of the eye by érignes and hooks, and plunging a knife by mistake into the globe, with other mal-practices of operators, are no argument against the use of the proper remedies. Thus therefore these, and also wounds of the cornea, perforation of the sclerotica, hemorrhages, neuralgia, (*Dufresse*, p. 65,) etc., do not properly constitute any of the accidents of the operation for strabismus.

§ IV.—*Inflammation.*

The inflammation is generally slight, or is characterized by a tumefaction which is confined to the inner half of the eye and to the lips of the wound; and, though it may take on the appearance of an irregular grayish and then red mammellated fungous plate at the inner commissure of the lids, is of little consequence, causes but little pain, and seldom any general reaction. This projection soon disappears, and cicatrizes under the proper treatment already recommended.

When the patient has committed imprudences, the inflammation may proceed to the formation of a complete chemosis, with cepha-

lalgia, febrile reaction, intestinal disturbance, etc. As the cornea may become implicated, bleedings, leeches, purgatives, etc., may then be required.

§ V.—*Polypus in the Inner Angle.*

This is the reddish tumor at the bottom of the wound, as described by M. Verhaeghe, (p. 53,) and since, by all others who have adopted the method of dissection of the tissues. This, which at first is a simple vegetation of the character of fungosities, assumes afterwards the appearance and consistence of a small mucous polypus, similar to those sometimes seen, under other circumstances, on the inner surface of the lids, or at the internal angle of the eye. It is rarely observable until after the eighth or twelfth day, and does not become isolated from the sclerotica, and pediculated at its root, till at a later period.

It has no other inconvenience than keeping up a slight degree of purulent discharge, conjunctivitis, and blepharitis, which blear the eye and prevent it from assuming its natural color and normal movements. It varies from the size of a currant-seed, to that of a pea or small nut, and has the appearance of a cherry, or strawberry, in the corner of the eye. It took place in two thirds of the cases upon which M. Velpeau had operated. It is rare after the operation for external strabismus, or the section of the superior and inferior rectus and oblique muscles. The section of the internal rectus is the only one, almost, that produces it. It does not originate from the anterior extremity of the divided muscle, nor from the conjunctiva, because it has been formed in some, where M. Velpeau has with the greatest care excised the conjunctiva close up to the cornea; and in others, where, after the division of the rectus muscle, and after scraping the sclerotica as much as possible, he has removed the tendon of the muscle. In fact, the pedicle of the vegetation is farther back than the cut end of the muscle in question, or than the conjunctiva.

The process by which this polypous vegetation is formed, he explains thus:—The lamellar cellular tissue which lines the sclerotica, vascularizes and softens a little, at the same time that the divided edges of the conjunctiva and aponeuroses are becoming tumefied. The cicatrization proceeds from the circumference towards the centre of the traumatic surface. The contact of the lids, which makes permanent compression on a great portion of this wound, leaves the vicinity of the caruncula lachrymalis intact. The continual movements of the eye thus crowd all the *vascularizable* portion of the cellular tissues behind the straight portion of the free border of the lids, and thus form the polypus.

This tumor, though frequently observed in the cases operated upon by MM. Dieffenbach, Verhaeghe, Phillips, Dufresse, and all others, who practise the method of dissection, is, however, a circumstance of little importance. Even if left to itself, it will disappear sometimes without any treatment, only that it may then last for

several months. It may be arrested and destroyed even before it is pediculated, by touching it lightly with the nitrate of silver crayon three or four times a day for the space of ten days. The better way is to let it pediculate perfectly, and not to touch it under three weeks or a month. It is then removed with the greatest ease, and without pain, by a pair of blunt scissors, the patient turning his eye outward. Nothing more is necessary. In the first cases, it returned two or three times, because they undertook its excision before it was properly pediculated. To retard its growth, all that is necessary in the first eight or ten days, especially where it is in the form of a small cone, is to touch it with the lapis infernalis; or with astringent collyria, if the patient is intractable or timid; finally, to excise it with the scissors, from the fifteenth to the thirtieth day. There is no need of a hook or érigne, to raise it up first, as the blade of the scissors suffices for that. Cauterizing the root afterwards, is also unnecessary.

Article VII.—Inconveniences of the Operation.

Besides diplopy, an abnormal separation of the lids, exophthalmia, and alterations in the mobility of the eye, as already mentioned, the operation may also cause a shrinking or absorption of the caruncula lachrymalis.

§ I.—*Diplopy, (Double Vision.)*

Double vision is readily accounted for in those who squint, because the axes of the globes cross each other at an angle more or less acute, instead of being parallel; but why this should continue to exist, immediately and for some time after the operation, and when the eye has been righted in its position, has not been explained. Some impute it to the eye being yet unaccustomed to its new functions. Most frequently, it lasts during the first eight to fifteen days, and entirely disappears before the end of a month. In one case only, of a man aged fifty, in whom the rectus internus and externus were divided in both eyes, and the internus again for the return of convergent strabismus in the right eye, the double vision obstinately continued, though the strabismus was removed.

§ II.—*Separation of the Eyelids.*

Though mentioned by MM. Phillips, Lenoir, and Dufresse, this flaring open of the lids has not been seen by M. Velpeau, in his own cases, except as connected with exophthalmia. In those of others, he has seen it. Where it exists in both eyes, where both have been operated upon, it is of no consequence; but if in one eye only, it makes a deformity, and the cause always is too extensive a dissection of the sub-conjunctival aponeuroses, and different lamellæ which unite the lids to the eye. M. Velpeau suggests, that the reason why he has not observed it in his cases, may be because he

is in the habit of *incising the conjunctiva much nearer the cornea than the caruncula*, whereas the reverse is the practice of M. Phillips and others. The treatment of compression on the whole front of the orbit, as recommended by Dufresse, is of no use; and the *suture*, as some suggest, makes a worse deformity.

§ III.—*Exophthalmia.*

The *projection of the globe* is a serious deformity. In a young man operated upon some months before, by M. Baudens, it seemed to M. Velpeau as if the ball was double its natural size, and had started out of the head. A sort of *buphthalmia*, he says, is thus sometimes produced.

He has seen it in his own cases, only in those where several of the muscles had to be divided; as in a woman aged fifty-two, with convergent strabismus in both eyes from infancy, and in whom the internal, superior and inferior recti muscles in both eyes had to be divided, before the eyes were restored to their position. However, the appearance of both eyes is uniform, which is one thing gained over their previous condition. So in two other similar cases, in one of which, a fat subject, the eyes, naturally protuberant, were made excessively disagreeable by the operation. He never saw it on one side only, but in two or three cases. In no case of his was this exophthalmia ever perceptible, where only one muscle was divided, or the neighboring fibro-cellular tissues also with it, except in a very slight degree.

Unfortunately, it is without a remedy. In some cases, perhaps, early compression, and before the divided ends of the muscles have formed adhesions, might possibly succeed. He has great doubts of any advantage from the kind of palpebral suture advised by MM. Rognetta, Guérin, (Cunier, *Premier Suppl., Annal. d'Ocul.*, p. 310,) and others, or as practised by M. Cunier, after excision of the conjunctiva at the angle of the eye, (*Suppl.*, p. 311.)

§ IV.—*Immobility and Fixity of the Eye, (Fixité de l'Œil.)*

The eyes are often affected, after the operation, with a certain restraint, irregularity, and inequality in their movements. However strange, as remarked by M. Velpeau, it might seem, à priori, yet he has established, that in some cases an obliquity still continues inwards, (in convergent strabismus,) even where the rectus internus, and the fibro-cellular tissues uniting it to the superior and inferior recti muscles, have been thoroughly divided. This he noticed especially in very old cases, and he considers the cause to be this: *that the inner portions of the superior and inferior recti muscles, participating in the retraction of the rectus internus, act in such manner as to take the place of the divided muscle, and thus keep up the deviation.* It is, however, rare in cases of but a few years standing, and in some cases it is impossible.

In some cases, where it is not observable immediately after the operation, the divided muscle will ultimately regain its power upon the globe, through the intervention of the fibro-cellular tissues, and will not fail to establish it. After a month or two, he has seen almost all his patients enabled to move the eye in all directions as before the operation, but this complete mobility of the eye is, nevertheless, often wanting.

Where M. Velpeau has been compelled to cut several muscles, and to make extensive denudation of the globe, the eye has sometimes become steadily fixed in the middle of the orbit, without the possibility of making it pass within the antero-posterior line. And in some, in whom he divided the internal and external recti muscles, this position in the centre of the orbit was immoveable, and could not be altered either inward or outward.

Where it is excessive in both eyes, it gives a haggard look to the visage, and the patient has to turn his head like a statue, or image, to see sidewise. Though it be in one eye only, it is still a repulsive deformity to have one ball turning freely and naturally, while the other is fixed. This last deformity, to a certain degree, is almost inseparable from the operation; as the new attachments must be more or less approximated to the cornea, or deviated more or less upward or downward, owing to the different degrees of movement in the eye, the volume, force of retraction, and special contractility of the divided muscle, and the degree of relaxation or inflammation of the cellulo-fibrous lamellæ which reconnect them with the cornea; all which are beyond the control of the surgeon.

In most cases this deformity is not perceptible. Where one muscle only is divided, it is generally slight, and almost always disappears entirely. After the section of two or three muscles, on the contrary, it is in general very marked; and often complicated with exophthalmia, flaring open of the eyelids, and new deviations of the organ.

To attempt to reach and detach the divided muscle, in order to attach it on another part of the sclerotica, as has been proposed, would be too difficult and dangerous, and probably do more harm than good.

Preventive measures, therefore, during the operation, are all that can be relied upon, and those M. Velpeau has been in the habit of employing, are: 1. Not to liberate or detach the aponeurosis above and below the divided muscle, but to the extent absolutely required; 2. To allow only slight movements to the eye during the first days, and should immobility be apprehended, to prevent it, by covering it, from moving in the direction opposite to that of the divided muscle.

Time will often do much, in these patients, in restoring the organ to its natural state.

§ V.—*Alteration of the Caruncula Lachrymalis.*

When the caruncula disappears after the operation, the eye appears much larger on one side than the other, and is extensively denuded of the conjunctiva in one direction, and covered entirely by it in the other. The internal angle of one of the orbits, is thus also made much deeper than the other, causing a hideous deformity.

M. Velpeau thinks he has noticed it at Paris, more frequently in patients that had been operated upon by MM. Phillips, Amussat, and L. Boyer; and more frequently still, in those who had been under the hands of M. Baudens. Having seen it but very seldom in his own cases, he imputes it to the process of Strohmeyer, as adopted by MM. Phillips, Amussat, and others. While M. Simonin, and the English surgeons who adopt M. Velpeau's mode of incising the conjunctiva, at a very considerable distance forward of the caruncula, make no mention of it.

M. L. Boyer proposes, as a preventive, to incise the conjunctiva both above and below the muscle, and to divide this latter behind the tegumentary membrane, as under a bridge, so as to leave this bridge or bridle untouched in its whole extent, from the root of the nose to the neighborhood of the circumference of the cornea.

M. Guérin ascribes the absence of all deformity of the caruncula, in his cases, to his process of operating.

M. Velpeau, in conclusion, says, that when the conjunctiva is grasped over the tendon of the muscle by one of the forceps, while we take care to force this membrane inwardly with the other forceps, it is divided at a point so remote that the caruncula is not touched by the operation, and there remains afterwards but a very trifling depression in the angle of the orbit. He therefore thinks, that the suture of M. Cunier, and the precautions of MM. Guérin and Boyer, are alike unnecessary.

Article VIII.—State of the Parts after the Operation.

Three opinions have been entertained on this subject: 1. That the body of the shortened muscle being approximated to its deep attachment, became fixed and contracted new adhesions, and was transformed, at its free portion, into a new tendon, which would attach itself to a part of the sclerotica more or less distant; 2. That a new tissue would be formed between the two ends of the division, so as to re-establish the continuity, at the same time giving it a greater length; 3. M. Phillips, among others, (*Tenotomie sous-cutanée*, etc.,) adopting the idea of M. Strohmeyer, maintains that after the operation, the muscle, no longer undergoing retraction by the spasm, is enabled, by a kind of elongation, to become fixed near its former attachments. None of these opinions are positively true,

and that of M. Strohmeyer (*Verhaeghe*, p. 49 and 50) must be pronounced from inadvertence.

An examination of the orbit after death, has shown that each muscle, when once divided, retracts more and more backward for a week or two; that the cellulo-fibrous laminæ or aponeuroses which line its surfaces, approximating and hardening as they become thicker, assume by degrees the form of a riband or small flattened tendon, which, inserting itself upon the sclerotica near the extremity of the transverse diameter of the eye, is continuous in front with the sub-conjunctival aponeurosis, that ultimately becomes partially re-established, and behind with the aponeurosis of the eye, properly so called. This kind of new tendon does not reach to the situation of the former one, but the lamellæ which compose it, in other respects are arranged at a short distance from the cornea, in the same manner as were the aponeurotic layers of the primitive muscular sheath. This is what M. Velpeau saw in three subjects, also in the cases that M. Bouvier exhibited to the Academy, as well as in some others whose details have been published in England.

We have thus the explanation of the variety, force, and re-establishment of the motions of the eye, where the operation has not been followed by any unpleasant consequences.

It sometimes, however, happens otherwise. Where the inflammation has been very active, and the muscle has become too quickly reattached to the globe of the eye, it is possible that an immediate reunion may take place between its recently divided fleshy extremity, and the cellular tissue which belongs to the sclerotica. M. Velpeau had two patients, in whom the wound completely reunited in twenty-four hours, and whom he operated upon a second time at the end of eight days. In a case of M. Lenoir, dissected two months after the operation, the rectus internus muscle which had been divided, adhered to the sclerotica by its fleshy substance. and not by a flattened tendon, in the manner the three other recti and the two oblique muscles were attached to it. There had also been, in this case, a return of the disease. The nerves, vessels, and other connections of the eye, undergo no change.

Article IX.—Counter-Indications.

Some of these appear to me not well founded. M. Cunier, for example, who at first approved of the operation only in *permanent* strabismus, (*Myot. Ocul.*, etc., p. 39,) has abandoned this opinion.

§ I.—*Optical Strabismus.*

A natural, though not a real distinction, has been proposed, of *muscular* and *optical* strabismus. There are persons in whom the eye deviates, because the rays of light cannot any longer reach the retina on their natural axis; as happens from spots or cicatrices

upon the cornea masking the sight, and obliging the eye to deviate in the direction of the blemish, in order to bring the pupil as much as possible in a line with the light; so also, when from disease or lesion of some kind, the pupil is approximated to the circumference of the iris. To these forms we may apply the title which M. Guérin gives them, of optical strabismus.

For these, it was contended, no operation should be performed—1. Because the deviation is an advantage; 2. Because the eye would reassume this deviation after the operation. It is false, that strabismus must necessarily be produced by the above causes. I have seen hundreds of persons, as all physicians can daily attest of their own, who have for years had albugo, leucoma, and various kinds of opacity of the cornea, covering a quarter, a third, two-thirds, and even four-fifths of the pupil, and whose eyes, nevertheless, were perfectly straight. So with those who have the pupil on one side, whether from the operation of cataract, or artificial pupil, or from accident or disease. I have operated upon a considerable number of subjects, in whom the cornea was in the condition I have described, and the restoration of the eye has been as perfect as in others. The operation, in them, has been attended with no particular difficulty or embarrassments, or any serious consequence or tendency to a return, that I have not met with in others.

The only question that could arise in such cases, is whether the improvement of the sight, from the deviation of the eye, compensates for the inconvenience of the strabismus? This must be decided by the patient. The deviations, in fact, are but a slight advantage, while the strabismus is a serious deformity. *Optical* strabismus, therefore, should not be considered a counter-indication.

§ II.—*Fixed Strabismus.*

In many cases, where the eye would appear to be permanently fixed in its morbid position, it is found to possess all its motions on closing the sound eye. There are, however, some in which the globe is steadfastly maintained in its false direction, and in which even mechanical means of traction cannot force it into a central position between the lids. Cases of this kind may arise from paralysis of some of the muscles, and unnatural adhesions between the sclerotica and corresponding wall of the orbit.

§ III.—*Strabismus with Adhesion.*

Strabismus complicated with adhesion, by M. Cunier denominated *strabisme ankylosé*, is not unfrequent. M. Velpeau has seen five cases of it. It is caused, chiefly, by former inflammations, wounds, and various lesions of greater or less depth in the corresponding angle of the eye. In one case, an abscess which had been for a long time suppurating, was the cause; in another, it was produced by a wound from a ram-rod, between the eye and

the caruncula lachrymalis; in a third, by a wound from the point of a knife, in the same place; in a fourth case, from shot lodged there by a musket; and in the fifth, it was ascertained that there had been an acute inflammation in that part twenty years before.

Although these are the only cases which, according to a rigid interpretation of M. Cunier's principle, should be operated upon, they are precisely those which, in that respect, often present serious inconveniences. M. Velpeau operated upon all the above five cases, and in three of them the normal direction and mobility of the eye were almost perfectly restored. In the other two the deformity was re-established. In such cases, the muscles, fasciæ, and even conjunctiva, are sometimes so blended together, and so intimately and extensively united to the sclerotica, that their dissection becomes very difficult, and their isolation, in the manner it is effected in ordinary cases, out of the question. We must expect, therefore, under these circumstances, great difficulties and tedious painful dissections, besides the tendency of the parts to become readherent. The cure is almost as uncertain as that of the attempt to relieve deformities produced by cicatrices from burns in other parts of the body. It is these cases that are adapted to such remedies as compression in the angle of the eye, and other *orthophthalmic* means. Yet fixed strabismus, by adhesion, is not absolutely a counter-indication

§ IV.—*Strabismus with Paralysis.*

When the eyes are deviated by defect of innervation, it would naturally seem impossible to remedy the deformity by an operation. But there are many kinds of paralysis. Sometimes it is in the brain, when nothing can be done: at other times, in one of the nerves going to the orbit. It may be the sixth pair, producing then convergent strabismus. If it is the third, or common motive of the eye at its source, the strabismus is external, with complete immobility of the eye. If only one of the branches of this latter, the eye, though turned outward, may still move upward and downward, or inward, according to the muscles that remain unaffected.

For the most part, strabismus with paralysis is a counter indication. However, there may be established two classes of this deformity: 1. Complete paralysis from some lesion of a part of the brain, or of the body of the nerve, and which lesion is still existing, in which case there can be no operation. The treatment for the paralysis is the only indication. 2. When the paralysis is only partial, unaccompanied with any lesion of the brain, and is ancient, and appears to be permanent, and to have not varied for many years; and where the eye still retains certain movements and oscillations in a direction opposite to that of the deviation. The operation may then be performed, if the patient consents; and it is proper to inform him of the slight amendment only that he may

derive from it. One of the first patients M. Velpeau operated upon, (viz., in September, 1840,) had a convergent strabismus from paralysis of the rectus-externus. The eye was straightened, and could perform slight movements outward and inward, and preserved its normal power of elevation and depression. He explains this result by the division of the rectus-internus muscle, the only one which could give equilibrium to the externus, while the oblique muscles, acting in concert, direct the eye a little outward, and the inner fibres of the superior and inferior recti muscles come to the relief of the divided muscle, as their outer fibres do to the paralyzed muscle. It was, no doubt, M. Velpeau says, from not taking into consideration this arrangement, that M. Cunier (*Myot. dans le Strab., etc.*, p. 87) censured the operation for strabismus in any case of paralysis.

M. Velpeau made trial of it again, in two patients affected with divergent strabismus. In one, the eye had lost its movement of adduction only; the section of the rectus-externus restored the eye to the centre of the orbit. The movements on the inner side were not restored, and there resulted from this a kind of fixity in the organ. Nevertheless, the strabismus was destroyed, and the second deformity was infinitely less repulsive than the first.

The other case, though unfortunate in the end, was not the less conclusive. The patient was fifty-nine years of age, and had been troubled with distressing pains in the head for eight years, and with divergent strabismus for four years, with a depression of the upper eyelid from the commencement, and an almost entire paralysis of the rectus-internus, and of the superior and inferior recti muscles, the eye, however, retaining still some slight motions upward and downward, and in the direction of the axis of vision. Anxious to be operated upon, M. Velpeau, doubtful of the result, as he told him, nevertheless assented. On the division of the rectus-externus, the eye regained its straight position without difficulty; but for fear of the deviation returning, the compressing bandage already mentioned was applied. This was made by a pupil of the hospital with so much force, and so directly upon the eye, that acute pains on the same day attacked the entire cavity of the orbit. On the morning after that, the upper eyelid was found to be swollen, and affected with a diffused ophthalmia. The inflammation reached the cellular tissue, and a severe chemosis supervened; a simple erysipelas now extended over the entire face, invaded the head and neck, and in ten days returned to the face, and aggravated the suppuration of the lid and the inflammation of the eye, which latter also suppurated at the expiration of the third week. As to the restoration of the position of the organ, it continued perfect throughout; and it is not probable the deviation would have been reproduced, if the accidents mentioned had not supervened. In strabismus with paralysis, therefore, the operation is not absolutely contra-indicated but in certain cases. It allows, however, in general, only of a partial restoration of the position of the eye, and a dimi-

nution of the deformity, but not a perfect re-establishment of the motions of this organ.

§ V.—*Amaurosis.*

Many cases of strabismus have been mistaken for amaurosis. In closing the sound eye, it is observed that the patient sees badly, or with difficulty, with the one deviated, and that the pupil of this latter is more or less dilated. At present it is well known that this is owing to defective action in the affected eye. Nevertheless, true amaurosis does sometimes exist in cases of strabismus. But in cases of strabismus with amaurosis, either true or apparent, the operation is as likely to succeed as in those who have not lost their power of vision, because amaurosis does not affect the muscular action of the eye. But though the amaurosis will not be relieved, there is no reason, if one eye is sound, why the mere deformity itself in the other should not be removed. It would not, however, be prudent, if the amaurosis proceeds from disease in the brain or optic nerve, compromises the life of the patient, or is attended with an organic lesion still present. Therefore, with these exceptions, amaurosis is not a contra-indication, but in truth is frequently followed, after the straightening of the eye, by an improvement of the faculty of vision.

§ VI.—*General Diseases—Tumors in the Orbit.*

Where there are bony, fibrous, or cancerous tumors in the interior of the orbit, and the muscle is not concerned in the strabismus, the operation for this latter is contra-indicated, or should be deferred. So also where there exists acute inflammation of the brain or in the face, some serious affection of the nose, mouth, or pharynx, erysipelas, an affection of the respiratory organs, or circulating or digestive system. So also in pregnant women, and, in short, in every case where an accession of febrile symptoms is apprehended. But an affection purely local, upon the extremities, would not be a counter-indication.

§ VII.—*Age of the Patient.*

Though infants and old persons ought, in the opinion of some, to be considered exempt from the operation, it often succeeds as well in them as in adults. In infancy there is room to hope the disease may disappear, and after sixty the operation scarcely compensates for the pain, and there is also required a more extensive dissection of the tissues; whereas, in infants, as there is less of this necessary, it succeeds better than in adults; and in fact it may be laid down as a rule, that the younger the person is, the more successful the operation. Convenience, therefore, and not necessity, may induce us not to operate at either extreme of life, though we should

do so, even in patients far advanced in age, if they desire it. In them the chance of success would be as great as in young subjects, if we took the precaution of freely liberating the connections of the retracted muscle. M. Velpeau has operated with entire success in patients of fifty-two, fifty-five, and fifty-eight years of age. In children he does not operate previous to the age of three or four years. In the first years of life, the causes of strabismus so often appear and disappear at intervals of some months, that the deformity might, with the same facility, recur after an operation. But after the fourth year, though the operation may be more troublesome than at a later period, the child may be then mastered, and delay would incur the risk of giving a greater degree of permanency to the deformity.

§ VIII.—*Double Strabismus.*

Sometimes, both in convergent and divergent strabismus, both eyes appear to squint, and the question arises whether both should be operated upon, and at the same sitting; while some contend that an operation on one eye is in such cases often sufficient, others, with some degree of hardihood, advise both to be operated upon, even when one only is the seat of the deformity.

Where both eyes are affected alike, and to the same degree, M. Velpeau strongly recommends that both should be operated upon on the same day. The operation then does not require so extensive a dissection of the tissues as for one eye, and the patient recovers in half the time.

Where there is a marked difference in degree, and the patient has his doubts if one eye is actually affected, the operation should be confined to the eye most deformed. The other eye may be operated upon immediately afterwards, if the deformity of the first is not at all changed; if it is, however, we should wait from eight to ten or fifteen days before operating on the other. M. Velpeau has cured many cases of apparently double strabismus, by operating only on the most deformed eye. The other soon begins to act in harmony with the one that has been restored.

He proscribes operating on the two eyes when one only is affected, though that course, it would seem, is recommended by M. Elliot, (*British Medical and Chirurgical Foreign Review*, 1841,) M. Guérin, &c.

Article X.—Advantages of the Operation.

These consist in restoring the position of the eyes, and improving the vision.

A. *Restoring the Position of the Eyes.*

M. Velpeau alludes to the heated controversy and discourteous language which characterized the schools of Paris in the first epoch

of strabismus, inasmuch as the immediate restoration of the eye to its normal position did not always ensure success, and that the deformity often returned within a few weeks or months, (as in the twenty cases out of thirty operated upon by M. Cunier.) Those who were cautious and prudent in making up their minds as to the real benefits of the operation, have been too often rudely denounced by its more violent and unscrupulous partisans.

M. Burggrave mentions a case of his, in point, (*Cunier, Myot. Ocul.*, p. 43,) of a young girl, wherein he was warmly complimented for his brilliant success, for eight days after the operation, but in whom the disease returned on the ninth as bad as ever! So in a lady of rank, six months after being operated upon (1840) by M. Dieffenbach. So in a case referred to by M. Velpeau, who, in six months after he had been operated upon on both eyes by M. Guérin, (January, 1841,) squinted as much as before. M. Velpeau having also observed, that in many persons whom he himself had operated upon in September, October, and November, 1840, the strabismus, though the restoration for eight, fifteen, twenty, and even thirty days, appeared perfect, returned as before, saw the necessity of further experience before he could make up his mind as to the value of the operation.

Eighteen months, and some *thousands of cases*, have afforded positive results. The cases of return of the disease are now only exceptions. Three explanatory circumstances may here be mentioned.

§ I.—*Illusion of the Operator.*

One cause of deception in strabismic cases is this: that when the sound eye is closed, the other often regains as it were a perfect command of its functions, reassumes its normal position, and moves freely and correctly under the guidance of the will in all directions, and even sometimes as it were unconsciously. It is a mistake to suppose that there is any parallelism in strabismus in this respect to club-foot, for example, where the retracted or atrophied muscles and tendons present a physical impossibility to extension by the will, or even by tractions. M. Velpeau has seen in strabismus cases in the dead subject where there had been no operation, that the deformed eye exhibited no perceptible alteration, either in the length or thickness of the fleshy or tendinous portions of the muscles, in comparing them with those of other subjects in whom the eyes had always been sound. One of these was a man of thirty, who had had convergent strabismus in both eyes, from birth. M. Simonin (*Du Strab.*, p. 10) thinks the muscles thicker, but others find them thinner. So in a case of a female subject aged over eighty, who had had strabismus from infancy, and in whose orbit, as exhibited by M. Bouvier, it would have been impossible to have distinguished the rectus-internus of the squint eye from the corresponding muscle of the sound eye.

Many cases of apparent or supposed return of the disease, M. Velpeau thinks, have arisen from the practice of covering the sound eye during the operation, when, as has been before remarked, the deformed eye would, immediately after the operation, appear to have recovered all its motions perfectly, whereas the muscle had not in reality, perhaps, been entirely liberated. So also the practice of covering the sound eye after the operation, which M. Velpeau says he himself was at first in the habit of, for the same reason prolonged the deception; though in fact in this, as in the other case, the disease had not in the beginning been effectually operated upon.

Taylor, the empiric, (mentioned in the first part of this treatise,) appears to have availed himself of this, as Lecat distinctly says that oculist was in the habit of covering the sound eye instantly after the operation, and that the multitude thereupon cried out miracle!

§ II.—*Incomplete Division of the Parts.*

An imperfect or partial section only of the muscles, or too restricted a liberation of the neighboring fibro-cellular lamellæ, were, says M. Velpeau, the principal causes of the return of the disease in the first cases of MM. Roux, Sédillot, Amussat, Guérin, and himself. Confining myself, says M. Velpeau, to seizing the muscle, and to stretching and dividing it with the serpette by one stroke, I studiously avoided directing the instrument to the bottom of the wound, and afterwards dividing the bridles which might have remained upon the sclerotica, and enlarging, both above and below the incision of the aponeuroses, so much fear had I of large wounds and extensive dissections in the orbit. It is certain, he thinks, that in acting in this manner he must have often left portions of muscle and resisting bridles, that were quite sufficient to reproduce the deviation.

To the discovery of this error he imputes the recommendation of large denudations, and the excision even of a part of the muscle by MM. Dieffenbach and Phillips.

§ III.—*Circumstances Difficult to Control.*

M. Velpeau differs from M. Bonnet in the opinion that the strabismus, when the eye is once fairly straightened, never returns. M. Velpeau particularly specifies two cases where it returned twice, and even after he had carefully divided and even scraped and cleansed off from the entire inner side of the sclerotica all muscular, tendinous, aponeurotic, or cellular bridles, from the inferior up to the superior rectus.

In some, the deviation has been so obstinate that, after all this dissection, the eye was not restored but to one half the distance from its true position. Thus, in a case of a young man aged twenty, at La Charité, (April, 1842,) where M. Velpeau had thus in

the second operation denuded the sclerotica as far back as the optic nerve, and where the patient moved his eye freely in all directions; it turned inward again towards the nose, twenty days after the operation. M. Bonnet errs, also, in saying that the deformity will not return where the eye has remained straight for three weeks, for M. Velpeau has seen cases, though rare, where it returned, either to the inward or outward direction, two to four months after the operation.

If it is true that a new intermediate tissue is formed between the divided ends, it holds the place of tendon, and must consolidate, retract, and shorten, and contract more or less extensive adhesions with the neighboring tissues for several months.

M. Velpeau sees no reason why the process of reorganization between the eye and its connections should not be kept up at the bottom of the orbit, in some persons, a long time after the external cicatrization is complete; although M. Bonnet may or may not admit (p. 157, 158) that this result can be possible.

If one of the causes of the return of convergent strabismus, that already mentioned, in very old cases, of the short space on the sclerotica upon the same side as the internal rectus, even where that and its fibro-cellular dependencies have all been divided, could be ascertained beforehand, it would be better not to operate.

This condition may also exist, perhaps, where the difficulty appears to arise from the bandelettes of the superior and inferior recti muscles, whose division, however, may prevent a return. But such dissections should not be undertaken without cause, as they might favor the projection of the eye, exophthalmia, and the fixity of the organ.

M. Velpeau says he has operated upon a number of persons, who, whether from primary or accidental causes, have had a singularly abnormal arrangement of the muscles. After having divided the conjunctiva opposite the lower edge of the rectus-internus, for example, he has found that the scissors glided with difficulty there upon the sclerotica. Using then the blunt hook, he has found the muscle adherent to the sclerotica as far back as the posterior part of the eye, in place of being separated by the usual lamellæ of that region, so that it has been impossible to isolate it, compelling him to divide the fibres, bundle by bundle, from the neighborhood of the conjunctiva to as far back as the optic nerve, and from the inferior up to the superior rectus. Once he found a muscle with three anterior divisions, (*languettes*,) as M. Phillips mentions to have seen frequently. As before remarked, these close adhesions seem to have been occasioned by previous purulent inflammations, though in two cases they had the characters of primitive organization. Failure in cases of this kind ought not to surprise us. For however free the division of the fleshy bundles, they will recombine with the intervening tissues, readily readhere to the sclerotica, and re-establish the deformity.

It may also happen, that from fear of pain, or ignorance, the eye will be kept immoveable for several days, or the patient may persist in retaining it in its morbid direction. The divided tissues then speedily reunite by first intention.

In a young girl, aged nine years, with strongly convergent strabismus, and whom M. Velpeau operated upon with apparent perfect success, the disease returned in three days, the reunion of the divided tissues having been so complete, that there were no visible traces in the angle of the eye either of inflammation or wound. Two days after he repeated the operation, kept a bandage over the other eye for a week, and the cure this time was complete.

In some cases the inflammation, after the operation, being too intense, produces in the tissues, which contract new adhesions with the eye, too great a degree of induration, then imperceptibly a retraction, which reproduces the primitive deformity to a greater or less extent.

§ IV.—*Return of the Deformity.*

Rigidly speaking, it is almost absolutely certain that a return of the disease may be prevented; for where the surgeon is skilful and the patient resolute, a failure is rare. If the section of one muscle does not suffice, we may proceed to the others, from one of the recti or both to the oblique; or where the division of the internal rectus causes divergent strabismus, we can attack the external rectus, and repeat the operations. M. Velpeau, however, is adverse to this repetition of the operation, for such a course must favor the production of exophthalmia, the flaring open of the lids, the absorption of the caruncula, the fixity of the eye, or some other unusual alteration in its appearance.

M. Velpeau then makes two divisions of cases: one, of *complete success* after the operation; the other, where there is still some defect left.

Cases of Complete Success.

1. Those in which the restoration is so perfect, that, unless they are examined very near, no evidence is apparent that the individual has ever had strabismus.

2. Where the eye preserves its mobility, and acts in harmony with the other; where it is neither more projecting nor flaring than the other; and where the caruncula remains, and the look of the eye has nothing peculiar.

Cases where a Defect Remains.

1. Where the eye is usually straight, but at certain moments

slightly deviates in one direction or another, especially when the patient is excited.

2. Where the eye can only be partially turned in the direction of its former deviation.

3. Where the caruncle is flattened, the commissure of the eyelids slightly separated, and the eye a little more prominent than the other, and its look not perfectly steady.

None of these discordances, however, are perceptible but upon close examination, and are nothing compared to the deformity before the operation.

Out of three hundred cases operated upon by M. Velpeau, [by his last computation when this brochure on strabismus was published,] half of those who have followed the necessary precautions have been perfectly restored in every respect. A third part of the other half came under the second class just mentioned, that is, there continued to be a slight deviation above, downward, outward, or inward, or a slight degree of fixity or projection, or discordance in the axis, or movements of the two eyes, or a perceptible alteration of the caruncle, or a certain undefinable awkwardness in the opening or appearance of the two lids. The two other thirds of this last half comprise the cases of actual failures—namely, where the deviation was in a direction opposite to the first; where the primitive deformity was completely or partially re-established; where the eye, in place of turning itself outward or inward, deviated upward or downward; where there was exophthalmia, or immobility, or fixity in the look of the eye, or irregularity in its movements; and where all of these defects were apparent to any observer. The deformity was changed, but still unpleasant and noticeable by every person.

Had they rigidly observed the precautions directed, the results, doubtless, would have been more favorable; but so much had been said in the journals of the trivial nature of the operation, and that it was of no more importance than a simple bleeding, that most of the patients came to the hospital in the morning, and being operated upon, returned to their homes, to resume their usual occupations and mode of living, as if the eye had not been touched. M. Velpeau, therefore, does not wish that the absolute success of the operation should be judged of by the cases under his care, or by others that have been related.

It will require, he thinks, some years, to come to a definitive solution of the question; and when the operation shall no longer be attempted but by conscientious surgeons, who will carefully weigh all the necessary precautions.

M. Bonnet also gives (pp. 162, 163) only *fifty-four* cases of complete success out of three hundred operations which he had performed for strabismus, though he says there were many of them whom he never saw again. M. Velpeau doubts if he would have found in the whole number of three hundred more than one hundred and fifty perfect cures. M. Velpeau justly remarks, that it is

a difficult thing to furnish correct statistics in this matter, and that he should not feel authorized to speak with certainty of more than one hundred and fifty of his three hundred and more cases. A very great number from the environs of Paris, from a distance, or from the provinces, neglected to come back, he says, to the hospital, either from indifference, or unwillingness to put themselves to the trouble, or from not conceiving any possible utility in doing so, &c.

Prepared for these difficulties, this surgeon took the precaution of obtaining the address of the out-door patients, and to keep an eye upon the cases during the space of two, three, or four months, in the event of their not returning to the hospital to show him their eyes at the times appointed. M. Gouraincourt, whose zeal, he says, he has greatly to praise in this matter, visited them every eight or fifteen days, and took a minute of all that passed.

M. Velpeau then proceeds to give a *resumé* of the details of about *one hundred and fifty cases*, which, as they have been promiscuously taken, he thinks may be received as a fair sample of a close approximation to the proportions of success, partial success, and failures, among those also where no minutes could be obtained. He doubts if the marvellous narrations of the success of others would in reality present any thing more favorable than this list.

There is an instructive table of the cases of M. Boinet in the *Journal des Connaissances Médico-Chirurgicales.* Out of sixty-eight also operated upon by M. Peyré, (*Traité du Strab., &c.*, 1842,) he admits only *eight* to *ten* failures. M. Proske allows of only *twelve* failures in fifty-five cases operated upon by M. Kuh.

The Cases Operated upon by M. Velpeau.

Out of 128 cases minuted by M. Gouraincourt, there were—

Convergent	111
Of these there were—	
Double	17
Right eye	67
Left eye	27
Divergent	17
Of these there were—	
Right eye	10
Left eye	7
Total	128

Out of 138 cases, as examined by M. Velpeau—

Convergent		123
Of these there were—		
Double	20	
Right eye	52	
Left eye	51	
Divergent		15
Of these there were—		
Double	2	
Right eye	8	
Left eye	5	
Total		138

Cases Operated upon by M. Bouvier.

The number was 45, and all on one eye. The muscles divided, were the rectus internus and rectus externus, and in one case only the inferior oblique with the rectus externus. In no case were the superior or inferior recti, or the superior oblique, divided.

Of the above 45 cases, there were—

Females	29
Males	16
From 8 to 10 years of age	5
From 11 to 20 years of age	16
From 21 to 30 years of age	16
From 31 to 47 years of age	8

There were in this number—

35 cases of convergent strabismus,
10 cases of divergent, (including one case which followed an operation for convergent strabismus.)

22 cases affected the right eye, either exclusively or principally.
23 the left eye.

The definitive results of the operations, ascertained a month or several months afterwards, were as follows :—

1. *Convergent Strabismus*, 35 cases: the eye entirely restored in 25 cases; the strabismus partially remained, or appeared occasionally, in 8; the restoration failed entirely, or nearly so, in 2.

Out of 25 cases of complete restoration, there were 8 in which the position and movements of the eye were altogether normal; 16 in which the eye was too much in the *middle*, between the opening of the eyelids, and its movement of adduction more or less enfeebled, or almost entirely abolished; 1 in which there occurred a strabismus outward, which continued in spite of the section of the rectus externus.

Among the 16 cases (above) where the eye was *too much* straightened, (*trop redressée*,) is to be reckoned the case in which the operation had been already performed without success.

2. *Divergent Strabismus*, 10 cases. The eye was entirely restored in 7 cases; it preserved in all these cases its position and normal movements.

The operation failed, or nearly so, in 3; and of these three cases, one was the case of consecutive strabismus, following an operation for convergent strabismus performed by another surgeon, and should not in reality be included with the other cases. A second of these three cases is that of a man aged 47, affected with paralysis of the rectus internus, from a cerebral affection; this, therefore, is a case, also, which had nothing in common with the others. There were, therefore, but 8 cases of failure.

Section II.—Amelioration of Vision by the Operation of Strabismus.

A fact, which had hitherto almost escaped notice, has been ascertained from the operation of strabismus, viz., that almost all squint-eyed persons see badly with the deformed eye. With some the strabismus is complicated with *ambliopie*, or a species of amaurosis; others have the sight double, (*dyplopie*,) or short, (*myopie*.) In some the eyes soon become fatigued, and in others these organs have a constant trembling. Not that the vision is altered in all cases of strabismus; M. Velpeau has, on the contrary, remarked that, in 25 out of 100 cases, the patients see as far with the distorted eye as with the sound one.

It has been found that the defect of vision in question was not the cause, but the effect of the strabismus.

§ I.—*Amblyopy.*

One of the most common defects in persons with strabismus is amblyopy, or a sort of confused vision. M. Velpeau has noticed it in various degrees in about half his cases. M. Phillips is in error, in saying that the operation always removes it; for M. Velpeau has seen it in a great number of patients as late as a month or two after the operation. In some it disappears immediately, but it cannot be determined beforehand whether the operation will relieve it or not. The operator is often deceived on this subject, from patients crying out, immediately after the operation, that their sight

is vastly improved, when, in fact, there has been, as yet, no change effected in this respect.

§ II.—*Diplopy.*

Some squint-eyed persons see double, when they attempt to use both eyes; which is a very natural result of the crossing of the axes of vision, and the double image which is the result of it, as has been before mentioned. There are scarcely any other strabismic patients that retain their vision natural, except those who can scarcely see with the distorted eye; but these last are most numerous; and among the others, there are some who, in fact, make use only of the sound eye, though the visual faculty may exist unchanged in the distorted eye. Diplopy is almost always cured by the operation; but M. Velpeau mentions a case where it continued after the division of the rectus internus and perfect restoration of the position of the eye.

§ III.—*Myopy.*

A considerable number of strabismics are short-sighted in the eye that squints. M. Velpeau doubts if this can be imputed to the compression of the recti muscles, through and from above downward upon the sclerotica, or to the action of the oblique muscles from behind forward and from before backward, having the recti muscles for their antagonists. The operation, however, often removes the myopy.

[It was, as we have seen, (supra,) the opinion of Dr. Hosack, that short-sightedness arose from the too energetic contraction of the recti, compressing and thus actually elongating the globe, and at the same time giving greater convexity to the cornea—the oblique muscles merely serving as antagonists to keep the eye in place. Then a *permanent contraction* of one or more of the recti must favor the production of short-sightedness; and as this is seen to accompany strabismic cases, it is so far, in our opinion, a striking corroboration of Dr. Hosack's theory.—*T.*]

§ IV.—*Amaurosis.*

The alleged cure of amaurosis by the operation appears to be unfounded. This disease is generally the result of lesions independent of the globe and its appendages. No one, M. Velpeau thinks, would hope to cure amaurosis caused by remote lesions in the digestive passages, interior of the mouth, or cranium, or in the optic nerve or retina, by means of the section of one or more muscles of the orbit. Physicians have, no doubt, erroneously diagnosed confusion of vision (*amblyopy*) for amaurosis; but the cure of the first by the operation is a very different thing from that of an idiopathic or symptomatic paralysis of the retina. The almost total

abolition of vision in the diseased eye is, nevertheless, not a counter-indication for the operation.

§ V.—*Kopiopy, or Fatigue of the Eyes.*

The fatigue which the unsound eye experiences when attempted to be used alone, has been noticed by M. Pétrequin, who gives it the name of Kopiopie, (*Annal. d'Ocul.*, 1841,) and by M. Bonnet and most other surgeons. M. Velpeau rationally explains it by the diminished power of the diseased eye and its habitual repose. Therefore, as he justly remarks, when, after the operation, this eye is restored to its position, and begins to act in concert with the other, and to become, as it were, disciplined and habituated to exercise, this feebleness gradually disappears. In many, however, it continues for some time.

§ VI.—*Nystagmus, or Trembling of the Eyes.*

Nystagmus, or continual oscillations or vibrations of the eyes, is seen in some strabismics, and also in some persons who are not affected with squinting. The cause is unexplained, and the remarkable part of it is, that the sight in such persons is sometimes as regular and perfect as in others. M. Selle, a physician of Paris, has it in an extreme degree.

Whatever others have anticipated or related of cures of nystagmus in strabismic patients by section of the muscles, from the very natural supposition that it must originate in some derangement of the motive functions, M. Velpeau considers it very doubtful if the operation will give relief. In four or five of these cases, which he operated upon, not one was radically cured of the nystagmus. One was a child of seven years, with double convergent strabismus, and perpetual oscillation in both eyes, which was slight when he was at rest, but vehemently agitated, into irregular movements downward, upward, inward, and outward, whenever any one attempted to approach or examine his eyes, and especially if one eye was, at the same time, kept shut.

After the operation on each eye successively, the trembling subsided for a few weeks, but returned in two months as strongly as ever, though the strabismus in both eyes was perfectly cured. The brother of this child, aged eleven, had, in a less degree, the same singular affection complicated with strabismus from infancy, and the results of the operation in both were precisely the same.

In most cases, however, the operation has the effect to diminish the oscillations.

§ VII.—*Conclusion.*

The operation for strabismus may, in general, favorably affect, but will not always completely restore, all the functions of the eye, where the sight has undergone a certain change.

In strabismus, the sight may be confused, or almost abolished, uncertain, short, or fatiguing, in two ways—1. By defect of use of the organ; 2. By some organic alteration in the tissues which compose it.

In the first, the eye, once restored to its natural position, gradually recovers from the prolonged repose of the organ, and regains its functions.

In the second, where the defect in the vision in strabismus is complicated with actual lesion, as of the optic or some other nerve of the orbit, lesion of the choroid coat or retina, the section of the muscle will have little or no avail. Nevertheless, even in a strabismic patient, with amaurosis or myopy, the operation is not to be proscribed, for the restoration alone of the position of the eye is a matter of some importance, though other complications may not be remedied by it.

Article XII.—Section of Different Muscles of the Eye to Remedy other Diseases than Strabismus.

The alleged results obtained in the amelioration of certain complications of strabismus, have led to the proposition to apply the operation to these affections, even where there is no strabismus.

§ I.—*Myopy.*

This has been the first disease upon which this practice has been attempted, and it has given birth to three opinions as to the origin of the disease.

In one, it was maintained that the myopy was caused by the shortening, active or passive, of the recti muscles. Hence the proposition to make the section of one or more of them.

M. Guérin makes two kinds of myopy, viz., mechanical or muscular, and optical or ocular, (*Annal. d'Ocul.*, Avril, 1841, p. 31,) and gives examples of successful treatment by the operation.

M. Cunier relates cures of myopy by the simultaneous section of the internal and external recti muscles, (*Ann. d'Oc.*, Juin, 1841.)

M. Kuh of Breslau, who about the same time published in the Journal of Casper (1841—No. 15) a successful case of myopy, from section of the four recti muscles, and one of *presbyopie* (*Proske in Ann. d'Oc.*, t. vii., p. 44: *Sach's Allgemeine Zeitung*,) admits that he obtained no success from the section of the internal and external rectus in another case.

M. Phillips, representing the opinions and practice of Dieffenbach, contends that it is the superior oblique muscle which is the cause of myopy, while M. Bonnet (*Des Sect. Musc.*) maintains that it is the small oblique.

M. Velpeau thinks, if the cause lies in the muscles, that all may be equally concerned in the production of myopy, the globe, during the retraction of the recti muscles, finding a point d'appui behind by the reaction of the oblique muscles, and these last again, when

retracting or shortening, finding antagonists at the cornea in the recti muscles.

M. Velpeau says, that having long since maintained at his clinique, that *transparent staphyloma of the cornea*, and *staphyloma* in general, was a *mechanical effect from the action of the muscles on the globe of the eye*, he was naturally strongly disposed to adopt the new theories of myopy, and even went so far as to operate on the muscles for it in one case—a man aged about forty-six, from the provinces, who had had myopy and nystagmus from infancy. M. Velpeau first divided the rectus internus on one side, and, in twelve days after, the external rectus in the same eye, not only to relieve a divergent strabismus which was beginning to form, and also an unpleasant diplopy, but in order to complete the operation.

M. Velpeau ascertained, by careful attention to this patient, that his myopy was benefited to the extent of seeing to one-half greater distance than before the operation. But the double vision still annoyed him; and as this might arise from the two organs acting in different fields of vision, he operated upon the other eye with the same precautions as upon the first. The myopy at first appeared to subside in this eye as it had done in the other, but the sight remained uncertain (*vague*) and confused, and the diplopy, which had ceased for some time, soon became re-established. One of the eyes finally deviated inward. He considered that he should re-operate upon it as for a convergent strabismus; but the external rectus having been already divided, the eye could not be completely straightened but by methodical compression in the inner angle of the lids.

The eyes being now straightened, he found they could not be turned outward or inward but imperfectly. The double vision had diminished, and he went home, but returned in six months to the hospital, with this last-mentioned disease strongly marked, and also decided amblyopy, and slight convergent strabismus in both eyes. M. Velpeau now thought an operation for this would destroy the diplopy, and the rectus internus of the right and left eye was again detached. The eyes were completely straightened, but the double vision continued. The patient now resolutely proposed, as is recommended by M. Phillips and M. Bonnet, that one of the oblique muscles should be cut. M. Velpeau declined, believing the eyes already too restricted in their movements to justify the section of any more of their muscular bands.

M. Velpeau thinks that the section of the muscles in sound eyes exposes to more unpleasant results than after strabismus. For who can say that the section of the internal and external recti muscles will not be followed by a deviation inward or outward, or that a section of one of the oblique muscles will not cause any deviation of the eye? What can secure us in these sections against fixity and immobility of the eye, in various degrees? With the possibility of such results, the remedy would be worse than the disease; and as *myopy* itself, moreover, does not always yield to

myotomy, the operations hitherto made trial of in these cases will not, he conceives, be adopted in practice.

§ II.—*Amaurosis.*

M. Adams, an English oculist, proposed myotomy for amaurosis. After division of one of the recti muscles, in a girl aged 22, the vision was partially re-established; but, as the *diplopy* supervened, he cut the rectus muscle opposite. The diplopy ceased immediately, and the sight continued to improve, (*Prov. Med. and Surgical Journ.*, April, 1841.) But M. Fleussu remarks with justice, that this was rather a case of *kopiopy*, or fatigue of the eyes, than of amaurosis, (1er *Supplement aux Ann. d'Ocul.*, p. 319.)

The two cases of M. Ruete of Gottingen, reported as cures of amaurosis, by myotomy, are considered by M. Fleussu to have been only partial paralysis of the third pair, with strabismus and mydriasis.

M. Pétrequin of Lyons, who contends that certain forms of amaurosis may be produced by a spasmodic state of one or several muscles of the eye, (*Revue Médicale*, 1842, t. i., p. 207,) is also much in favor of ocular myotomy in gutta serena. Two such cases, operated upon by him in 1841, experienced, he says, decided benefit, (1er *Supplement*, *Annales d'Oculiste*, p. 321;) but M. Velpeau, in reference to these cases, as well as to what has been said on this subject by M. Kuh, and M. Peyré, (*Traité du Strabisme*, p. 174,) feels constrained to entertain some doubts as to the *amaurotic* nature of the disease in question, and concludes in expressing it as his opinion, that the operation would for this disease be still more unjustifiable than for myopy.

§ III.—*Nystagmus.*

Among the cases of myotomy for nystagmus proper, M. Velpeau remarks, that the patient of M. Phillips appears to have been completely cured by this means, (*Tenotomie Sous-Cutanée*, Paris, 1841, p. 317;) but M. Bonnet confesses that he failed in three cases where he made trial of it, (p. 302.) If it be true that M. Roux of Mexmieux has cured a person both of myopy and nystagmus, by the division of the two inferior oblique, (*Bonnet, Ouvrage Cité*, p. 305;) it is equally true that M. Bonnet himself has failed, both in dividing the inferior oblique as well as recti muscles, (p. 303.) Moreover, M. Velpeau says with great candor, that his own cases are totally adverse to the anticipations of MM. Phillips and Peyré, (*Traité du Strab.*, p. 163, 1842.) Since the strabismics operated upon by M. Velpeau retained their trembling movements of the eye, he could not rationally conclude that the operation could be depended upon for this affection, where there was no strabismus.

M. Velpeau deems it a feeble resource in nystagmus; but believes, with M. Bonnet, that this disease may often be complicated with, or the effect of, various alterations in the eyes. Thus it may

originate from a myopy, amblyopy, diplopy, a spot on the cornea, or from a cataract from infancy. It seems that in all these circumstances, the uncertainty of vision induces the eye to carry itself instinctively and continually in every possible direction, as if in search of the rays of light that it required. In these, therefore, the cause must be first removed before thinking of myotomy. M. Velpeau deems it doubtful, even where the convulsive trembling and strabismus are unaccompanied with any defect of vision, (*pertur-tion visuelle,*) (as in the two children above related,) and has his doubts of the reported success of M. Kuh, (*Sach's Allgemeine Zeitung*, and *Annales d'Oc.*, t. vii., p. 44.)

§ IV.—*Artificial Pupil.*

Sometimes the spots on the cornea cover only one half or two thirds of it. Nature, to accommodate the pupil, turns (as has been already explained) the eye in such manner forward, as to bring the transparent part of the cornea more directly in a line with the pupil and axis of vision. This is, at least, as good as an artificial pupil.

M. Cunier, therefore, proposed making an artificial strabismus in patients with leucoma, or cicatrices of the cornea. This, he says, he does by dividing one or more of the muscles of the eye, (*Lettre à l'Académie des Sciences*, 1841.) M. Cunier has given one successful case, and M. Pétrequin, in a letter to the Academy, (*Bonnet, Ouv. Cit.*, p. 312,) relates another. M. Proske (*Ann. d'Oc.*, t. vii., p. 44) has also treated of this subject.

M. Velpeau remarks, that this new application of myotomy can only be practicable in cases where the pupil remains sound behind the cornea, and that the opacity does not go beyond the circumference of the pupil. The operator should hold the eye steadily with the forceps or érignes, for some seconds, in the position in which the globe should be turned, [to enable the light to strike through the cornea and pupil upon the retina,] so as to be assured that this can be effected before he divides the muscle or muscles.

We should also weigh well whether one of the numerous operations for artificial pupil, as these do not require division of the muscles and deviation of the eye, would not still be advisable. This artificial strabismus, it must be recollected, is the establishment of a permanent deformity, to remedy a simple imperfection of the sight, and but few persons, probably, would desire to squint for the sake of seeing with both eyes.

The facts on the subject are still too limited to give a definitive opinion.

The muscles to be divided are always those that correspond to the point of the cornea nearest to the pupil. Thus the internal rectus for divergent strabismus, if the pupil, could be seen better, and the patient could see better on the nasal than any other part of the cornea, and *vice versâ* with the external rectus. If the transparent point on the cornea was below, we should divide the infe-

rior rectus to produce a frontal strabismus, and for the reverse the superior rectus.

Article XIII.—New Varieties of the Operation of Strabismus.

Less severe means than myotomy have been proposed for strabismus.

§ I.—*Destruction of a portion (plaque) of the Conjunctiva to remedy Strabismus.*

Some suggestions upon this subject from M. Dieffenbach, are to be found in the Journal of Casper, 1841, No. 36, and in the small volume just published by M. Cunier, (*Revue Ophthalmologique, &c., ou Suppl. aux Ann. d'Oc.*, p. 297.)

When the strabismus is slight, in order to avoid an inverse strabismus after the section of the retracted muscle, the operator of Berlin advises an excision of a portion of the conjunctiva and of the tissues which line it, near the tendon of the corresponding muscle. In the progress of cicatrization, the borders of the divided conjunctiva gradually approximate, so as to shorten it considerably, and thus straighten the eye.

M. Dieffenbach professes to have obtained the same result by cauterizing with nitrate of silver. M. Velpeau, with every confidence in M. Dieffenbach, cannot but express his doubts that all the cures he has spoken of were in reality cases of pure strabismus. The conjunctiva, says M. Velpeau, is too moveable and pliant, and is too easily displaced, for an operation of this kind to restore in reality the natural position to a deviated eye. Moreover, if the straightening should take place, there would result from it a manifest impediment to the movements of the eye in the other direction, and consequently a new deformity.

M. Cunier (in the work quoted) says, if this operation should be adopted, it would be much better to *reunite the wound* of the conjunctiva by first intention, by means of the suture, than to leave it to suppurate. But this, says M. Velpeau, would probably deprive M. Dieffenbach's operation of the only chance for success which it has; viz., that of forming an inodular cicatrix, which would slightly draw the eye in that direction.

§ II.—*Section of the Muscles of the Eye by a Thread.*

M. Velpeau has for a long time, he says, reflected upon the probable utility of operating for strabismus by embracing the tendon of the retracted muscle, previously raised up by the forceps, in a noose of silk; then to twist the two threads of this noose together, and fasten it on the other side of the nose in external strabismus, and on the temple in the internal variety. The straightening of the eye could be thus carried as far as we judged necessary, and even beyond the central line, and this organ could be kept there, until the

thread had completely divided the tissues comprised in the noose. As I foresee (says M. Velpeau) the theoretic objections which might be advanced against this proposition, and which I do not look upon myself with any great degree of confidence, I have not yet made trial of it.

[STRABISMUS IN GREAT BRITAIN, AND ON THE CONTINENT OF EUROPE.

General Remarks.

Mr. B. Lucas, says Mr. Braithwaite, (in his invaluable Journal, entitled *Retrospect of Practical Medicine and Surgery*, July to January, 1840,) was, he believes, the first to introduce the operation for strabismus into Great Britain. He uses a sharp hook for the conjunctiva, a blunt hook for the tendon of the muscle, and a pair of sharp-pointed scissors. The eyelids are secured by the fore-fingers of the assistant, which are less irritating to the orbicularis muscle than any instrument, such as a speculum, forceps, etc. To accustom the eye to the manipulations, the assistant raises and holds up the upper lid with his finger three or four times, before the operation is begun; and the surgeon should, for the same reason, thus touch also several times, with his blunt hook, the part of the conjunctiva he is about to divide. The sharp hook should have a light cedar handle, that its weight may irritate less when, in the struggles of the patient, the operator designedly relinquishes his hold upon it. The hook is inserted into the conjunctiva at about two lines from the cornea, on a line with the tranverse axis of the latter. Mr. Lucas makes a semicircular incision into the conjunctiva, from below upwards, to four or six lines, or more if required. The sharp-pointed hook is now withdrawn, and the eyelids are permitted to close for a few moments. The blunt hook is then inserted through the opening of the conjunctiva, underneath the muscle, and between it and the sclerotica.

The sub-conjunctival cellular tissues and fasciæ, and the sub-muscular fascia, especially the last, often make some resistance to the progress of the hook. The tendon of the muscle, being brought into view, is to be divided as close to the sclerotica as it can be, with propriety. If, by trying the vision, it is found that any filaments remain, the blunt hook is to be reintroduced. Still there may, and will be, says Mr. Lucas, after the most careful division, and after even a portion of the muscle itself has been excised, an inversion of the globe; which, he says, he has ascertained beyond all doubt to be owing to the condition of the sub-muscular and sub-conjunctival fasciæ. They will be found tense, and must be divided freely upward and downward, with a forceps and pair of scissors, and in most cases the eye will become perfectly straight. The exceptions are, when these fasciæ are intimately adherent to the sclerotic coat, from which they must be carefully dissected off, until

the latter is completely bare. In such cases it will be seen, that in dividing the conjunctiva, it is found not connected loosely to the subjacent parts, as in the natural state, but that it is thicker than usual, and cannot be freely raised with the sharp hook. (Vide *Prov. Med. and Surg. Journ.*, Oct. 3, 1840.)

Dr. Franz (see *Med. Gaz.*, July 24, 1840) has sometimes found it necessary to divide the tendon of the superior oblique, as well as that of the internal rectus. Mr. Liston is also reported to have frequently divided the inferior rectus, completely or partially, when the eye retained some obliquity inward, after the division of the internal rectus; and Dieffenbach has occasionally divided the trochlearis also, when shortened, as well as the rectus. Mr. Duffin thinks, however, the remedy will generally be found in the division of some few tendinous fibres, or bands of adventitious cellular attachments, remaining above the tendon of the muscle; so small is the degree of fibrous adhesion that may mar the beauty and finish of the operation. These fibrous bands, or digitations, are sometimes posterior to the largest diameter of the ball, and they appear to be a condensation of the cellular tissue, connecting the muscle with the sclerotic coat, and gradually adapting itself to the shortened state of that muscle. This condensation may arise, in childhood, from inflammation, and thus produce permanent strabismus. It is most observable, he thinks, in persons who squint most. The free division of these attachments will, Mr. Duffin says, succeed in ninety-nine cases out of a hundred, in removing the slight abnormal direction of the ball after the section of the muscle.

Mr. Charles Guthrie agrees with MM. Lucas and Duffin, that it is only necessary, in the convergent strabismus, to divide the internal rectus, and the cellular and tendinous attachments mentioned. These generally, Mr. Guthrie thinks, should be liberated, especially from all remaining connection with the superior or inferior recti muscles, by a free division every way to three eighths of an inch, leaving the sclerotic coat in that part bare. (Vid. *Medico-Ch. Rev.*, Oct., 1840.)

Mr. Charles Clay, of Manchester, has invented a very ingenious speculum, as a substitute for the sharp hooks. It is spoon-shaped, and has a semilunar notch anteriorly, to leave the inner canthus exposed, while the edges of the speculum are thick, in order to keep the lids apart. If this does in reality answer, it would indeed be a great point gained, as no part of the operation is so painful and unpleasant to the patient, as the insertion of the sharp hooks into the conjunctiva, and keeping them there, as is done, by a certain degree of force and traction. (See *London Lancet*, Sep. 12, 1840.)

Mr. James Adams has invented an improved hook, viz.: by making the short points turn back on the stem at an acute angle, so that it is not necessary to thrust them into the sclerotica, as is done with the hooks which have the points at right angles, but it is required only to make use of a drawing motion gently, and in a line with the stem, by which means they enter obliquely, and make no disagreeable pressure. (Vid. *Med. Gaz.*, Aug. 21, 1840.) [This mod-

ification of the érignes or hooks, to avoid penetrating the sclerotica, is justly due, we believe, to Professor Velpeau, and not to Mr. Adams. Vide the extended supplement, which we have given above, from Professor Velpeau's brochure on strabismus, transmitted to us by him, for this American edition of his Operative Surgery.—*T.*]

Dieffenbach relies on hooking into the conjunctiva only. He and an assistant stretch the conjunctiva upward and outward, into a tense fold, by two fine sharp hooks inserted near each other, and which, as soon as the scissors make the incision, and the blunt hook is passed under the muscle, are withdrawn. While the blunt hook commands the eye, and draws it out of the inner angle of the orbit, a flat probe detaches the cellular tissue between the muscle and sclerotica, and the division of the muscle is made anterior or posterior to the hook. The upper eyelid is held up by an assistant behind, with one of Pellier's hooks, and the lower held down by a double hook, by another assistant who kneels in front. Dieffenbach thinks the operation is more complete, the farther back the division of the muscle is made; and that slight cases of strabismus require only the division of the anterior fibres. In these latter, when convergent, the opening into the conjunctiva should be very small, and the tendon divided close to the eye only, without separating the muscle from the globe. After some weeks, the eye acquires the normal position. On the contrary, where, for example, the cornea itself is sunk and hidden into the inner angle, an extensive incision of the conjunctiva, and equally free division of the muscle and all the connecting cellular tissues, as far back as possible, are imperatively required. (Vid. *Casper's Wochenschrift*, July, 1840, and *British and Foreign Med. Review*, Oct., 1840.)

Mr. French, of the St. James' Infirmary, and Mr. Edwards, of Chelsea, operate in this simple manner: An assistant behind covers the sound eye with one hand, and with his other hand raises the upper lid. The patient then directing his eye upward and outward, the conjunctiva is snipped at the under edge of the rectus, which latter is immediately secured by a curved probe, the point of which, by another cut of the scissors, is then made to appear. The muscle is divided on the probe. The curved hook or probe used, has two parallel stems between which the point of the scissors passes, in dividing the muscle. It should, when under the muscle, be held loosely, for fear, in spasmodic movements of the globe, it might plunge back and bruise. When held loosely, it produces no pain. (Vid. *Med. Gazette*, Sep. 4, 1840.)

M. Guérin places the patient on his back. He uses the hook for the ball, and then, with a small convex bistoury, pierces first the conjunctiva, and then, by a semi-rotation, passes it behind the muscle, and divides that from within outwards. By drawing the eyeball a little forward and sidewise, the muscle is made tense. This process may be called the sub-cutaneous, in its principle, or, as M. Guerin says, sub-conjunctival, both in relation to the small opening into the conjunctiva, and the mode of dividing the muscle. (Vide *Provincial Med. and Surg. Jour.*, Nov. 14, 1840.)

Mr. Charles Brooke has invented an efficient instrument, which is a small curved bistoury blade, sliding in a small curved director. The blade and director are accurate portions of a circular arc, comprising rather more than one sixth of a circle, the diameter of which is one inch and a quarter. The groove gradually deepens from the point to the handle, so as to conceal the taper-pointed blade when withdrawn a little; and is continued through the solid part of the handle, to give steadiness to the motion of the blade. Mr. Brooke says he has used this instrument, with complete success, in more than a dozen cases, without the aid of any accessory instruments, for fixing the eye or eyelids. He makes in the conjunctiva a very small opening, with a pair of probe-pointed scissors, through which the director is introduced, and passed under the tendon to be divided; the blade being passed forward with the point of the forefinger, completes the operation. The instrument is made by Mr. Fergusson, London. (Vid. *Lond. Lancet*, Nov. 14, 1840.)

Mr. Hocken justly, as we conceive, considers the pathology and the cure to be founded upon the same principles as those of talipes. Thus, the unequal contraction being removed, the normal position is maintained by the antagonist muscle, while the divided muscle, by becoming attached further back, is thus virtually elongated, and becomes equally balanced, in its muscular energies, with the atrophied but now reinvigorated antagonist muscle. (Vide *Med. Gaz.*, Sept. 11, 1840.)

M. Bonnet, of Paris, imputes the continuance of strabismus after an operation, to a fibrous capsule at the bottom of the orbit, which surrounds, without being in contact with, two-thirds of the posterior part of the globe. The recti and oblique muscles pierce it to reach the eye, and it is their attachment to the capsule at the point where they emerge, that produces the subsequent difficulty. (Vid. *Gaz. Médicale*, Feb. 13, 1841.)—*T.*]

[STRABISMUS IN AMERICA.

This last, latest, and most brilliant conquest of tenotomy, has spread, as it were, like a contagion over both continents; for, though but three years only have yet elapsed, since it obtained admission or was even named in standard surgical works, and but four years since it made its début in distinct treatises, it is an operation in its nature so simple, easy, and prompt of execution, that it has now become almost of universal adoption. It has, moreover, been justly remarked, that the facility with which the mere mechanical manipulation of the operation may be performed, has often emboldened adventurers in the profession, persons ignorant of the anatomy of the parts, and even empirics, to undertake to practise it, that they might thereby obtain a temporary notoriety, before those who were witness to the sudden and natural righting of the eye in its position, immediately after the section of the retracted muscle was made.

It is to be hoped, and, in truth, this hope has already been partially realized, that professed and expert surgeons will take and keep this subject in their own hands, and devise, as they no doubt will be enabled to do by extended experience, a great number of improvements, and especially precautions, which are still required in the processes now so much in vogue, and which, in fact, are already much perfected, since this bold and beautiful discovery was first made by the illustrious Dieffenbach.

Professor Gibson, of Philadelphia, claims the merit of having divided the recti muscles of the eye, some twenty years since, at Baltimore, with the view of curing strabismus; but the operation did not succeed. (See *Reese's edition of Cooper's Surg. Dict.*, New York, 1842, art. Strabismus—Appendix.)

It is difficult to say to whom the credit is justly due, of having first performed this operation successfully in America. Dr. Willard Parker, of New York, claims to have performed it first in this city, in August, 1840; and Dr. Detmold, of New York, Dr. Goulding, of Arkansas, and Dr. Gross, of Kentucky, are also stated to have soon after repeated it, (*Reese, loc. cit.*) And Dr. Mott also performed it a very few months after his return from Europe, which was in May, 1841, and since that it has become generalized in all parts of the country. Dr. Mott is inclined to give a preference to a rather free incision through the conjunctiva, that not only the muscle, but its lateral attachments and tendinous expansions on each side, may be thoroughly divided, and thus remove the disease effectually. Dr. Dix, of Boston, on the other hand, prefers a smaller opening in the conjunctiva, as he thinks too free a division of it is one cause of a disagreeable projection or protuberance of the globe, and of the gap at the inner canthus, not unfrequently noticed after the operation of convergent strabismus more especially.

It is due to Strohmeyer to say, that he first suggested the division of the muscles of the eye for strabismus, immediately before Dieffenbach put it into execution.

So great is the preponderance of convergent strabismus (the turning of the eye inward) over all other kinds, that a writer in the Philadelphia Medical Examiner found that in five hundred and thirty-six cases of the disease, five hundred and six were of this variety. There is also, in the convergent form, according to Professor Gross, of Louisville, almost constantly an accompanying inclination slightly upward, rather than downward. The writer quoted in the Medical Examiner remarks, that in eight hundred and sixty-six cases of strabismus, only forty-four were divergent, that is, the eye turned outward; but in these the upward obliquity is less than in the convergent variety. In the same article it is stated, that in four hundred and fifty-nine cases, the distortion was in one eye only, and only forty-seven had it in both. Professor Gross denies this proportion, in respect to convergent strabismus, in which, he says, both organs are almost always implicated, though not to the same degree; which opinion he considers conformable to the known and intimate organic sympathy existing between the two eyes, in health

and disease. The one that squints the least, and that the patient consequently uses most, he usually calls his best eye; and this, says Professor Gross, will be found to be in most cases the right, the left being the one which is generally most affected. This opinion would seem questionable, when it is recollected that the greatest development of muscular energy is usually on the right side of the median line of the organization. Dr. Phillips, of Liege, confirms this remark; though Mr. Lucas thinks the proportion of cases of squint, in the left to the right, is as three to two. Professor Gross imputes, and no doubt with truth, many cases of squinting to *imitation;* and says our school-rooms, from the propensity of boys to imitate, for example, one of their cross-eyed companions, are a fruitful source of this distortion. We differ from the Professor in one point—that the disease is not hereditary; as there can be no question, as common and familiar observation every day shows, that it is very often hereditary, running through a whole family where both the parents, or even one only, is strongly marked with it. Prof. Gross thinks this too is explicable, by the child imitating the parent or parents. He gives a striking example against the hereditary notion, which is this: that of three brothers, with perfectly sound eyes, one had three children with strabismus, another two, and a third, one. The uncles and aunts of these children, too, all of them except *one*, have all sound eyes. To decide this point, however, the Professor should have pushed this inquiry farther back, that is, to the third or fourth generations; for the action of the hereditary principle in the organization, in other matters as well as in this, is familiarly known to lie dormant for a time, in one or two intermediate generations. Thus, in the mixture of the African and white blood, some strong and characteristic features of the negro, as the thick lip, curly hair, dirty, discolored, or brassy tint and appearance of the skin, especially about the temples and around the eyes, ears, nose and mouth, etc., will be suppressed often for four, five, or six generations, and then suddenly peep out, in characters too legible to be mistaken; while, perhaps, in a twin sister, (as I have seen in the West Indies,) there will be every trait of a pure white.

Professor Gross remarks, that the more frequent occurrence of convergent strabismus, is doubtless owing to the internal straight muscle being not only naturally larger than the others, but inserted nearer the cornea. He thinks the earlier the operation is performed the better, if it be after the age of one year. We are somewhat surprised, however, that after all the cautions given by some of the ablest European surgeons, who have had such immense opportunities, against too much wounding of the sclerotica, or even penetrating it at all, if it be possible to avoid it, that Professor Gross should distinctly, unequivocally, and even emphatically, recommend (vid. his American edition of *Liston's Elements of Surgery*, Philadelphia, 1842, p. 297) "*inserting the sharp hook into the sclerotic coat;*" and that "the points of the hook (a double one too) *should be fairly implanted into the substance of the sclerotic tunic, but no more.*" Indeed, we think that quite far enough. He, however, justifies this by

saying, that he thinks it impossible to steady the eye if the hook penetrates no deeper than through the conjunctiva; and besides that, there would then be danger of lacerating that membrane. Moreover, Professor Gross divides the fold of the conjunctiva very far forward, viz., about three lines from the cornea, just behind the sharp hooks, which he directs to be inserted at only one line from the cornea. This recommendation appears to proceed from an opinion he entertains, of the possibly troublesome nature of the hemorrhage, if the division should be farther back. In further evidence of the necessity of avoiding the sclerotic coat, if possible, we may mention his own admission, that a wound there may be followed by suppuration, or abscess of the ball, and the escape of the humors.

He entirely disapproves of the practice of endeavoring to keep the eye, as soon as the operation is performed, in a natural direction and normal position. When the eye is made straight by the operation, and yet does not move in concert with the other eye, he invariably divides the corresponding muscle of the opposite side, for the reason which he had already given, that the distortion generally involves both organs.

The most general cause of the failure of the operation, and one which has been, in the opinion of Professor Gross, too much overlooked, is the co-existence of strabismus in both eyes, and the fact that the operation is usually confined to one eye, which he decidedly disapproves of. He always, therefore, if possible, operates on both. He doubts if the oblique muscles have any agency in strabismus.—*T.*]

[STAMMERING.

The relief of this unfortunate infirmity, a legitimate object, as has hitherto been supposed, of the curative processes of tenotomy or myotomy, remains as much a mystery to-day as in the earliest periods of time. The dangerous process proposed and practised by Dieffenbach, of exsecting a triangular-shaped wedge from the base of the tongue, having been followed too often by alarming hemorrhage, and even, it is said, by death in some instances, and in no case, that we are aware of, effecting a perfect cure, has been generally proscribed.

The division of the genio-hyo-glossi muscles, close to the symphysis of the chin, has been practised for two or three years past to great extent in New York, and other parts of the United States; but though affording manifest and palpable temporary relief, not to say miraculous restoration of the powers of articulation and speech, at the moment, has effected no well-attested, permanent cures. The same may be said of horizontal acupuncture of the tongue, through the entire thickness of its tissues, transversely; also, of electro-puncture.

In those cases only where the genio-hyo-glossi, or the frenum, have been abnormally contracted, has their section proved of decided advantage.

Nevertheless, the rational hope exists, with Dr. Mott and others, who have given the above section of the muscles at the chin and acupuncture a full trial, that farther advances in tenotomy and myotomy may ultimately shed light upon the true pathology of this disease in the organs of speech, and show which are the proper parts upon whose retractions, or other organic defects, the remedial agents of surgery should be directed.—*T.*]

SECTION THIRD.

OF ANAPLASTY OR AUTOPLASTY, (*DE L'ANAPLASTIE OU AUTOPLASTIE,*) OR RESTORATION OF DESTROYED PARTS.

The operations whose object is to repair mutilations, constitute one of the most brilliant triumphs of surgery. These operations, known under the name of organic restitution, animal engrafting, (*greffe animale,*) and transplantation of parts by *autoplasty*, have not yet been described with precision. If the term autoplasty had been sanctioned in science, I should have adopted it, however incorrect it might be; derived, as it is, from the words αυτος, himself, and πλασσειν, to create, it properly signifies the spontaneous creation of a part, the creation of a part by the individual himself, which in no respect expresses the idea which should be formed of the operations of which I am about to speak. *Anaplasty*, being synonymous with the words remake, (*refaire,*) or reconstruct, (*reconstruire,*) is evidently much more appropriate, though in itself not free from every objection.

PART FIRST.

ANAPLASTY IN GENERAL.

Anaplasty has now been brought to such a degree of perfection, that it is indispensable to divide it into many species, in order to treat of it appropriately. It comprises, in the first place, two great branches, easy of separation: 1. The surgeon confines himself to replacing (*replacer*) the organ itself, or some similar parts, (*quelques parties semblables,*) on the seat of the mutilation, either by restitution or transplantation; 2. At other times, he repairs the point de-

stroyed, by the transposition or elongation of parts, taken either from the neighborhood or from some remote regions.

CHAPTER I.

ANAPLASTY BY RESTITUTION.

The restitution differs according as the organ to be reunited (*à recoller*) is completely separated, or that it still holds on, by some lamellæ, to the living parts.

Article I.—Restitution of Organs Partially Divided.

Let a portion of finger, ear, nose, or lip, be divided in such manner as still to hold on by a quarter part, or half its thickness, and no one will contest the possibility of reattaching (*recoller*) it. Let the same organ, a finger, we will suppose, be cut off so as to hang, on the contrary, by only one of its surfaces, and to adhere only by a strip (*languette*) of skin, or epidermis, and most surgeons would consider it as lost. If doubts may exist on this subject for a portion of the finger, still greater doubts, with stronger reason, would exist in respect to an entire hand, leg, arm, or forearm. Nevertheless, facts seem to demonstrate, at present, that organs of considerable size, almost completely separated from the body, have, when properly brought together and supported, been enabled to resume their vitality, and to cicatrize.

De Horn cites the case of a hand which held only by the tendon of the index finger, and which Jung, (*Rougemont, Bibliot. du Nord*, t. i., p. 92,) nevertheless, succeeded in reuniting perfectly. An observation of Hoffman (*Ibid.*, p. 98) is scarcely less remarkable: an arm, which adhered only by the vessels and a portion of the biceps, and where the humerus and the integuments were completely divided, (*coupés*,) was, nevertheless, preserved and perfectly cured. Percy (*Mém. de l'Acad. Roy. de Méd.*, t. ii., p. 14) appears to have been witness to a similar fact. The arm was held only by the vessels and a flap of integuments. M. Stevenson relates (*Gaz. Méd.*, 1837, p. 390) something much stranger still. An individual had the vessels, biceps, and humerus, completely severed by the cut of a sabre; the arm was retained only by a flap of skin at its upper part; the surgeon, nevertheless, effected a reunion! A case also is related, of a great portion of the calf, which was held only by a slight pedicle, and which M. Groenscher succeeded in reanimating, (*revivre*,) and reuniting to the natural parts. They have gone much farther than all that; for Esculapius (*Dujardin, Histoire de la Chir.*, Introduction, p. 15) restored the head to a decapitated woman; and a soldier, who was decapitated by an enemy, was cured by a peas-

ant, (*Jour. Gén. de Méd.*, t. liii., p. 232—Sédillot,) who had the misfortune of putting the head on with the face turned backward, a mistake which Pantagruel rectified by saying he did not wish to have a torticollis! while Rabelais, (*Œuv. de Rabelais*, liv. ii.; *Pantagruel*, liv. ii., ch. 30, p. 286,) jesting as usual, has preserved to us the history of Epistémon, who had had his head cut off, but which Panurgus reunited exactly, vein with vein, nerve with nerve, and vertebra with vertebra, etc.: the aforesaid Epistémon being perfectly cured, except that his voice remained hoarse, and that he had a dry cough, which he never was relieved of but by the aid of liquor!

If it is difficult to admit as correct the observation of Jung; if the facts of M. Percy and M. Stevenson are equally surrounded by improbabilities, it is not the same with those of Hoffman and Groenscher. In those last cases, there remained enough of living parts to prevent the mortification of those which were separated.

Also, it is principally upon the surface of the skin, and the projecting parts of the body, that these divisions have been observed. The fingers, the nose, and the ears, have furnished the most examples of them.

§ I.—*The Fingers and Toes.*

Thomson (*De l'Inflammation*, etc., p. 243) has seen the fifth toe reunite, though it held only by a small cutaneous flap. The end of the little finger, which was prevented from falling only by a slight pedicle, was also perfectly reunited, in a patient in whom the same author proposed that it should be amputated.

Two fingers, divided from behind forward, and which were held only by a flap of a line or two in width, were so exactly united together by M. Layraud, who showed them to me, that they not only continued to live, but also reacquired all their functions. A sausage-dealer's boy receives the cut of a knife upon his hand; the middle and ring fingers immediately fall upon their palmar surface, and a copious hemorrhage takes place. Reaching the young man in about half an hour after, I find that in the third finger, the wound, which penetrated through the middle joint, included the extensor tendon, the whole thickness of the bone, the flexor tendons, the vessels, and the nerves. There was no other continuity except by a small strip of the palmar integuments, which was from two to three lines in width. In the medius, the division was forward of the phalangeal articulation, and did not comprise as great a width of anterior integuments. The hemorrhage, which had begun to diminish, did not prevent me from attempting the immediate reunion of these two fingers. A small splint of white-wood, strips of adhesive plaster, and a roller bandage, constituted all my dressing. It was in the month of June, 1837; the hand was kept constantly moistened with water, at the natural temperature; the immediate reunion took place; and this boy, at the present time, uses his fingers the same as before the injury.

§ II.—*The Nose.*

It is in the nose that these anaplastic unions have been more especially noticed. Among other facts of this kind, I will cite that related by Bagieu, (*Examen de plus. Quest. de Chir.*, etc., p. 599,) in which we find that the nose, holding only by a very small filament, (*filet*,) completely reunited in the space of eight days, in the case of a gendarme named Densi. The point of a nose which held only by a slender pedicle, was well restored in 1742, by Dubois. Lombard (*Thomson, Oper. Cit.*, p. 242) succeeded in reattaching a nose, almost entirely separated for several hours, though it was during winter. A similar fact is attributed to Loubet, (*Plaies d'Armes à feu*, p. 31.) Thomson (*Oper. Cit.*, p. 242) has related two similar cases: in one, the nose held only by the skin of one of its alæ; the septum (*cloison*) only retained it in the second. We owe to Boyer (*Traité des Mal. Chir.*, t. vi, p. 59, edit. 1818) a third observation, full as conclusive. The butcher of whom Dionis (*Opér. de Chir.*, 7e demonstr., p. 588) speaks, was not less fortunate. Percy (*Dict. des Sc. Méd.*, t. xii., p. 344) relates, that he has met with many cases of noses, which he has successfully reunited when they held only by a small flap. Blasius (*Obs. part.* 5. *Obs.* 1re cité par Percy) has given us the history of a nose almost entirely detached, and in which, owing to its tardy reunion, it was necessary to pare (*raviver*) the edges of the wound. M. Moulinié (*Bull. Méd. de Bordeaux*, 1833, p. 21) also speaks of a bruised nose, in great part torn off, and which he succeeded in reuniting, by means of a suture. I myself have seen many similar cases: in a young man, in whom the point of the nose held only by a small pedicle of the septum, I was enabled to reunite the parts, by means of simple adhesive plasters.

Without admitting, with many ancient authors, that the eye, in certain wounds, after hanging down upon the face, has been replaced in the orbit, and been enabled to resume its functions; we cannot now deny that portions of the ears, or lips, have been fully as well united as the nose. F. d'Arce says, that a nose even, which with a large part of the upper jaw had been torn down (*renversé*) upon the chin, was raised up and perfectly reunited.

From these facts, and from a great number of others which I might have quoted, from Glandorp, Painchchriston, Ledran, Ravaton, etc., we have these results at least: that parts of the body, partially detached, may in certain cases be reunited with those from which the wound had temporarily separated them. Only that we should be wrong in concluding, therefore, that these attempts at agglutination will be always followed with success. The conditions which the surgeon should look to for his prognosis, are the following:—All other things being equal, the chances of success are greater in wounds from a cutting instrument, than in cases of contused wounds. In the first cases, the adhesion will almost always take place, if the flap which is preserved, includes a certain

number of vessels, or presents a thickness of several lines. It will also be practicable and proper to attempt it, in cases where the pedicle holds on to the rest of the body only in the extent of a line or two, provided it is a part of the tegumentary tissue, and that there are neither bones, muscles, nerves, nor vessels, of a large size in the parts separated, as is seen in the ear, at the point of the nose, and in some regions of the face. If it was an arm, or forearm, as in the observations of Horn, Percy, and Stevenson, or what is worse, the leg, and that the section comprised the whole thickness of the limb, with the exception of a flap of integument, we ought not, as I conceive, to count on the success of the reunion: every thing shows, that it would be better then to resign ourselves to the sacrifice of the part. In the second case, that is, in cases of contused wounds, the restitution is hardly possible, except the pedicle has at least the fourth or fifth of the thickness of the injured organ. If under these dimensions, it would be more prudent not to attempt the anaplasty, but to complete the section of the flap.

[There can be no harm, as we conceive, in at least making the attempt, however small the pedicle or flap may be; for, if the union does not take place, the decomposition in the separated parts will soon be made manifest, without occasioning but very little delay in the subsequent treatment, and certainly without producing any mischief to the sound parts.—*T.*]

Another circumstance which must be kept in view, is that which relates to the nature of the divided tissues. Thus the organs whose integuments are nourished by numerous vessels, or which are united in an intimate manner with the subjacent tissues, such as the fingers, the sole of the foot, the cranium, face, nose, and ear, in a word, homogeneous parts, offer, in this respect, the best possible conditions. If the division comprises, also, tendons or bones, as is seen in the fingers, or simple cartilages, as in the nose and ear, there is still no reason to object to *anaplasty*. The most unfavorable conditions are those of the division of the muscles, bones, nerves, and vessels of a large size. For the rest, the chances of success are in direct relation with the homogeneousness of the parts, and the absence of large circulating trunks (*circulation à grand courant*) in the parts; that is to say, that the organs which appear to exist under the influence of the capillary circulation or imbibition, are more favorable to the success of the operation, than those which are naturally traversed by vessels or nerves of large size.

Whenever the surgeon shall find the parts in the favorable conditions of which I have spoken, he will attempt the reunion. It is important, then, not to leave any foreign body, or any clot, between the lips of the wound, and to place the two ends of the divided organ in perfect contact. For that purpose, we should wait until the blood ceases to flow, if the divided vessels are not of sufficient size to require the ligature. A quarter of an hour, a half an hour, or even an hour of delay, under such circumstances, should not disquiet us, but would be rather useful than injurious in a considerable number of cases.

If the blood should not stop of itself, and we can suspend its current between the wound and heart without too much inconvenience, we should call in the aid of compression; if it were actually necessary to act upon the wounded vessels, torsion would be the best means to use. We should not, consequently, have recourse to the ligature, unless it became indispensable. The parts being well cleaned, and properly brought together, are kept in contact by means of simple bandages, adhesive plasters, or the suture. Bandages generally suffice on the cranium, trunk, and limbs. Strips of adhesive plaster are much better for wounds of the fingers, which do not involve the bones, and for some similar wounds in the face. When the bones make a part of the section, it is almost indispensable to associate with these strips, splints of wood or pasteboard; it is then that the immovable bandage would also become valuable. But for the nose, ears, and around the mouth, the suture should almost always have the preference.

It is important, in these essays, that we should make but very little pressure upon the parts. If their exact contact is indispensable, a compression which would interfere with the circulation, would cause the whole to fail; in the place of having recourse to topical refrigerant applications, or to antiphlogistic means, it is better to wet the parts with aromatic and slightly stimulating lotions, such, for example, as spirits of camphor; it is well, also, that the wounded region should remain in a dependent position during some days. It is to be understood, also, that the surgeon should watch these wounds with the same care that he would all others; and that he should carefully prevent their lips from being disturbed, until the reunion is complete, or become impossible.

[Dr. Mott mentions to me the case of a penis severed by the sweep of a razor, in the hands of an enraged woman, almost entirely off, close up to the scrotum. It hung by a mere thread of integuments. Dr. Mott did not dare to hope for its restoration, but it did take place in the most perfect and natural manner.—*T.*]

Article II.—Restitution of Organs Completely Separated.

The restitution of organs partially separated, has rarely been regarded as impracticable, under the circumstances which I have just mentioned; but those are not the points of controversy in *anaplasty*, which are prevailing at the present time. The point which has found the greatest number of skeptics, and given rise to the most contention, is that relating to actual transplantations. It would appear difficult, in truth, for a part which has been completely isolated from the body, and then put back in its place, to be capable, under such circumstances, of reacquiring its vitality. Reflecting persons, therefore, have not been disposed to admit the fact, but upon proofs altogether conclusive.

These transplantations, however, were credited by certain persons in former times, since Lanfranc, Guy de Chauliac, and other surgeons of the middle ages, exerted themselves to prove their im-

possibility. There are, also, two kinds of transplantation, which it is proper not to confound: in one, it is the detached part itself which is reapplied, and which we endeavor to reunite—in which case we have a simple restitution; while, in the second kind, it is at the expense of another individual that we reconstruct the mutilated organ, by an actual transplantation. The idea of restoring to its place, a part completely separated from the body, prevailed also at a very remote time.

§ I.—*The Nose.*

One of the most ancient observations of this kind, appertains to Fioraventi, (*Secrets de la Chir.*, liv. ii.,) who, to convince the incredulous, replied to them thus: "Go visit Signior Andreas, who lives at Naples, and where every one knows his history; he will tell you that, happening on the spot where the accident occurred, I took up his nose, which had fallen in the sand, and washed it and replaced it in the best manner I could. Examine this nose, and listen to the statements which will be made to you, and we shall see if you can still call in question a fact so clearly demonstrated." The point of a nose which had been cut off, having been received in a hot loaf, was also reattached by Molinelli, (*Bonet, Corps de Méd.*, t. iv., p. 59,) with complete success. According to Blegny, (*Zodiaque Méd.*, Mars, 1680,) a nose which had been cut off by the stroke of a sabre, was replaced with no less success by Winseult.

An observation which acquired for Garengeot the title of a liar, related to a soldier, whose nose, bitten off by the teeth of an adversary, who threw it into the mud as he escaped, was afterwards cleaned, replaced in its position, and reunited by the barber Gallien. Though looked upon as fabulous by De la Motte, Dionis, and Lafaye, the transplantations of the nose are, nevertheless, reasserted in a thousand ways with circumstances fully as marvellous. There is one which is not less extraordinary than that of Garengeot: A man named Loudun had his nose entirely bitten off by the teeth of a smuggler. The patient had wrapped it in his handkerchief, where the surgeon who was sent for found it, cold and black. "I put the piece in camphorated spirit of wine," says Regnault, (*Gaz. Salutaire*, 1714, No. 26, p. 4,) "and washed it thoroughly; I then replaced it in the best manner I could, and kept the whole in place by a containing bandage. Three times a day, I sprinkled the upper part of the nose with the same camphorated spirit of wine. At the end of eight days I took off the dressing, and saw that the part had become attached, (*reprenait.*) As there were large lacerations, a suppuration came on which lasted a month; there finally resulted from it only two small cicatrices, slightly sunk in on the lower part of the organ." Leyser was not less fortunate than Fioraventi, in the case of a young man of respectable family; and Loubet (*Plaie d'Armes à feu*, etc., ou *Rev. Méd.*, 1830, t. iv., 119) had the same success at the battle of Rocroy.

Utterly incomprehensible as they would appear to be, these his-

tories seem, nevertheless, to have been confirmed by recent facts. A student, in fighting a duel, had the point of his nose cut off by the stroke of a sabre; having sent to look for the end of the nose, which was found under a chest, M. Chelius warmed it, then replaced it, and succeeded perfectly, though an hour had intervened between the accident and the operation! M. Bridenback says, in the same letter, that a dog having got possession of a nose that had been cut off, finally surrendered it to the surgeon, who took it from his mouth to restore it to its place, and that the operation was entirely successful. Germany, also, offers frequent examples of similar anaplasty. M. Hoffacker (*Annal. Cliniq. de Heidelberg*, vol. 4., cahier 2; *Bullet. de Ferussac*, t. xvii., p. 75; *Gaz. Méd.*, 1830, p. 403) alone, has published sixteen cases of them. Here is one of the examples which he gives:—M. Sch**, aged twenty, of medium height and strength, was wounded in a duel, January 1, 1825. The stroke of a sabre carried off, 1. The end of his nose to the extent of half an inch in all its dimensions; 2. A piece of the upper lip; 3. A piece of the lower lip and chin. All these parts fell upon the ground; the last was first found, and fixed in its place by fifteen points of suture; the point of the nose was not found until ten to fifteen minutes after the wound; as to the piece of the upper lip, it was searched for in vain. The end of the nose reunited to two-thirds of its extent, and the wounds of the lips cicatrized in six weeks.

When consulted by M. Champion on the authenticity of these facts, M. Chelius replied, that they had taken place under his eyes, that they could be received with perfect confidence, and that he possessed others in every respect similar to them. To explain their frequency at the University of Heidelberg, it suffices to know that sabre duels are there extremely frequent among the young men, and that M. Hoffacker has been appointed surgeon of duels, by the senate. It is next to impossible, therefore, to reject absolutely, and without qualification, all the histories of this kind that are related by authors. The case of a nose which was entirely detached, and which was reunited with success, is also related by M. Barthélemy (*Journal Hebdomad. et Univers.*, t. v., p. 15) on the faith of Regnault, of the Gros-Caillou. The nose removed by the bite of the teeth, could not be replaced until at the end of five hours, yet it reunited.

§ II.—*The Fingers.*

Similar observations, also, have been made on a great number of other parts. I have had a case, says Regnault, (*Gaz. Salut.*, 1774, No. 26, p. 4,) where I replaced, without any unpleasant result following, the whole external ear, that had been removed by the bite of a horse; and if my observations required proofs, I could furnish them.

In a long note by M. Magnen, (*Bullet. de la Facult.*, t. vi., p. 497 et 507,) we find also the case of a portion of the concha (the exter-

nal ear) entirely separated, and then reunited. M. Manni (*Filiatre Sebezio*, Mai, 1834; et *Arch. Gén. de Méd.*, 2e série, t. v., p. 300) has more recently related the history of an ear cut off by the stroke of a sabre, and which he reunited with success, by means of a suture.

The fingers, also, for half a century past, have been the occasion of numerous operations of anaplasty, by transplantation or restitution. Heister (*Institut. Chirur.*, p. 468) cites an example of it in the wife of a butcher. Bossu d'Aras (*Thomson, Trait. Chir. de l'Infl.*, p. 241) says he succeeded in a similar case; and Flurant mentions, according to M. H. Bérard, (*Rev. Méd.* 1830, t. iv., p. 416,) the case of a laborer who had the extremity of his left forefinger removed, and in whom anaplasty succeeded perfectly well, though the division had comprised the articulations of the two last phalanges.

These facts, nevertheless, were passed by unnoticed, when Balfour, in 1814, made known two others, with all the details that could be desired. Since that time, there have been published a great number of them in the periodical journals. Thomson, says that different persons, whose veracity he has no reason to suspect, have related to him a great number of examples, in which the phalanges of the fingers or toes had been totally separated, yet nevertheless reunited, (*Thomson*, p. 242.) A surgeon of d'Armentière, M. Lespagnol, (*Bull. de la Facult.*, t. v., p. 313,) published, in 1818, through the medium of M. Percy, an observation similar to that of Balfour. A similar fact was communicated, soon after, by Agouge, (*Ibid.*, t. vi., p. 50;) but information obtained from the spot, authorizes us to call in question the existence of any such physician, as well as the authenticity of his facts.

More recently, M. Houston (*Arch. Gén.*, t. xi., p. 447) has published the case of a thumb completely reunited in this manner. We find in the Bulletin of Férussac, (1830, p. 229,) an analogous observation taken from the English journals. M. H. Bérard, (*Rev. Méd.*, 1830, t. iv., p. 417,) on the authority of Wigorn, mentions the case of a young girl who had the muscular mass of the left thumb removed, and who recovered exceedingly well by anaplasty. One of the most ancient histories of this kind was published by Regnault, (*Gaz. Salut.*, 1714, no. 26.)

"A youth of fifteen or sixteen years of age, finding himself crowded by a chariot at the corner of a street, placed his belly against the wall and his left hand upon the angle of the same wall, in order to hold himself more steadily; the end of the axle-tree grazing a little too near this angle, tore off the little finger at the articulation of the second with the third phalanx. The finger had fallen, and the young man took it up; I was called immediately, and readjusted the detached finger, which I took care to keep in its place by a containing bandage. I made him hold his hand down, and the little finger in a glass of brandy during two hours. The finger united exceedingly well in a few days, and so perfectly, that to-day

he has as much strength in this part, says Regnault, as if it had never been detached."

It has nevertheless been necessary, in order to draw attention definitively to these facts, that many surgeons of known reputation should furnish others of a similar character. Sommé (*Traité sur l'Inflam.*, p. 42) has communicated a case of reunion of the end of a finger which had been completely separated. M. Piédagnel has related a similar case, (*Revue Méd.*, 1830, t. iv., p. 405.) M. Barthélemy (*Journal Hebdom. Univers.*, t. v., p. 15) speaks of a portion of skin removed from the inner side of the sole of the foot, and which reunited perfectly; afterwards of two similar reunions, where fingers had been severed. M. Beau (*Arch. Gén. de Méd.*, 2e série, t. iv., p. 472) practised anaplasty with success, in a woman who had lost her thumb at the Salpêtrière. M. Després, who at the Hôtel-Dieu endeavored to reunite a finger by the same method, says that just as Dupuytren, (*Ib.*, p. 480,) who did not believe in the reunion of the parts, was going to pull upon them underneath, to detach them, it was seen that the union, by intercommunication (*abouchement*) of the vessels, had in reality begun.

We ought, nevertheless, to add, that many of these cases not having been attended, in all their stages, by the same person, and being found almost always deficient in details, have continued to create a certain distrust. I myself hesitated to admit of their accuracy, until an observation absolutely conclusive, succeeded, in 1837, in removing all my doubts. A member of the Royal Academy of Medicine, M. Gorsse, cut off the pulp of the left forefinger by the stroke of a razor; the piece fell upon the ground; the patient hastened to pick it up, cleaned it and reapplied it, and held it in its place by means of a handkerchief. Having reached my study in less than half an hour, he again let the end of his finger fall while unwrapping his hand. Having picked up this fragment of tissue, I washed it in pure water, replaced it accurately upon the wound, which still bled, and fastened it there by means of small compresses, and then a roller bandage methodically applied. It was agreed that the dressing should be saturated with spirits of camphor, three or four times a day. Pains, somewhat acute, were experienced for the space of a week. I renewed the bandage on the fifth day, and again on the tenth, and finally removed it upon the twentieth. No suppuration had taken place; the cuticle alone had assumed a dark hue, and came off in the form of an eschar on the twenty-fifth day. The portion of skin and fatty cellular tissue had reunited completely; and M. Gorsse, showing his finger a month afterwards, perfectly cicatrized, brought conviction to the minds of his associates, in presence of the whole Academy. A similar accident happened to another surgeon of Paris, with this difference, that the flap of integuments still held on by a filament of cuticle, and that the size of the flap was only a fourth part that of M. Gorsse.

[*Reunion of a Completely Separated Portion of Finger.*

The case of M. Velpeau, in the text, is fully confirmed by one of Mr. Alex. Graham, at Edinburgh, (*Edinb. Monthly Journ. of Med. Science*, April, 1841,) in which a joiner, of middle age and healthy constitution, entirely severed the left forefinger by an axe, between the first and second phalanges. He lifted the separated part from among the shavings, and walked a few yards to where the surgeon happened to be. Being asked for the separated portion, he took it out of his waistcoat pocket and laid it on the table. Mr. Graham fixed it on by two sutures and an adhesive strap, and on the fourth or fifth day the patient found that the part had recovered its sensation, as he could distinctly feel when it was touched by the point of the scissors. Complete union was effected, and a perfect restoration of the powers and functions of the finger.

Another more recent confirmation of the above cases, is related by Signor Della Fanteria. A girl, aged fourteen, had two of her fingers severed below the first phalanx by a knife. The two pieces were soon after found in some meal, but each piece was separated into two portions. He replaced them together, and kept them upon the parts from which they had been separated, by sutures and strips of plaster. In a few days the adhesion was complete. Marvellous as this case appears to be, its authenticity is confirmed by Professors Centofanti and Vacca.—(Vide *British and Foreign Med. Rev.*, July, 1842.)—*T.*]

I do not, therefore, see how we can possibly call in doubt, at the present time, the practicability of uniting, by anaplasty, tissues that have been completely separated from the body. In admitting that most of the facts related until now, are doubtful, or that they have been imperfectly detailed, it is certain that some of them have a real existence. It would be of no avail, for the purpose of refuting them, that we should adduce facts of a contrary character, or the want of success in cases of a similar kind.

In place of rejecting this class of observations, surgeons consequently will, in future, examine into them, and reserve a place for them in practice.

We must not on that account suppose that all parts of the body may be thus agglutinated. The favorable or unfavorable conditions, also, are the same for this order of reunions as for cases of incomplete division. It is, therefore, in the fingers and toes, and in the palm of the hands and sole of the feet, in the nose, ears, and face, and even in the bones of the cranium, as we had already seen by some observations of Ambrose Paré, M. Maunoir, and M. Walther, that we may have reason to hope for success.

M. Chelius, who has frequently seen cases of this kind, thinks that if success is an object, so far from being in a hurry, we should await the cessation of the bleeding; that we ought not to allow ourselves to be misled by the unpromising appearance of the part which has been separated; that even if it assumes the aspect of gan-

grene, there ordinarily results from it desquamations only of the cuticular lamellæ, (*lames epidermiques;*) and that the important point is, to put the wounded surfaces into perfect contact.

The choice to be made between adhesive plasters, the suture, or simple bandages, will depend upon the same circumstances as those I have previously pointed out. Though, at the end of five or six days, we notice the tissues to be of a blackish hue and flabby, as if mortified, still we must guard ourselves against abandoning every hope. Though there should even be an elevation of the cuticle in the form of phlyctænæ, with a reddish (*roussâtre*) liquid, we should be wrong, provided the flap has contracted adhesions, not to continue to use means of reunion. The greater part of the facts that are given with details, prove that after the desquamation of some external layers, the rest of the flap remains not the less adherent to, and engrafted upon, the primitive wound.

CHAPTER II.

ANAPLASTY BY HETEROGENEOUS TRANSPLANTATION.

In all the cases that we have been speaking of, it is the part itself that we agglutinate; but in another series of facts, we see that the mutilation has only been repaired by borrowing from other parts, or other individuals. It is in this respect that anaplasty may be compared, in every particular, to the engrafting of plants. However surprising and inconceivable this species of organic reunion may at first sight appear, it is nevertheless founded, at present, upon a certain number of experiments of very great importance. It comprises two varieties. Sometimes, in fact, in order to remedy a deformity, we borrow a part similar to that which has been destroyed; sometimes, on the contrary, we repair the mutilation at the expense of parts altogether different.

The nose and teeth have served as a point of departure for these two kinds of operations.

Article I.—Transplantation of Analogous Parts.

Ambrose Paré had already spoken of a sound tooth, which, extracted by mistake, and immediately reinserted, had continued to live. A fact exactly similar, is related by Pomarest, (*Bonet*, t. iv., p. 404.) From thence arose the practice of borrowing teeth, to replace those that had been lost. Hunter says that he had ascertained an actual vascular reunion between the new tooth and the socket. M. A. Cooper possesses a specimen (*pièce*) similar to that which served as the foundation for Hunter's assertions. Fauchard, afterwards corroborated by Bourdet, maintains even that a tooth,

dead in all respects, when introduced into a living socket may be retained and remain there for years, without the intervention of any mechanical means, (*Thomson*, p. 236 *à* 241.) The proof, says Fauchard, that these transplanted teeth actually live, is, that we can neither plug them nor sound them, when they are carious, without occasioning the most acute pain.

[That a human tooth that has been for years out of the body, and thus, in common parlance, *dead*, nevertheless possesses the principle of vitality to a certain extent, and in a dormant state, like those seeds of wheat that have been for thousands of years hermetically sealed, as it were, and debarred from the vivification of their germinating properties, in Egyptian sarcophagi, is a fact that is familiar to every dentist; since such teeth, set in the mouth even upon plates of metal, and especially of seahorse bone, are well known to reacquire their vital energies by this mere contact with the heat and breath of a living person, so as actually to become carious, and decay like a living tooth in its socket, though of course without any pain. We doubt, however, if such teeth inserted as stated above in a living socket, could ever possibly become repossessed of that degree of vitality which would assimilate their functions to those of the living parts in which they were located. The mechanical experiments of charlatans in these matters, and which are too well known, have produced the most disastrous consequences, in their attempts to force the agglutination of fresh healthy teeth of another person, transplanted into sound gums where decayed ones had been removed to give place for them. Destruction of the alveoli, gums, and parts of the jaw, and extensive ulcerations and abscesses in the roof of the mouth, vault of the palate, etc., have been some of the fruits of this empiricism. And the thing is not singular, when the immense disparity, and proverbially known capriciousness of form, seen in the roots of teeth, are considered; for how is it possible that there ever can be a coaptation of the tooth of one person to the alveolus of another? though we doubt not, if by quickly shaping the former to a mould, taken as quickly, of the cavity of the latter, by any mechanical means, the parts containing and contained could be brought into as close contact as in the case of the finger related by the author of this work, that a reunion, more or less perfect, would take place. There is no knowing, in fact, whether, in the unexampled progress of scientific discovery in our days, a mode may not be discovered, resuscitated even from the destructive experiments hitherto made by dental charlatans, which shall establish a new and most profitable order of anaplastic operations, by the insertion of fresh living teeth into the toothless gums of those whose alveolar processes have not yet been absorbed by age. A series of well-conducted, careful experiments, might even lead to the formation of an artificial socket in a sound cicatrized gum and alveolar border, and the immediate insertion there of a fresh living tooth, whose exact form and dimensions had served as the model for the cavity to be excised. Some curious facts of deep abrasions of parts in anaplastic operations, and that have,

nevertheless, healed perfectly, might trace the way for such experiments.—*T.*]

[*Transplantation of a Sheep's Tooth into the Alveolar Socket of a Child.*

M. Twiss, of Kerry, (Ireland,) states that he extracted the remainder of a broken front tooth from a young lady aged fourteen, and transplanted into its socket (April 24, 1841) the front tooth of a yearling sheep, reeking from the jaw of a living animal, previously shortening its root about a quarter of an inch. It sat rather loose, but after the first week it became firm and soon enlarged, but less than it would have done in the animal to which it belonged. M. Twiss recommends the teeth of the sheep from the cleanliness of this animal, and from the beauty and aptitude of their form. He would prefer the teeth of sheep of two or three years old, as at that age they are about the size of adult human teeth, and are more likely to grow when transplanted. The root may be shortened or pared to fit in its new situation, and kept in place by waxed silk ligatures.—(Vide *London and Edinburgh Monthly Journal of Medical Science*, Oct., 1842.)—*T.*]

The history of noses restored in this manner are numerous and ancient. Van Helmont relates, (*De Magnetica Vulner. Curat.*, p. 459,) that a man thus repaired saw, at the end of thirteen months, his borrowed nose putrefy and fall, at the moment when the porter who had furnished it died. Dionis was told, (*Demonst. des Oper.*, p. 589, 7e demonst.,) that a robber, whose nose had been cut off, ran to a surgeon, who asked him for the piece, in order to replace it. Having lost it, his comrades immediately ran out, cut off the nose of the first person they met with, and brought it fresh to the surgeon, who reunited it in the most perfect manner.

But, besides that none of these facts of anaplasty are authentic, or even probable, we cannot see how it would be possible to find venders of the article, even though it were allowable to appropriate in this manner the nose of another person.

Article II.—Transplantation of Parts that are Different.

A method which consisted in reconstituting a nose, or any other organ, by means of integuments borrowed from the breech of another person, is one which it appears has been very anciently practised in India. M. Dutrochet affirms that, upon the evidence of his brother, a general-in-chief to an Indian prince, a subaltern officer, who had had his nose cut off, went to consult some of the natives, who willingly undertook the cure. At the end of a certain time, these Indians selected a place upon the breech, which they excited into a swelling by repeatedly striking upon it with their slippers. Having cut out from this part a piece of tissue of the proper form, they applied it, and successfully kept it in its place upon the destroyed nose. If there were only this fact in favor of the animal engrafting of which I am now speaking, it would be unnecessary

to occupy ourselves any farther with it; but the experiments of Duhamel, (*Acad. Roy. des Sc.*, 1746,) from whence it results that the spur (*l'ergot*) may be engrafted upon the comb of a cock; those of Hunter, which confirm the same fact; the case of the testicle of the same fowl, which, after being introduced into the belly of a hen, continued to live; the experiments of Baronio, which, if we are to credit him, would prove that the wing of a canary bird, or the tail of a cat, can also be engrafted upon the comb of a cock; other facts, also, from which, according to Bartholin, it would result that the flesh of a sheep, placed upon the wound of a sailor, adhered to it, and soon effected a cure; and the fact related by Olaus, of a portion of a fowl which had been advantageously employed in the cure of hare-lip; all tend to prove that actual animal engrafting is, perhaps, not absolutely impossible.

Supposing, however, that this was of easy execution, it would be difficult, as may be seen, to derive any advantage from it, seeing that no person probably would be willing to submit themselves to such operations. There has, nevertheless, been presented in my division of the hospital of La Charité, a case, in which, strictly speaking, it would have been allowable for me to have undertaken this species of transplantation, and I really regret that I did not profit of the opportunity. A patient had two deformed toes removed from him, which were otherwise perfectly sound. Another patient, whose fingers had all been destroyed by being frozen, would have liked nothing better than to have had a small hook on each of their stumps. It might have been, in this manner, easy for me to have engrafted the toe of the well man upon the metacarpus of the maimed one.

In conclusion, the question of animal graftings, by transplantation from one individual to another, does not, as yet, offer any facts which operative surgery can profitably occupy itself with. With the few remarks above, therefore, I will conclude what I had to say on this subject.

CHAPTER III.

ANAPLASTY BY TRANSPOSITION.

In place of bringing back to the mutilated part the portion which has been completely separated from it, as in anaplasty by transplantation, we confine ourselves in anaplasty by transposition to cutting and dissecting off the tissues, without wholly detaching them, in order to draw them suddenly, or by degrees, to the destroyed parts. Almost the only kind now in use, this species comprises two varieties that are very distinct; the one consists in seeking at a distance the tissues suitable to repair the mutilation, the

other, on the contrary, borrows them from neighboring regions. Destroying but incompletely the continuity of the flap, anaplasty by transposition has nothing in it repugnant to the laws of the organization, nor contrary to sound surgery. The whole consists in knowing how to cut in a proper manner the parts of which we stand in need, and to preserve for them a pedicle, or proper points of adhesion.

Article I.—Anaplasty by Remote Flaps, or the Italian Method.

One of the most ancient modes of anaplasty consists in cutting the patches, which we have need of, from a region more or less remote, and completely distinct from that which it is our object to restore. This method seems to have had its birth in Italy, or in India. I shall, however, designate it under the title of the Italian method.

Every thing shows that it was first put into use by practitioners, of whom history has not preserved the name. The family of the Brancas do not seem to have originated it. If Bojano, or Voiano, have been enabled to discover its source in Calabria, without pointing out its author, it is evident, that it was an ancient method, and one whose origin was already lost. Tagliacozzi, who seems to appropriate to himself the title of its inventor, has, in strict justice, the merit only of having regularized and perfected it, and of ultimately introducing it into practice. In this species of anaplasty, the progress of science has established many processes.

§ I.—*The Italian Process.*

Tagliacozzi was in the habit of taking his flap from the outer and front part of the arm. This flap, of a triangular form, and whose base remained adherent, was immediately fixed upon the destroyed region, which had been previously pared, (*avivée.*) When it was sufficiently agglutinated in its new position, the surgeon cut through its root, in order to set the arm at liberty. Nothing more then remained to be done, but to mould the borrowed piece upon the organ to be restored, and to shape it to its new uses.

Frequently performed in Calabria in the fifteenth and sixteenth centuries, the Italian method has been the object of some new trials in more recent times. M. Roux made use of it in my presence upon a young girl, in whom he wished to close up a hole in the face ; M. Signoroni likewise employed it for a mutilation in the face. It is, nevertheless, almost entirely abandoned. If we still wished, however, to make trial of it, we should not forget that the restorative flap suits so much the better, in proportion as the integuments of which it is formed are thicker, more homogeneous, and more vascular.

As it is almost impossible to keep the parts in a state of perfect rest by means of adhesive bandages, stitches of suture, sufficiently approximated, should, I think, merit the preference over containing

dressings, properly so called. It would, furthermore, be superfluous to dwell upon the necessity of not comprising in the incision any more than the teguments and the sub-cutaneous tissue. If Vesalius, Paré, and others, in citing the Italian method, have spoken of the biceps muscle, it has been by inadvertence. The plainest reflection is sufficient to show, that the flap which the Brancas and Tagliacozzi made use of was never cut at the expense of the muscles. The wound which results from it ought, moreover, to be dressed like any other simple wound. Before detaching the base or pedicle of the flap, we must assure ourselves that it is perfectly agglutinated, and that it has acquired vitality at its edges. This separation being made, we trim its angles with the scissors, so as to adjust it accurately upon the region upon which it is to remain. From fifteen to thirty days are in this manner generally required to complete the operation. Sooner than this period the new circulation might not be established; at a later period it would have nothing to gain. The adhesion of the borrowed flap is well advanced at the end of the second week, or it will not have taken place at all.

§ II.—*Process of Graefe.*

Perceiving that the patch of skin, separated in this manner, has a great tendency to become gangrenous, that it agglutinates with difficulty, and also contracts to a considerable degree, some modern surgeons have adopted the plan of not applying it immediately upon the new region, and of giving it time to contract and to cicatrize upon its edges while yet in its place. In operating upon a young man, who had already submitted, without success, to another kind of anaplasty, M. Graefe, after having cut the flap upon the fore-arm, left it to cicatrize separately, and did not make the attempt to unite it to the nose until after the expiration of some months; he took thus more than a year to complete the operation, which, moreover, succeeded perfectly. It is, in fact, true, that in the limbs the cutaneous flaps are too thin, and are provided with too large a proportion of adipose cells, to agglutinate with facility to the teguments of other regions, or to be exempt from readily becoming gangrenous. In this respect, there are, in reality, some advantages in leaving the flap free, after it has been cut. It is then seen to retract (*revenir*) upon itself, in the direction of its two largest diameters, to become thicker and firmer, (*se durcir*,) and more and more vascular, and to assume, in fact, some of the characters of the integuments of the cranium, or of the face. When it has become so, we may, without fear, pare (*aviver*) its edges, and fasten them, either by suture or bandages, on the part which is to become their new residence. We afterwards proceed for the wound which results from this flap, and for the section of its root, when the flap has become adherent in its place, as we do in the process of Tagliacozzi himself.

I should, nevertheless, add, that these precautions would be unnecessary for a flap cut from the palm of the hand, the sole of the

foot, or from the cranium or face. The arteries that course upon the internal surface of the skin in those regions, keep up too active a vitality there, to permit us to have any apprehension of mortification. Even on the body of the limbs, the plan of M. Graefe would not be necessary, unless the flap should be of great length, and had more breadth in its free portion than at its base or root.

Article II.—Anaplasty by Flaps from Neighboring Parts, or the Indian Method.

The method which consists in taking from the neighborhood, tissues to repair the loss of substance in a mutilated organ, comprises, in truth, a great number of modifications; all of them, however, may be reduced to two principal kinds:—Sometimes, in fact, we cut a true flap in the neighborhood, but beyond the circumference of the deformity, and in such manner as to be enabled to reverse it, turn it around, (*le contourner*,) and adjust it, (*le ramener*,) like a patch upon the part that it is to cover: it is this fundamental character of a pediculated flap, which constitutes, in my mind, the Indian method. At other times, we confine ourselves to separating the parts all around the ancient solution of continuity, in order to be enabled to elongate, approximate, trim, (*découper*,) and adjust them in contact by their free border, without either reversing or twisting them. This is what I shall call the French method.

The anaplasty which consists in cutting flaps completely independent of the mutilated organ, but at such distance as allows of our immediately covering them with it, is evidently derived from the Italian method, of which, in reality, it is nothing more than an improvement. It comprises, moreover, three or four processes.

§ I.

The Indians of the tribe of *Koomas*, formed a flap sufficiently large to fill up, in a suitable manner, the voids in the organ destroyed. Being turned over from above below, and twisted upon its pedicle, they afterwards fastened this flap to the previously pared (*avivées*) lips of the part to be reconstructed. In acting in this manner, there is generally preserved only a very narrow pedicle to the flap, and as this pedicle has to be twisted upon itself, there are but a very few regions where the method of the Koomas presents positive chances of success. Moreover, they employed it only to the nose, where the vascularity of the skin, and the homogeneousness and thickness of the subjacent tissues, render gangrene difficult in the parts that are separated. It results from this, that in the chest, arm, and thigh, where I have attempted to employ it, it offers no longer the same chances of success. It is on that account, that early attempts were made to modify it.

§ II.

In cutting the flaps thicker, (*plus largement,*) it has been found practicable, 1. To turn them back from below upward, thus folding them upon themselves, without twisting them, as I have done for fistulas; or, 2. To twist them, as Delpech did in cheiloplasty; or, 3. To detach them (*les dédoubler*) from within outwardly, to bring down their free border in another direction, as M. Roux has done in a case of genoplasty. In certain cases, the flap once cut has admitted, 4. Of being rolled up like a cork, (*roulé en bouchon,*) and held by a large root, as I have frequently done; but all these modifications, and also some others of the Indian method, will be more easily understood in their special applications, than under the general head of anaplasty.

Article III.—Anaplasty by Separation of the Tissues.

We find some expressions in Celsus, which would lead us to believe that at the time of this writer, the mutilation of the ears, nose, and lips especially, was sometimes repaired by a species of anaplasty. Celsus says, in fact, (*Lib.* 7, *cap.* 9, *ou trad. de Ninnin.*, t. ii., p. 275:) We begin by seizing hold of the borders of the mutilated part; after which we make incisions at the inner angles of the wound, in order to separate its flesh and skin below from those above; we then take the portion which has been thus detached, and bring it upon the part we wish to repair. If the edges do not approximate sufficiently, says Celsus, (*Ninnin.*, t. ii., p. 275,) we must make, in a crescent form, two other incisions, whose points should be turned towards the wound, and which should not penetrate deeper (*plus avant*) than the skin: "Alias duas lunatas, et ad plagam conversas immittere quibus summa tantum cutis deducatur." This text, however, is sufficiently obscure to have allowed of discovering therein the internal separation (*décollement*) of Roonhuysen, Van Horn, and Pauli, and the external gashes (*balafres*) of Guillemeau and Thévenin. Valentin, (*Recherches Critiques sur la Chir. Moderne*, p. 249,) who severely reproaches Louis with having misunderstood these authors, and of imputing to them a practice which they were not chargeable with, would have been in the wrong, if Louis had not confounded the precept of Van Horn with that of Thévenin, since the semilunar divisions of some, and the internal dissections of others, seem both alike indicated in Celsus. It may also be urged as an objection, that these different passages, whether of Celsus, or of Thévenin and Guillemeau, or of Van Horn, Roonhuysen, Pauli, etc., relate rather to hare-lip, than to legitimate anaplasty.

§ I.—*Process of Franco.*

But Franco (*Traité des Hernies*, chap. 122, p. 462) explains him-

self, on this subject, in a manner altogether unequivocal. If anaplasty by separation of the tissues were not found in the Latin authors, it would, however, be impossible not to recognise it in an example related by him with much detail, and in which we perceive that he succeeded, by this means, in closing a hole which a man had had for a long time in his face.

The anaplasty of Franco, or by the French method, exposes to fewer deformities than any of the others. It is founded upon this principle, that when once separated and detached (*decollés*) from the subjacent parts, the cutaneous and the cellulo-adipose and musculo-cutaneous tissues, yield, elongate themselves, and allow of being easily drawn to a very considerable distance. In adopting it, we succeed perfectly in putting into contact the sides or borders of very deep notches, (*échancrures*,) and in filling up (*combler*) great losses of substance. We should, nevertheless, be wrong in therefore concluding, like some modern surgeons, that by this method it is always possible to procure a great elongation of the parts. In all regions where the teguments are dense, or the tissues are firm and adherent, it would be necessary to effect a separation of some inches to obtain an elongation of some lines. Persons with retractile tissues, and firm flesh, are rather unfavorable subjects for it. In the face, there is scarcely any other part than the lower portion of the cheeks, and the chin, which will advantageously allow of it; in the cranium, we would succeed still less frequently; on the neck, breast, and abdomen, and on the body of the limbs, it is, on the contrary, a species of anaplasty which gives us great resources. To sum up, it is the method which is the best safeguard against gangrene, and which allows of the speediest cure, and exposes to the least risk of deformity. At the same time that it does not exact the absolute displacement of any flap, it does not require wounds upon the skin of sound regions; but it has the disadvantage of not filling up, except by means of tractions, (*tiraillements*,) and often in an imperfect manner, those voids in which there have been extensive losses of substance. Compelling us to destroy the natural adhesions of parts to a considerable extent, it singularly favors erysipelatous inflammations, angioleucitis, and even phlebitis and the formation of dangerous purulent collections.

It should not, therefore, have the preference, except, 1. In individuals or in regions where the integuments have an easy play, (*un glissement facile*;) 2. Where our object is to remedy losses of substance that are of greater breadth than depth; 3. Where, by adopting the Indian method, we should be compelled to cut the flaps in those places where it was important to avoid all cicatrices and deformities. It will be seen, however, that the method of separation of the tissues, is one of those anaplasties that we shall have the most frequent occasion to apply; it results from this, therefore, that it embraces many varieties.

§ II.—*Anaplasty by Internal Incisions,* [*or scorings,—T.*] (*decoupures internes,*) *or the Process of Celsus.*

Though the text of Celsus leaves much to desire, it seems however that some surgeons of his time, with a view to elongate the lips, the nose, and the ears, separated those parts from the surface of the bones, and afterwards scored them in different directions, upon their internal face. This process, which has the advantage of leaving no cicatrix upon the skin, and of placing all the wounds in the interior, is not certainly to be despised, but it procures, in fact, but a very moderate elongation, and does not answer but in a very small number of cases.

§ III.—*Anaplasty by External Incisions,* [*or scorings,—T.*] (*decoupures externes,*) *or the Process of Thévenin.*

A modification of French anaplasty, might be derived from the language of Thévenin, (*Œuvres*, in-fol., edit. 1658, p. 28,) and of Guillemeau, (*Œuvres*, in-fol., edit. 1649, p. 682.) In place of cutting the separated parts perpendicularly, upon their internal surface, it is upon the skin (i. e. externally) that they afterwards score them, according to the process of those authors. Thus, to relax the tissues, they make on each side, at some distance from the wound, long straight or semilunar incisions, which go through (*comprennent*) the entire thickness of the integuments. There is no doubt that by this method we may, from having a less extensive internal separation, favor better the reunion of the separated lips of the wound, than by the process of Franco or Van Horn; but, on the other hand, we create cicatrices upon the surface, and deformities, from which the other method exempts us. The regions where the sub-cutaneous tissues are more extensible than the skin, or where a uniformity of the surface of the body is a matter of little importance, are consequently the only places which occasionally allow of a preference for this method.

[Dr. Mott cannot conceive what utility there could have been in the incisions upon the inside, as it is not the sub-cutaneous tissues that resist. They are always sufficiently extensible. It is the incisions on the skin itself, externally, therefore, which are the important point to be attended to—as that is the part whose elongation we desire.—*T.*]

§ IV.—*Anaplasty by Simple Lateral Incisions. Process of Dieffenbach.*

These lateral incisions, which are only spoken of by Guillemeau and Thévenin in reference to hare-lip, have been adopted, in our time, first by M. Dieffenbach, afterwards by a great number of other practitioners, who have more or less modified them. Thus, without separating the parts upon their internal surface, they are

abraded and then reunited by the lips of the division; but in order to relax the parts, and to prevent all traction of the suture, there is made, upon each side, an incision which comprises the whole thickness of the skin, and which, in place of being shaped into a semicircle, is made parallel to the wound created by the loss of substance. It is an operative method, which has already been put in practice about the mouth, cheeks, and velum of the palate, and upon the sides of most fistulas, and one which I have made trial of, also, in certain cases of artificial anus, ulcers in the limbs, and perforations in the vault of the palate. I feel that I am also justified in saying, that wherever the cicatrices do not disfigure, as about the genital organs, and the anus, and in the interior of the mouth, vagina, and rectum, that it is a process which has not yet been sufficiently introduced into general practice.

§ V.—*Anaplasty by Transportation of a Cutaneous Bridge.*

It has appeared to me, that in certain cases it would be advantageous further to modify this kind of anaplasty; that is to say, that in order the more easily to approximate the two borders of a great destruction of substance, in the limbs, for example, it would not only be useful to incise the integuments on each side of the deformity, to a great length, but also to separate them, [the integuments,] in order to construct from them a flap in form of a bridge, adherent by its two extremities, but capable of being stretched to a very considerable distance by its inner border.

§ VI.—*Anaplasty by Raising an Arcade of the Integuments, (par soulèvement d'une arcade tégumentaire.)*

I have modified, in still another form, the bridle which I have just spoken of. After having incised it, and separated it as in the preceding case, I have thought it advisable to raise the flap which I had thus dissected from the recto-vaginal partition, up to the interior of the bladder, with the view of closing a vesico-vaginal fistula.

§ VII.—*Anaplasty in the Manner of a Drawer, (en tiroir.)*

In order to obtain a complete elongation, Chopart had, as it appears to me, the idea, not only of separating the tissues to be displaced, but also of forming a flap with them, by means of two parallel incisions. This process, which I have many times seen employed by M. Roux, in 1824 and 1825, which allows of our giving to the flap such shape as we wish, and of carrying it up or drawing it across to the opposite border of the mutilation, is now definitively introduced into practice. Applicable especially to the lower lip, the process of Chopart is equally suitable to the forepart of the chest, and to some regions of the abdomen and limbs. I have to say, however, that in order to fill up in this manner a wound of

three inches extent, after the removal of a breast, I was obliged to cut from below a square flap of nearly five inches in length, and which ultimately terminated in mortification.

§ VIII.—*Anaplasty by Invagination.*

M. Blandin (*Thèses de Concours*, 1836) admits, as a species of anaplasty, the operation which consists of invaginating the integuments in certain musculo-fibrous canals, the inguinal, for example, to make a radical cure of hernia; but I do not think that this invagination can be arranged under any head in the class of anaplasties.

As to the other different modifications and varieties of the processes of anaplasty which I have been describing, it will not be possible to point them out and to appreciate them, but when treating of this class of operations in the regions to which they are most easily applicable.

PART SECOND.

ANAPLASTY IN PARTICULAR.

Reason points out, and practice proves, that anaplasty is applicable to almost all the regions of the body, and that the different modifications of this operation should be estimated precisely according to the nature of each organ that requires it.

CHAPTER I.

ANAPLASTY OF THE CRANIUM.

There can be no doubt that we could transfer to the cranium, all the different kinds of anaplasty which I have spoken of above. As the mutilations of this region do not, but in a very inconsiderable degree, compromise the beauty of the person, it has scarcely been thought of for them. The lateral slits of Thévenin, and the method of Franco, are almost the only ones which permit of application, in cases that relate to the destruction of parts in the hairy scalp. But anaplasty by transplantation, or animal engrafting, has more than once been made trial of on the bones themselves. Some surgeons, for example, relying upon the experiments of Duhamel,

and of Hunter, have thought, that after the operation for trephining, it would be possible to replace and reconsolidate the osseous disc, in the part from whence it had been removed, and to reunite the soft parts over it.

Job-a-Meckren (*Gooch on the Wounds, &c.*) had already mentioned the case of a Russian nobleman, who, having lost a portion of the cranium, undertook to replace it with an osseous plate, taken from the head of a dog, and that the operation was perfectly successful. Also, M. Maunoir (*Dict. des Sc. Méd.*, art. *Ent. Animale*) formally advises this method, to protect the brain after the operation of trephining. Some facts, more remarkable still, have been since related. After having laid bare the cranium of a dog, M. Walther removed a disc of it by the trephine; the piece, completely denuded of its soft parts, was replaced a little while after, and the integuments having been brought over, it immediately reunited. The dog was killed a year after, and hardly a trace of the callus could be found; but the bony disc was paler than the rest of the cranium. After having performed the operation of trephining upon a man, M. Walther, finding no disease existing under the bones, immediately returned to its place the disc which he had just removed. A suppuration ensued, which continued three months, and was followed by the separation of a scaly plate of bone; but this plate comprised only the external table of the disc, and did not prevent the other part from consolidating perfectly. M. Merem, therefore, thinks himself authorized to conclude, that it is proper in this way to reapply the fragment removed by the trephine, as often as we wish to attempt the immediate reunion of the wound. For myself, in reflecting upon the case of M. Meckren, the facts of M. Walther, or the experiments related by MM. Maunoir, Dubreuil, etc., I deem it incumbent upon me to proscribe this kind of anaplasty, seeing that it would be a means of favoring inflammation, or suppuration, within the cranium, and that the fact of the reconsolidation, spoken of by authors, is not yet absolutely demonstrated.

[Dr. Mott remarks, that he would deem such an attempt in the highest degree reprehensible.—*T.*]

CHAPTER II.

OTOPLASTY, (ANAPLASTY OF THE EAR

The art of repairing the ear, is as ancient as that of restoring the nose. Galen, and Paul of Egina, as well as Celsus, speak of both. Every thing leads us to believe that the Brancas, and other surgeons of Italy, made many improvements in this process during the

course of the fifteenth and sixteenth centuries. In the example given by Tagliacozzi, he says, that after the cure the resemblance between the two ears was so exact, that they might readily be mistaken for each other. Otoplasty, however, had ceased to be spoken of when Dieffenbach attempted to reintroduce it into Germany. No doubt, if the whole body of the ear (*pavillon*) was entirely carried away, we ought to give up the idea of restoring it, and to decide, as in the time of Paré, to replace it by a metallic ear; but when it is destroyed only in part, and that at least one half of it is remaining, we may endeavor to restore it to its natural dimensions. The lobe, especially, could be very easily reproduced. While the loss of substance does not comprise more than the anti-helix, or though it should even include almost the whole of the helix, we still should not despair of success. Without ever acquiring the firmness of the destroyed cartilages, the new tissues that are put in their place, attain sufficient consistence to render the deformity of the ear much less repulsive.

[Dr. Mott has seen the whole external ear restored, where it hung down and was held only by a small pedicle.—*T.*]

The Indian and the Italian methods, moreover, are the only ones applicable to the ear. To the cases of otoplasty by restitution, which I have already spoken of, it is necessary to add the successful case of this kind which has been related by M. de Renzi, (*Filiàtre Sebezio, etc., Gaz. Méd.*, 1834, p. 634,) remarking, at the same time, in reference to myself, that I have twice made trial of it without success.

The Operation, (Manuel Opératoire.)

As with the nose, it is the skin of the neighborhood which is to furnish the material for reparation, (*raccommodage.*)

First Stage, (Premier Temps.)—We commence by excising, shaping, (*régulariser,*) and paring (*rafraichir*) the mutilated border of the ear. We afterwards separate above, below, or at the posterior part of the concha, (*conque,*) the integuments which cover the temple, mastoid process, or subauricular fossa (*échancrure*) in the neck, a little nearer to the meatus auditorius than in a line with the abraded (*avivé*) border, but in a direction parallel with this border. Another incision, of greater or less length, made at each extremity of the first, allows of our giving to the flap the form and extent that we wish, an extent which ought at least to be one half greater than the loss of substance would seem to indicate. In dissecting this flap in a circular direction, (*direction excentrique,*) that is to say, from the first wound towards its adherent border, it is important to turn over with it a sufficiently thick layer of the cellular tissue which lines its posterior surface, and which furnishes it nutrition and life.

Second Stage, (2e Temps.)—The surgeon immediately adapts the free border of the flap (*opercule*) to the bleeding wound of the external ear, and effects its reunion by means of short fine needles,

and a sufficient number of turns (*points*) of the twisted suture, delicately adjusted. To finish the operation, we have nothing more than to pass behind the kind of bridge which results from this arrangement, a small band of linen, spread with cerate, the object of which is to prevent the reunion of the dissected skin. After having enveloped the whole with compresses, wet with tepid water of marsh-mallows, we replace or leave the patient in his bed. At the end of three, four, or five days, if the adhesion is accomplished, we may remove the needles, those at least that correspond to the points the most solid. In the contrary case, we should examine if it is not advisable to substitute new ones in the place of some of the first. When the cicatrix is solid, that is to say, from the fifteenth to the thirtieth day, we separate from the cranium the tegumentary flap, which being now liberated, requires additional attentions.

Third Stage, (3e *Temps.*)—In the first place, it is requisite to remove all the inequalities of this flap, to round off its angles, in a word, to adjust its external border. In the fear that it may mortify, we renew the dressings with emollient applications, for some days; afterwards we treat it, as well as the wound which is left upon the head, like any other solution of continuity. In retracting, it thickens and hardens, and takes the form of a raised border, (*bourrelet*,) and after being first pale, then becomes red, and remains for a considerable length of time more highly colored than the parts surrounding the external ear. Such, at least, were the appearances in a case reported by M. Dieffenbach.

[*Otoplasty* has been successfully performed by Dr. M'Clellan, of Philadelphia, (*Reese's Ed. Cooper's Surg. Dict., Loc. Cit.*) The external ear was buried in the adhesions of the cicatrix following a wound of the head, and the deformity was remedied by dissecting out the cartilage, and elevating it to its normal position, by flaps taken from the adjacent integument.—*T.*]

CHAPTER III.

RHINOPLASTY, (ANAPLASTY OF THE NOSE.)

In Italy, and also in India, it was formerly the practice to cut off the nose of criminals. Sextus Quintus caused it to be enforced upon thieves and rogues; the king of Goorka inflicted the same upon the inhabitants of Kirtipoor, in order, he said, that he might recognise them everywhere, and to be able to apply to them the vile epithet of *Nascatapoor*. Persons have been seen who have themselves cut off their own nose, to escape pursuit, or who have deprived others of it from motives of vengeance. Charles II. thought he could not inflict a more cruel punishment upon the earl of Coventry, who had dared to speak lightly of two actresses. Frederick

II. treated in the same manner a certain nobleman who had complained, in disrespectful terms, of having been enrolled by fraud. On the approach of the Danes, a great number of women and young girls cut off their noses, it is said, with the view of securing their chastity. An abbess, with her forty nuns, did the same, when the Saracens presented themselves at Marseilles. Let us add to these unnatural mutilations, those which depend upon unforeseen accidents, which are caused by small-pox, syphilis, cancer, frost-bite, scrofula, burns, etc., and it will be conceded that the occasions for restoring the nose must have frequently presented themselves to the surgeon.

Article I.—History.

The hideous appearance of persons who have had the misfortune to lose their nose, must have early created a desire to remedy, as far as possible, so repulsive a deformity. Thus Celsus (*Méth. Méd.*, lib. 14) and Galen (lib. 7, cap. 9) already spoke of the art of restoring the nose. Nevertheless, it is only from the fifteenth century that *rhinoplasty* has taken rank among regular operations. P. Ranzano (*Annal. Mundi in Sprengel*, t. viii., p. 172) says, that the Brancas, father and son, surgeons of Sicily, and who lived in 1442, practised it with great skill. Bojano (*Eloy. Dict., etc.*) and Benedetti (*Anatom.*, lib. iv.) speak of it as a common practice.

G. Tagliacozzi, who died in 1599, had acquired so great a celebrity in this matter, that they caused a statue to be erected to him in the Anatomical Amphitheatre of Bologna. Mercurialis, Fyens, Fallopius, Vesalius, Read, (*Sprengel*, t. viii.,) and Gourmelin, have spoken of the art of remaking the nose. According to Fabricius, of Hildanus, (*Cent.* 4, *Obs.* 31 ; *Bonet*, p. 399,) Griffon, of Lausanne, was a skilful nose-maker, (*nasifex ;*) and A. Paré (*Œuvres Compl.*, in-fol., liv. 23, p. 671 ; liv. 17, p. 295) says they were astonished, at the court of Henry III., when they saw reappear there the chevalier de Thoan, who had been to Italy to have a new nose made. Nevertheless, in spite of so much testimony, to which we might have added that of Cortesius, Molinelli, Dubois, Garengeot, Rosenstern, Moinichen, Leyser, and Fioraventi, and notwithstanding, I repeat, so many and such numerous proofs, no one scarcely, among us, would have dared to admit the possibility of restoring the nose, when the work of Doctor Carpue, published in 1816, placed the subject beyond all doubt. A Mahratta, who served in the English army, was made prisoner by Tippo-Saib. This prince caused his nose to be cut off. Returning among his comrades, Cowajec (which was the name of the prisoner) excited the pity of a Hindoo, who made a new nose for him in the presence of T. Cruso and M. Finley, physicians at Bombay. Pennant had made known an observation of the same kind in 1798, and Sir Maket affirms that this operation is in general use in the East Indies, where, Lucas says, it had been practised from the time of Hyder-Ali. These facts, transmitted to London, excited the notice of MM. Lynn, Carpue,

and Hutchison, who proceeded immediately to investigate the origin of the Hindoo methods, as well as the advantages that surgery might obtain from them. Doctor Carpue (*Account of Two Successful Operations, etc.*, 1816) himself twice performed rhinoplasty with success. M. Graefe (*Rhinoplast. sive arte Curt., etc.*, 1818) also occupied himself with it, and made known, in 1818, the result of his essays. Trials of the same kind were soon made in France, by Delpech, Dupuytren, Moulaud, MM. Thomassin, Lisfranc, and Blandin. MM. Travers, Liston, and Green, in England, and MM. Dieffenbach and Beck, in Germany, have all endeavored to extend the art of repairing the nose.

In consulting the writings of Tagliacozzi, (*De Curtor. Chirurg., etc.*, Venis., 1597,) and of M. Carpue and Professor Graefe, we are compelled to admit that, in certain cases at least, the newly-made nose does not differ as much as might be thought from a natural one. One of the patients, also, operated upon by Dupuytren, and who was seen at Paris, had no reason to complain particularly of this patching, (*raccommodage.*) I have seen the patient whose case M. Lisfranc has published. In him, the new nose was far from presenting all the regularity desirable. Those of M. Blandin were better. On the other hand, we must not forget that at Paris there are manufactured, out of plates of silver, leather, pasteboard, and even wax, false noses, which are capable of being kept on the face by means of different springs, or better still, by suspending them to spectacles, so as almost to entirely conceal the deformity. Boyer speaks of a patient in whom, at the first glance, it was difficult to perceive that he was wearing a nose of this kind. The metallic nose, however, will never, like a patched nose even of the most deformed shape, allow of blowing, taking snuff, or the free use of the olfactory functions.

Article II.—Operative Processes.

As it is for the nose that anaplasty was first invented, it is very natural that the different methods which I have spoken of above, should have been transferred to rhinoplasty.

§ I.—*Rhinoplasty by Transplantation.*

In the country of the Parias, men who possess power do not, as it appears, make any scruple of cutting off the nose of any of their subjects, and putting it in the place of one that has been lost. To believe travellers, this mode has succeeded so well, that, in order to prevent criminals thus mutilated from remedying their deformities, they take the precaution of throwing the nose into the fire, as soon as it is cut off.

Rhinoplasty by restitution and transplantation not requiring any further special consideration, authorizes me to refer, for what relates to this subject, to what I have said when treating generally of anaplasty by transplantation and restitution.

§ II.—*Rhinoplasty by Transposition.*

Anaplasty by transposition is applied to the nose, as to all other parts of the body, whether we adopt the Italian method, the Indian, or the French process.

A. *The Italian Method.*

There exist two varieties of the Italian method: the one ancient, which preserves the name of Tagliacozzi; the other new, and of which M. Graefe is the inventor.

I. *Process of Tagliacozzi.* —Though in Sicily and Calabria they appear to have proceeded in various modes, there is one, however, which has taken the preference of all others, and which is generally adopted; it is that which Tagliacozzi, has made known, and the only one which was seriously entertained in Europe, until in these latter times. The surgeon commences by imitating a nose with pasteboard or wax; then bringing the anterior surface of the forearm in front of the nostrils, he immediately puts it back to its natural position, in order to spread out upon the spot which is suitable the pasteboard nose, the point of it being towards the shoulder; having marked out the circumference of this nose with ink, he by this means circumscribes a triangular flap of skin, which he dissects from the point towards the base, which latter is to remain adherent. A strip of adhesive plaster is placed under it, to approximate the lips of the wound. After the expiration of a certain time, we pare the edges of the deformed nose, as well as those of the tegumentary flap of the arm. Nothing now remains but to place the bleeding edges in contact with each other by means of the suture, while the arm is fastened in front of the face by means of an appropriate bandage. Dossils of lint, also, are placed in the anterior openings of the nares. When the union is effected, we separate the base of the flap, and trim the lobe of the new nose in the best manner we can. In certain cases, the surgeon confined himself to making in the forearm an incision, to which he attached the abraded borders of the mutilated nose, until they had contracted intimate adhesions with the skin. He had then nothing more to do than to cut and separate a triangular flap in the teguments of the arm, on each side, and unite them upon the median line, or dorsum of the nose.

II. *Process of M. Graefe.*—In the method of M. Graefe, the patient commences by putting on a laced waistcoat, surmounted by a hood, which will hold the head steady. One of the sleeves of this waistcoat, and which is open in front, has four leather straps near the elbow, and two shorter ones near the wrist. The operator pares the openings of the destroyed nose; takes the measure, as in the process of Tagliacozzi; marks out and cuts the flap in the same manner; fixes the arm thus arranged, by means of the straps just mentioned; and makes use of needles and the twisted suture,

to maintain in contact the sides of the mutilated nose and the edges of the flap of the arm. At the end of a period, which varies from four to thirty days, the union should be complete. We then remove the bandage, and the base of the flap may be detached. Having brought it down upon the subseptum, [i. e., the *columna*, or inferior border of the septum nasi.—*T.*,] we pierce it with two openings, which should resemble the natural openings of the nose, and in which are to be inserted small pieces of gum elastic catheter, until the cicatrization is complete.

III. *Appreciation.*—M. Graefe is almost the only one among the moderns, who, in modifying the Italian method, has practised it with success. Having employed it successfully in four cases out of five, he returned to it again, with no less advantage, in 1834, (*Gaz. Méd. de Paris*, 1835, p. 168.) M. Signoroni, (*Ib.*, 1834, p. 3,) who also attempted it in Italy once, failed entirely. Here is a fact which M. Champion has communicated to me, but which, however, must be placed by the side of those of M. Graefe:—A young man, in 1823, having lost his nose in consequence of syphilis, consulted M. Wazel, who, after having put him upon a course of mercurial treatment, restored the nose by a flap from the forearm. All visiting to this patient was interdicted, from the moment the operation was performed, in order to prevent the slightest movement, and to exempt him from speaking. The nose, examined some months after, appeared thin and meager, and in strong contrast with the rest of the face, which was well nourished; in other respects, it was passable. The young man, who said he had been punished during the whole time of the cure, from the restraint in which he was kept, did not, however, at all regret having submitted himself to the operation.

On the supposition that the Italian method should be practised in some cases, we should take care, at least in the beginning, to detach the flap from the arm only by a very limited incision, in order to preserve to it a base of sufficient extent and vascularity to sustain its vitality perfectly. The union of the borders, and of the point of this flap, with the abraded lips of the mutilated nose, would not afford any prospect of success, unless it was aided by numerous stitches of suture. Joining the immoveable bandage to this first means of union, the surgeon would have every possible chance of keeping the parts in the most perfect state of immobility.

It would, moreover, be required not to use any compression, and to prevent every kind of traction upon the flap, until it should be evidently adherent to the forepart of the nose. Another essential precaution would be, to give to it, at the first, dimensions at least twice the size of those which it is ultimately to have; dimensions, moreover, so much the greater, in proportion as the integuments employed in its construction are thinner, more distensible, and more pliant.

If gangrene has not taken place in the flap by the fourth or fifth day, every thing promises that its vitality will be maintained, and that the union has actually taken place. We should not, however,

be in haste to remove the stitches of suture, and to take off the bandage. It should not be, moreover, until towards the fifteenth day, or later, that we ought to allow ourselves to think of completing its section, in order to mould it definitively upon the nose. For this last stage of the operation, we are sometimes under the necessity of reconstructing both the septum and the alæ of the organ. We may do this in two ways:

1. The base of the flap, folded upon its cellular surface, and fastened above the upper lip, is afterwards pierced on each side in such manner as to imitate the two openings of the nose. Two canulas, of gum elastic or other substance, prevent the obliteration of these openings, and force them to cicatrize in the shape of holes.

2. We may cut also, upon the base of the flap, a pedicle destined to replace the subseptum. The rest of this base, brought down on each side to a sharp point, is afterwards united, by other sutures, to the root of the alæ of the nose. The canulas, of which I have just spoken, are here no less indispensable.

IV. *By means of a Cutaneous Flap from the Breech.*—In some countries, as soon as a person of rank has lost his nose, he procures a slave, who is struck upon his breech with a slipper, until the integuments in that place become considerably swollen. A nose-maker, (*nasifex*,) at the expense of this part, so singularly prepared, cuts a flap of the form and width sufficient to replace the lost nose, applies it and fastens it firmly upon the nostrils, the openings into which are maintained by means of small cylinders of wood. It is evident that this strange operation will never be practised in Europe.

V. *By Transplantation of a Nose.*—I have stated above, what value is to be put upon rhinoplasty by transplantation or restitution; on the testimony of Olaus, who says he had seen the flesl of a living fowl successfully employed in the cure of hare-lip; that of T. Bartholin, who pretends that a sailor was promptly cured of a wound, with loss of substance, on the hypochondriac region, by causing a surgeon to apply over it some sheep's flesh, which soon adhered to and nourished it; on the experiments of M. Baronio of Milan, contradicted, it is true, by those of MM. Huzard and Gohier, but corroborated by those of Duhamel and Hunter, from which it results that the skin from the flanks of an animal, transplanted from right to left, or applied upon the same parts in another animal, becomes engrafted upon them, and continues to live; on the custom of those youth in the north of Germany, who, as a pledge of intimate friendship, each one exchange a flap from the front surface of their forearm; in fine, on those cases of fingers completely separated from the hand, which so many authors mention, and which I have already related.

B. *The Indian Method, (Méthode Indienne.)*

The different processes of Indian anaplasty have been applied to the nose, more than anywhere else.

I. *With the skin of the Forehead, or Process of the Koomas.*—In the process which has been especially followed in England and France, we begin, as in the Italian method, by imitating a nose with pasteboard, or wax; we afterwards reverse this pattern, by spreading it upon the forehead in such manner that its point may be turned downward. Its circumference is also touched with some coloring matter. The flap is thus traced out. The operator, who dissects it, taking care to leave at its base a small prolongation, destined to replace the nasal sub-septum, reverses it from above downward to the ossa nasi; twists the pedicle, that the cutaneous surface may remain outside; pares and smooths the contour of the nares; unites, with their bleeding borders, the edges of the frontal flap; maintains the whole in contact, by means of a composition of Japanese earth, or the suture; brings down the median pedicle upon the front of the upper lip, and fills up the openings of this new nose with small compresses, rolled into the shape of cylinders, or with quills, or canulas of gum elastic.

The Hindoos scarcely ever employ the suture. But M. Carpue has thought it advisable to put it in practice, and Delpech, who says he has performed rhinoplasty several times, insists that it should not be neglected, and that we should give the preference to the twisted suture.

Among the modifications which this process has undergone, there are three which I propose to speak of.

II. The first trials, as we have said, of Indian rhinoplasty, were made in England, Germany, and France, in such manner as that a bridge of sound parts might remain intact between the pedicle of the flap and the part of the nose which was to be restored. Thus practised, the operation requires that we should divide this pedicle, and excise its free portion, as soon as the adhesion of the flap itself is effected. It results from this, that the new nose, feebly sustained above, sinks down (*s'abaisse*) more than is desirable, shrinks (*se resserre*) into the form of a tumor, and assumes a palish tint, which contrasts (*tranche*) with the rest of the visage. A patient thus operated upon by Delpech, and whom I saw at Paris, had a nose that was wrinkled (*ridé*) and shrivelled (*ratatiné*) like a potato, and which a lupus, moreover, finally destroyed.

III. In order to remedy this inconvenience, M. Dieffenbach makes a slit (*fente*) at the root of the nose, and fastens into this cleft the pedicle of his flap, in order that there may remain no free integuments below. By excising, at a later period, the projecting portion of this pedicle, M. Dieffenbach finds the flap blended with the dorsum of the nose, supplied with large-sized vessels, and secured from all downward tendency towards the upper lip. Many patients, says M. Dieffenbach, who were thus treated, obtained so much advantage from it, that their nose hardly differed from a natural one. It is at least certain, that a woman, somewhat over thirty years of age, who had the point (*lobule*) of the nose destroyed by a lupus, and whom I requested M. Dieffenbach to operate upon in 1833, in my division of La Pitié, was tolerably well satisfied with

the restoration. I should add, nevertheless, that rhinoplasty, in the hands of this surgeon, becomes a very complicated operation. After having engrafted his flap, he cuts from it, sometimes on one point, sometimes on another, different portions, which he excises or transposes according as the new nose has need of being raised up, depressed, inclined, or flattened, in this or that direction, where it has the appearance of being too thick or too pinched, (*trop grêle.*) Each of his patients, therefore, have to undergo as many as five or six operations, before they are cured.

IV. In a patient operated upon in 1825, at La Pitié, M. Lisfranc brought down the incision of one of the borders of his flap, quite into the mutilation; then, in place of twisting this flap upon its axis, in the manner of the Koomas, he turned it over, brought it around upon its side, and was enabled to attach it from one end to the other, to one of the sides of the opening to be repaired.

We have, in this manner, a pedicle which forms a kind of pucker, (*godet,*) open below, but which is not separated by any bridge from the wounded surfaces. It is true, that the nose obtained in this manner remained quite misshapen; but as the flap had been badly united, and the surgeon, in the place of sutures, had made use of simple strips of adhesive plaster, the failure, under such circumstances, proves nothing against the process.

V. M. Blandin, at a later period, adopted a mode somewhat different; having brought down and attached the parts in the manner of the Hindoos, (*Indiens,*) he excised the intervening cutaneous portion, in order to place the pedicle of his flap in immediate contact with this bleeding surface, where he kept it fixed by means of compression.

VI. *The Author.*—It appears to me that authors, in this way, are pursuing the shadow of the difficulties, and that it is a matter of little importance, whether we follow one of these processes or another. If the immediate adhesion of the pedicle, in one respect, has its advantages, it has also the inconvenience of rendering the operation more difficult and longer, and of requiring tractions, and a degree of tension, which manifestly interfere with the integrity of the circulation in the flap.

To prevent the sinking down of the tip of the nose, which MM. Dieffenbach and Blandin appear especially desirous to avoid, I should prefer, after the principal adhesion has been effected, to cut off the pedicle very high up, to trim it, (*le redresser,*) and shape it into a triangle with the point upward, to excavate a notch for it, and to attach it, by some additional stitches of suture, to the root of the nose, and in a cleft in the neighborhood of the forehead. It would be the means of obtaining every desirable degree of regularity in the new organ, without having to fear the embarrassments and the difficulties which present themselves in the modifications of which I have been speaking.

If it be important to preserve carefully, in the pedicle of the flap, all the arteries of any considerable size that may exist there, it is not because the absence here of important arterial trunks exposes us to

all the inconveniences that M. Blandin has specified; but because, whatever M. Dieffenbach may say of it, the more active the circulation in the flap is, the more are the chances of our seeing its vitality sustained, and of our obtaining its adhesion.

If, on the day after, or on the following days, the new nose should appear swollen, or livid, it may be advisable to use some bird-peck punctures to it, or to cover it with leeches. Lotions, often repeated, of spirits of camphor, and infusion of chamomile, appeared to me to favor the success of the operation, in the patient whom I confided to the care of M. Dieffenbach in 1833.

It has also appeared to me, that the simple suture, with stitches very nearly approximated, as employed by this surgeon, are preferable to the twisted suture, or to the stitches of suture at long intervals, as adopted by other practitioners. We also take away this suture on the day after, from the places where the adhesion appears evident, and afterwards, on the second, third, fourth, and fifth day, from the rest of the wound.

As to the wound in the forehead, I do not agree in opinion with the Professor of Berlin, who recommends that we should approximate its borders as much as possible by means of suture, and who, in order to favor this approximation, has recourse to long vertical incisions on the sides of the temples. In proceeding in this manner, we favor the development of erysipelas, diffused phlegmons, or meningitis, and which we cannot afterwards always control. For, out of five or six patients operated upon in the hospitals of Paris, at the time I have mentioned, two of them died, and the others experienced very serious symptoms. I would, therefore, content myself with a very moderate approximation, made by means of strips of adhesive plaster of diachylon, then with simple dressing; being well convinced that the action of cicatrization itself would soon gradually close up the wound, and finally reduce it to a very unimportant affair.

To sum up all, the Hindoo rhinoplasty is a serious operation. Of two patients, M. Blandin came near losing one of them; one of those of M. Lisfranc died. M. Dieffenbach lost two out of five or six, at Paris. If M. Green, (*The Lancet*, 1829, vol. i., p. 24,) M. Doubovitsky, (*Gaz. Méd. de Paris*, 1835, p. 748,) and M. Warren, have also performed it with success, M. Travers (*Bullet. de Férussac*, t. i., p. 352) has seen the half of the flap mortify, and his patient left with a greater deformity after, than before the operation.

A peculiarity sufficiently remarkable is, that the point of the nose of some patients, operated upon by the Hindoo method, becomes covered with hair; and that in some of them, when it is touched, it conveys the idea of pressing on the forehead.

VII. *Alæ and Sub-septum.*—If in the place of the tip, (*lobule*,) the patient has lost one of the alæ of his nose, it is from the neighboring cheek, and not from the forehead, that we should borrow the flap; but it is evident that the French method, in such cases, would answer better than the Hindoo.

It would be otherwise, if the *sub-septum* (*sous-cloison*) alone was

wanting. Then we should imitate M. Liston, (*Bulletin de Férussac; Practical Surgery, &c.*, p. 233, London, 1837,) cut out a vertical flap of tissues from the middle of the upper lip, and raise it up in order to fix its apex to the point (*lobule*) of the nose. Afterwards reuniting the wound of the lip, as in hare-lip, we should, of course, take care to keep the small flap firmly supported against the septum of the nasal fossæ. We should, nevertheless, succeed better if it were possible to unite also the upper edge of this flap, with what remained of the septum itself.

[If there is none of the septum remaining, Dr. Mott thinks it useless to attempt this operation.—*T.*]

C. *The French Method.*

Rhinoplasty, by the French method, consists much more in the repairing of a nose, than in the formation of a new one. M. Dieffenbach, (*Bull. de Férussac*, t. xix., p. 273,) who, following after M. Larrey, (*Clinique Chir.*, t. ii., p. 15,) has revived this operation among us, cuts, pares, detaches, (*découpe,*) and raises up, (*relève,*) the borders of the mutilated nose; then adjusts between them, in order to hold them up and to fill the void that separates them, small flaps or strips, that he takes from the neighborhood; then unites the whole, with fine needles and the simple or twisted suture. The passages of Celsus, which seem to have reference to rhinoplasty, had, as I think, this manner of proceeding in view. It is in dissecting (*en découpant*) the circumjacent tissues that Franco succeeded, as we shall see further on, in restoring the cheek of one of his patients. We should add, that a rhinoplasty of this kind, performed by M. Larrey in 1820, was completely successful, and that the soldier was exhibited cured to the faculty of medicine, where I had an opportunity of examining him. Among these cases, M. Dieffenbach insists principally on that of a young girl, in whom the vomer, the ossa nasi, and the plate of the ethmoid bone, had been destroyed by scrofula; and in whom the nose, in place of being convex, was found depressed, and as if sunken in, (*rentré en dedans.*) Several incisions, much more nearly approximated to each other in the direction of the forehead, than towards the upper lip, enabled him to bring out the middle portion of this apology (*simulacre*) for a nose, and thus to raise up its sides. Other incisions, which were transverse or semilunar, gave him an opportunity of uniting the little strips circumscribed by the first, and of borrowing from the lip a small flap to replace the septum. Numerous needles were then applied, in different directions, and by the aid of several small repairings, (*raccommodages,*) which some accidents rendered necessary, M. Dieffenbach finally succeeded in giving to the nose of this patient a tolerable shape, and a certain degree of regularity.

The trials which since the last ten years have been made, of this method of rhinoplasty, in France, Germany, England, America, and Italy, enable us, at the present time, to lay down the steps of the

operation according to certain rules. It includes, moreover, two distinct processes:

I. *Rhinoplasty by simple Separation (Décollement) of the Tissues.*—After having separated by dissection the teguments around the deformity, to the extent of half an inch or an inch, it is generally easy to stretch (*d'allonger*) the parts and draw them towards each other, (*d'attirer*,) so as to be enabled to bring them into contact (*les affronter*) by their previously pared edges. This process, which appears simple and natural, has the inconvenience of requiring a considerable separation of the tissues, where there exists a loss of substance to some extent, and of exposing to a retraction, difficult to manage. A nose restored in this manner, and which I have had an opportunity of seeing at the hospital of La Pitié, became by this means so flattened, that it finally sunk to a level with the rest of the face. In the successful cases cited by M. Signoroni, (*Gaz. Méd. de Paris*, 1834, p. 3,) he does not appear to have been more fortunate. In spite of the good opinion which M. Serre has of it, (*Compte rendu de la Clin. Chir. de Montpell.*, 1837,) this inconvenience will always render French anaplasty painful, and of but little advantage in its application to the mutilations of the nose. It would be useless to rely upon it, for example, when a portion of the bones, and of the cartilage of the septum, have been destroyed. When the point (*lobule*) alone has disappeared, it is yet still more frequently found to be unavailing. It is for losses of substance, therefore, of little extent only, that it should be reserved.

II. *Rhinoplasty by Combined Dissections of the Tissues*, (*par Décollement Composé.*)—If, after having dissected the tissues, as in the preceding case, we incise them, in order that we may displace them with more ease, we have a method which puts it in our power to repair a great number of deformities. In a young man who had lost the whole of the right ala of his nose, M. Mutter (*Case of Autoplasty, etc.*, Philadelphia, 1838) enclosed the hole by a V-shaped incision reversed, and then removed it. A horizontal incision, carried towards the cheek bone, (*pommette*,) enabled him then to make an L-shaped incision of the outer branch of his first wound. Then dissecting off the flap thus bounded, he was enabled to bring it inward and in front, up to near the median line, where stitches of suture fastened it to the anterior branch of the A. The operation was completely successful.

Upon the supposition that we might find this method too difficult, it would be necessary to call to our aid the lateral incisions of Thévenin, or, better still, to detach completely the outer or jugal side of the flap, which could then be transported (*transporter*) at the pleasure of the operator.

D. *Relative Value of the Different Methods.*

Of all the methods, those of the Koomas, evidently the most painful, have, moreover, the serious objection of only correcting one deformity, by producing another. As one of its consequences, the fore-

head becomes necessarily the seat of an ineffaceable cicatrix, (*cicatrice,*) sometimes of great size. In persons whose eyebrows blend with each other upon the median line, or who have their hair very low, the base and another part of the flap may, after the cure, become covered with hair, and without our having it in our power in any way to prevent it. Few persons among us, at the present day, would consent to sell their nose to the rich patient, that would like to make use of it to mend his own. Though what has been said, therefore, of this species of animal grafting were true, we could not put in practice the method of the Parias, unless in those cases analogous to that of which Garengeot speaks. The process of the Mongolians, the most outré of all, has the same objections. As to the French method, we should do wrong, as I conceive, either to adopt or reject it exclusively. Applicable to cases of simple deformity, (*déformation,*) to those where there is but little destruction of parts, it would no longer answer where there is an almost total loss of the organ. A patient upon whom M. Serre performed it, and whom I had an opportunity of seeing at La Pitié, derived but very little advantage from it. M. Marjolin told me that he saw a man who was operated upon in this manner at Rouen, and who was not more fortunate. Every thing, for the first few weeks, seems to go on very well, but in proportion as the cicatrices become more firm, the tissues retract, and the new nose becomes more and more flattened down. The method of the Koomas is still the one which, in our time, has been the most frequently attended with entire success.

So long as the bones have not disappeared, and that the point and cartilages only are destroyed, rhinoplasty may, to a great degree, remedy the deformity. In the contrary case, there is much to fear that the new organ will be reduced to a sort of fungous substance, (*morille,*) [i. e. mushroom,] and always remain flabby, to such degree, indeed, as to shrivel (*s'affaiser*) like a piece of linen subjected to the action of atmospheric pressure. When we make use of teguments from the forehead to construct it, preserving, in the meanwhile, as much thickness as possible to the flap, it is important to leave to the twisted pedicle the width only that may be necessary to keep up the circulation. Before separating it from the root of the nose, and cutting off as much of it as extends beyond the line of the neighboring parts, we ought to wait until the reunion of the tissues, recently brought into contact, shall have been firmly established. In the place of linen rolled in the shape of a cylinder, dossils of lint, and canulas of gum elastic, I should prefer rather to keep in the openings of the nares a piece of lead bent into the form of a ring, and which might, at the same time, serve as a mould, or pattern, for the borrowed patch with which the new organ has been formed. In short, it appears to me that Delpech has perfectly well combined all the different stages (*temps*) of the operation. The modification of M. Lisfranc, or better still, that of M. Blandin, which is only an improvement of it, would, though never absolutely required, also have its advantages. As to taking

the teguments from the arm, I do not know which would be the most advantageous, whether to follow the directions of the surgeons of Sicily, or to adopt the process of the professor of Berlin.

In conclusion, rhinoplasty is as yet an operation too little practised among physicians, not to allow of our performing it in any manner we please. The circumstances, also, under which it may be required, are so variable in their nature, that the details of the manipulations may be left to the particular views of the operators who may choose to undertake it.

[*Rhinoplasty—Operation for the Columna, (Sous-Cloison, or Sub-Septum.*)

In adopting the Indian method, Mr. Liston of London, (in his *Elements of Surgery*,) says the hairy scalp has in most cases to be encroached upon, to obtain the slip of tegument for the columna. After engrafting it on the lip, also, there is a risk of its not adhering, and if it does, it will, as happened in a case of his, be difficult to prevent its shortening and turning inward upon itself, and thus pulling down the apex of the nose. In the case to which he refers, a columna was made after the consolidation of the rest of the organ, by borrowing a thick narrow strip, cut out from the middle of the upper lip. This modification has also been since practised by him with perfect success. The flap from the forehead is made to supply only the alæ and apex, the part for this last being only a slight but broad projection of a few lines, serving as well for the apex as for the attachment of the columna. The latter must not be cut till the forehead flap has perfectly consolidated. This plan of M. Liston, for the columna, has been found by him of eminent service, in reparations where the columna only was wanting, and in which the deformity is nearly as great as where the whole nose is destroyed. The inner surface of the apex is first pared, and the middle portion of the upper lip, to the extent of about the eighth of an inch on each side of the median line, and of the breadth of a quarter of an inch, is then quickly insulated, by two successive parallel incisions with the sharp-pointed bistoury, piercing through the lip and proceeding from above downward to the free border of the lip. The frænulum is then divided, and the prolabium of the flap removed. The flap is turned up (not twisted) and fixed to the apex of the nose by a few turns of suture, made with the small spear-pointed hare-lip needle. Twisting the flap would incur a risk, and is not necessary, as the mucous lining of the lip, forming now the outer surface of the columna, readily assumes the color and appearance of integument, after exposure for some time, as is well known. The edges of the fissure in the lip must now be neatly brought together by the twisted suture, for which purpose two needles are sufficient, which must perforate to the depth of two-thirds of the thickness of the lip—one passing close to the vermilion border. Should troublesome bleeding take place from the coronary artery, one of the needles should be made to pass through the cut

extremities of the vessel. Each thread is to be finally secured by a double knot, and with a view to more exact compression, the thread may then pass from one needle to the other, but the pins must not be pulled upon, or the parts pucker in healing. The ends of the needles are to be snipped off with plies, and no further dressing is necessary, as it might disturb the wound on being removed, retain the matter, produce fœtor, and retard the cure. The needles may be removed, on the second or third day, by gently rotating them. The crust formed by the threads, and matter, and blood, is not to be disturbed, as it serves as a covering and protection, and comes off in a few days after. Some care is necessary in raising and filling up the alæ with lint, in order to effect, by proper compression, a repression of the œdematous engorgement which is apt to ensue in the columna. The lower part of the columna, also, is to be pushed upward, that it may come into its proper situation, which is effected by a small roll of linen, supported by a narrow bandage passed over it, and secured behind the vertex. The flap from the lip is of great advantage to that part, because, when the natural columna is destroyed, the lip is apt to sag down and tumefy, and become elongated in that very middle portion from whence the flap is taken; and besides, the cicatrix being in the natural fossa, is scarcely perceptible after the cure.

Mr. Liston further remarks, that the alæ of the nose, and deficiencies in the upper, anterior, or lateral parts of the organ, in the forehead, etc., may be supplied from the neighboring integument on the same principle. In many of these operations, the flap can be so contrived and cut out, that it can be applied without its attachment being twisted—as by making a more or less acute angle in its pedicle, etc., which angle is effaced when the flap is applied. This last plan of Mr. Liston's, then, virtually becomes the *French method*, or *anaplastie par décollement des tissues.—T.*]

[RHINOPLASTY IN AMERICA.

The first successful case of the operation of *rhinoplasty* performed in America, is stated, on the authority of Dr. Reese, (*Loc. Cit.*,) to have been by Dr. John Mason Warren, of Boston, in 1837. In 1840, he again performed it four times; first on a female, by the Indian method, the flap being taken from the forehead, effecting in this manner the restoration of the entire nose. In the second case, he used the Italian or Tagliacotian method, the flap being transplanted from the forearm, being the first successful case of this method in America. In the third case, he restored the alæ of the nose, by sliding the flap from the cheek by the French method. In the fourth case, he again adopted the Italian method, for the restoration of the tip end and alæ of the nose, the flap being taken from over the biceps muscle. In seventy-two hours, the adhesion was sufficient to allow of the division of the flap; being the shortest

time on record in which that has been done. The patient was well in two months. [For the first three cases, see the *Boston Medical and Surgical Journal.*] As remarked by Professor Velpeau in the text, the sensations of the patient were generally found by Dr. Warren, in his constructions of a new nose, to be referred to the place from which the skin was borrowed; to the forehead, in those cured by the Indian method, and to the arm in the Tagliacotian. The pins were used in his first case, but afterwards the interrupted suture was preferred. The new nose, in some of Dr. Warren's cases, was so perfect as not to be distinguished from a natural one.

Dr. George McClellan, of Philadelphia, has performed rhinoplasty four times, with complete success. Dr. Gibson, of the same city, eight times successfully, since his first attempt in 1827, which, however, failed.

Dr. Mutter, of Philadelphia, has performed rhinoplasty five times.

Dr. Muzzy, of Cincinnati, (Ohio,) twice; once by the Indian method, successfully; the other, by the Italian, did not succeed.

Dr. March, of Albany, has had complete success (*Reese, Loc. Cit.*) in two cases of rhinoplasty, by the Indian method.

Dr. Pancoast, of Philadelphia, has operated successfully with rhinoplasty, in three cases.—*T.*]

CHAPTER IV.

BLEPHAROPLASTY, (ANAPLASTY OF THE EYELIDS.)

The eyelids, more than any other part of the body, perhaps, are subject to alterations which daily make us sensible of the value of anaplasty. Besides ectropion and entropion, which sometimes require this kind of operation, there also occur losses of substance in the eyelids, which can be remedied in no other manner.

Article I.—History and Indications.

The adage of Celsus, *Si palpebra tota deest, nulla id curatio restituere potest*, (*De re Medica*, lib. vii., cap. 3, sect. 2, p. 391, édit. Valart.,) which has been a law in surgical practice, has given place, in our days, to an axiom totally opposite. It is now possible to restore the eyelids, as we restore the nose. Moreover, blepharoplasty, or *blepharopoesis*, which some surgeons of Paris, in 1833, viewed as a new operation, although I had pointed it out in the first edition of this book, is a process which was long since known. M. Graefe employed it successfully in 1816 or 1817, since he refers to a case of it in his treatise upon rhinoplasty, (*Rhinoplastik, etc.*, Berlin, 1818.) Another German surgeon, Dzondi, (*Journ. de Hufeland*, 1818,) makes mention of it about the same time. Nevertheless, the facts

set forth by these practitioners were almost entirely forgotten when M. Fricke (*Journ. des Progrès*, 2e série, p. 56–80) made a decisive trial of it in May, 1829. At the same time, almost, M. Jungken (*Journ. d'Ammon*, t. i., p. 262; *Arch. Gén. de Méd.*, t. xxvii., p. 257) published two cases of similar attempts, but where it had completely failed. From that time, blepharoplasty was omitted neither by M. Langenbeck, (*Nosologie und Thérap., etc.*, t. iv., p. 188,) M. Rust, (*Handbuch der Chir.*, 1830, p. 97,) nor M. Blasius, (*Handbuch der Akiurgïe*, t. ii., p. 14,) in their treatises. It has since been the subject of interesting dissertations from the pen of M. Dreyer, (*Dissert. Inaug., etc.*, Vienne, 1831,) M. Staub, (*Dissert. Inaug., etc.*, Berlin, 1830,) and M. Peters, (*De Blepharoplastice, etc.*, Leipsick, 1836,) besides the articles which MM. Dieffenbach and Ammon, in Germany, have devoted to it.

In France, MM. Blandin, (*Journ. Heb.*, t. viii., p. 95; *Gaz. Méd. de Paris*, 1835, p. 406,) Jobert, (*Gaz. Méd. de Paris*, 1835, p. 404,) and Carron du Villards, (*Guid. Prat. des Malad. des Yeux*, t. i., p. 364,) also soon directed attention to it. We must add to their observations those which have been published by M. Robert, (Barbier, *Thèse*, No. 6, Paris, 1837,) and the cases which belong to myself. It results from these facts, that blepharoplasty has now been performed a sufficient number of times to enable us to appreciate its value.

The circumstances under which this operation may be required, are: 1. The destruction of a greater or less portion of the eyelids; 2. Certain cases of shortening (*raccourcissement*) of the palpebral integuments; 3. Many of the deformities ranged under the head of ectropion, entropion, and trichiasis. Nevertheless, the principal purpose of anaplasty to the eyelids, as elsewhere, should be to supply losses of substance in the skin.

Blepharoplasty comprises many varieties, which, however, all belong to anaplasty by transposition. No one has advised to apply to the eyelids anaplasty by transplantation, nor even the Italian method. I will add, that blepharoplasty, though it had already been performed in three different modes, that is to say, by the method of the Koomas, or torsion (*contorsion*) of the flap, that of Chopart, by drawing (*entrainement*) or sliding down (*inclinaison*) of the flap, and by the method of Franco, or stretching (*allongement*) of the parts, has nevertheless continued to be almost exclusively restricted to the processes of Indian anaplasty.

Whatever may be the process adopted, blepharoplasty will afford no positive chances of success, except where the skin and the cellulo-adipose or fibrous tissues only are destroyed. Nothing, in fact, can replace the muscles of the eyelids, if they are found involved in the mutilation. It is through inadvertence that a surgeon of Paris (*Gaz. Méd. de Paris*, 1835, p. 405) has said that he had restored the entire thickness of an eyelid by means of blepharoplasty. It is nevertheless true, that in the lower eyelid, and in some cases of the upper eyelid, where its levator muscle is preserved, we may construct, with the skin of the neighborhood, something analogous

to the *tutamina oculi*, and thus partially mask the deformity. The destruction of the eyelids, by leaving the eye in perpetual contact with the atmosphere, exposes the patient to ophthalmias of every kind, and to the destruction (*fonte*) of the cornea, and makes him sensibly feel how fortunate it would be, if he could count upon the efficacy of blepharoplasty.

Article II.—Operative Methods.

The different modes of performing blepharoplasty, have almost all been borrowed from anaplasty to the nose. The three principal processes for this purpose, which science should preserve, belong, one to M. Fricke, if not to M. Graefe, the second to M. Dieffenbach, and the third to M. Jones. The figures annexed to the articles already cited from MM. Fricke, Peters, and Carron, give a very exact representation of them.

§ I.—*Process of M. Fricke, or the Indian Method.*

M. Graefe and Dzondi, having scarcely alluded to their mode of operating, have in some sort left to MM. Fricke and Jungken, all the honor of blepharoplasty by the Indian method of anaplasty. In this method, which I have twice employed for the upper eyelid, and which MM. Blandin, Gerdy, Jobert, and Carron du Villards, have also made trial of at Paris, we begin by excising the tissue of the cicatrices which deform the eyelid, in order to make in that part a regular wound. If there is no inodular tissue there, we cut through the skin transversely, in order to be enabled to elongate the retracted (*raccourci*) part, or that we may create there a void in order to lengthen the part by transferring a piece to this space. This being done, we cut in the neighborhood a flap which, turned round by one of its borders, (*contourné sur l'un de ses bords,*) is brought forward and fixed by a sufficient number of stitches of suture, upon the part of the eyelid where its substance has been destroyed. If it is the upper eyelid, M. Fricke takes the flap from the forepart of the temple, above the outer extremity of the eyebrow. This flap, which he detaches from above downward, preserving a large pedicle to it, is immediately brought, by its front border, to the lower border of the lid, while its posterior border is attached by degrees to the upper border of the lid. For the lower eyelid, M. Fricke takes his flap from the outer side of the cheek bone, and conducts it also, by the same mode, to the vacancy to be supplied. M. Ammon (*Peters, Opér. Citat.*, fig. 11, 12, 13, 14) has modified this process in such manner that the wound of the flap, and the wound of the eyelid, are made continuous with each other in the form of a capital L; so that the horizontal branch of the L ultimately becomes filled up by means of the flap, while its vertical branch remains void. M. Ammon, moreover, proceeds in all the different steps after the method of M. Fricke, or that of M. Jungken.

If MM. Gerdy, Blandin, and Jobert, have pursued a somewhat

different method in the construction and adjustment (*placement*) of the flap, it is, doubtless, because they were unacquainted with what had been done, in this respect, in Germany; for their process is evidently less favorable to the complete success of the operation, than those of which I have just spoken.

§ II.

In the first patient upon whom *I operated*, I felt myself obliged to conform, in every point, to the rules of Indian anaplasty; the flap which I had cut upon the forehead was reversed, twisted, and brought down, like the arch of a bridge, upon the wound of the eyelid. In the second case, I borrowed the flap from the upper part of the cheek bone, and I imitated, in some measure, the process of M. Fricke; but it has appeared to me that this process requires modification.

The rules which I would desire to lay down upon this subject are the following: 1. That for the lower eyelid, the flap should be cut from the temporal region, rather than upon the cheek, in order that its root and the wound it leaves may tend, by their natural retraction, to draw the lid rather upward than downward; 2. That this flap should, at the first, have twice the dimensions that it is to retain afterwards; 3. That it should be fastened by numerous stitches of suture, rather than by compression; 4. That it shall have a pedicle as large and thick as the condition of the parts will permit; 5. Finally, that we should approximate its upper side as much as possible to the free border of the eyelid.

In one of the patients treated at the hospital of San Louis, the operation was unsuccessful, because the flap which had been cut from the cheek had agglutinated too far from the ciliary border of the eyelid. In one of mine, the deformity disappeared only in part, because the flap, which was a third larger than the space it was to supply, contracted (*se rétrécit*) finally to more than one half its size. In the second case, the flap seemed to mortify in part, because I had diminished the pedicle too much, or because I had not fastened it by a sufficient number of stitches in the suture. It is evident, that if the root of the flap for the upper eyelid, is situated upon the cheek, it will be a means of preventing all consecutive ectropion; and that, for the same reason, where we are treating the lower eyelid, it is important that its root should be turned towards the temple.

§ III.—*Blepharoplasty by Sloping* (*inclinaison*) *of the Flap.*

Chopart's method of anaplasty is applicable to the eyelids, as to other parts of the face. M. Dieffenbach, also, has applied it in such manner as to obtain from it a process of blepharoplasty altogether peculiar. To follow this method, we begin by excising all the cicatrices, in order to transform them into a regular wound. We afterwards cut a flap of sufficient width, at the expense of the

integuments on one of the sides of the new wound, so that this flap shall have the shape of a trapezium, the inner border of which corresponds to the outer lip of the wound, whilst its upper or lower border, according to the eyelid which it is to be applied upon, (*à retourner*,) must be detached upon a line which should extend beyond the outer palpebral commissure. To form this flap, therefore, we must make a horizontal incision, which should be prolonged to a greater or less distance from the outer extremity of the eyelids towards the temple; then an oblique incision, from above downward, or from below upward, and from within outward, according as it is for the upper or lower eyelid, an incision which ought to have nearly twice the length of that of the horizontal incision. By means of these two incisions, and those which we have made to remove the inodular tissues, we form a flap of the figure of a trapezoid, or parallelogram, which is to be dissected from below upward on the temple or forehead, for the upper eyelid, and from above downward on the cheek, for the lower eyelid. Nothing is afterwards easier, than to draw (*entraîner*) this flap inward, without twisting or turning (*contourner*) it, so as to be enabled to sew its inner border upon the inner lip of the previous excision, and the free border to the teguments adjacent to the ciliary border of the corresponding eyelid. In conclusion, this flap then takes the place of the parts which it has been thought advisable to remove, and the situation which the flap itself did occupy, is that in which the wound in fact is now located. By this process blepharoplasty is, in reality, an operation easy enough for any one to perform. Many cases successfully treated in this manner, have been related by M. Peters, and I have been convinced, in examining at Paris one of the patients operated upon by M. Dieffenbach, that it is a process that should be preserved. Its principal inconvenience is that of obliging us to make a considerable dissection of the tissues, of requiring so long a flap that we have to apprehend its mortification, and of not being perfectly applicable but to losses of substance that have greater length than breadth.

§ IV.—*Process of M. Jones.*

An operation more simple than the preceding, and which is, nevertheless, a kind of blepharoplasty, is that which M. W. Jones states that he has performed, (*Encyclographie des Sciences Médicales*, 1836, p. 91.) In this process we begin by making two incisions, which, setting out from the extremities of the diseased eyelid, proceed to unite under a more or less acute angle, in the form of a V, more or less elongated either towards the cheek or the forehead, according to the eyelid for which the operation is to be performed. We then dissect this triangle from its point towards its base, to nearly one half of its length; we then draw upon it, as if to stretch it, by pulling upon the free border of the eyelid itself. Then immediately reclosing, by means of the suture, the wound which it leaves behind it, we succeed in pressing it (*à le refouler*) towards the eye, by actually elongating the eyelid to the extent to which it is deficient.

As this flap is neither twisted, reversed, nor inclined, we at the same operation reunite its borders, by some additional stitches of suture, to the tissues from which they have been momentarily separated. I have many times made trial of this method upon the dead body. I had become so satisfied with it, that I would have performed it upon a young girl, had I not recollected that M. A. Bérard, in making trial of it some months before, had failed completely. It nevertheless appears to me to be a modification of blepharoplasty which deserves to be tested. Since it has reference to a shortening of the tissues, a double incision will permit of our drawing, in this manner, one of the eyelids towards the other as much as we may desire. In order to secure the lid, and to prevent it from shortening again, it suffices to reunite immediately the new wound; we have thus a simple rapid operation, giving but little pain, which does not require the extensive dissections of the Indian method, and rarely exposes to a mortification of the tissues.

Article III.—Appreciation.

We must not, however, deceive ourselves with any illusion in respect to the resources which blepharoplasty may supply. Whatever mode we adopt, the eyelid which has been repaired in the best manner possible, rarely fails to become again deformed; sometimes the borrowed flap contracts so much that it assumes the form of a small tumor, or of a prominence of more or less irregular shape; sometimes it terminates by reproducing the ectropion, by drawing the repaired eyelid in one direction or another, in the manner of an inodular bridle. On the other hand, it would be folly to suppose that a flap, purely tegumentary, could ever replace an eyelid whose orbicular muscle, or tarsal cartilage, had been destroyed. We may also readily conceive, that the eyelashes could not be reproduced by this kind of operation.

It results from this, therefore, that for all cases where the deformity of the lids is caused solely by a disease of the skin, blepharoplasty methodically performed offers a remedy which is truly valuable; that even where the orbicular muscle is gone, it may be of great benefit, if the eyelashes and the cartilage of the tarsus have been preserved. If the destruction should be deeper, still blepharoplasty should not be rejected, provided it would allow us to furnish to the eye a protecting covering against the action of the atmosphere, and the inflammation or destruction (*fonte*) of the cornea; but we should do wrong, in such cases, to count upon procuring perfect eyelids, or to promise the patient that we would wholly relieve him of his deformity.

[BLEPHAROPLASTY IN AMERICA.

Dr. George McClellan of Philadelphia has, according to the authority of Dr. Reese, in his last and valuable American edition

(New York, 1842) of Cooper's Surgical Dictionary, [frequently cited by us,] (see also *North Am. Med. and Surg. Jour.*,) performed this operation fifteen times, and with most satisfactory results. Drs. Mutter and Horner, of Philadelphia, Drs. Mott and A. C. Post, of New York, and Dr. J. M. Warren, of Boston, have also frequently succeeded in this delicate process.—*T.*]

CHAPTER V.

KERATOPLASTY.

It has, doubtless, never entered the mind of any one to graft on a cornea, (*greffer une cornée*,) in cases of atrophy, or disorganization of the eye; but it often happens, that this tissue (*membrane*) only is changed, and that by its opacity vision is rendered impossible. It is in such cases that certain oculists have suggested to substitute a sound cornea, in the place of the diseased one. Keratoplasty, considered in this point of view, had already passed, in the last century, from theory to practice, if we are to believe Pellier, who gives himself out as its inventor. The character of this oculist, and the few details he furnishes, have prevented surgeons from giving attention to his assertions. Since Pellier, keratoplasty has been subjected to legitimate experiments by many authors of character M. Moesner attempted it in 1823, M. Reisinger in 1824, M. Drolshagen in 1834; MM. Himly and Bigger (*The Lancet*, Aug. 1837 p. 750) have also submitted it to various trials upon animals. These experiments, resumed by M. Dieffenbach, and by M. Stilling, (*Encyclographie Médicale*, 1836, p. 73,) have induced some German practitioners to make trial of it also upon man. Two processes, even, have been proposed for this purpose. In one, which is that which experimenters have most frequently employed upon animals, the diseased cornea is cut out, and replaced by a cornea taken from a calf or sheep. I should, as it seems to me, abuse the patience of the reader, to describe such an operation, and I should censure that surgeon who would have the hardihood seriously to propose it to a patient. In the second process, which M. Dieffenbach has told me he performed successfully upon a young girl, we pass, by means of a fine needle, three threads through the cornea on the sides of the opacity, (*leucoma*;) afterwards circumscribing the spot by two incisions, we remove it from the cornea in the shape of an ellipse, the wound of which is immediately after closed by tying the threads previously passed through its entire thickness. Since a man high in rank in our profession, has said that he has been successful in operating in this manner, we are bound to believe him; but I should scarcely credit it if I had done it myself, and I doubt very much if M. Dieffenbach will find any imitators among discreet surgeons.

Of two things, one must happen; either the transparent cornea is opaque in its whole extent, in which case there could be no other than keratoplasty by transplantation that could in reality be employed; or there is but a spot in the middle of this membrane, when it is clear that keratoplasty is not as serviceable as the operation for artificial pupil.

Pupil.—It might have seemed that the experiments which I have been speaking of, relatively to the cornea, would have formed the last limits to these kinds of essays; this, however, is far from being the truth. In the article above cited, M. Stilling speaks also of experiments having for their object to create a pupil upon the sclerotica, by transporting to it a flap from the cornea. MM. Moesner (*De Conformatione Pupillæ de Artif., etc.*, 1823) and Dieffenbach, and M. Ammon himself, have however proved, by their reiterated failures, that the success of keratoplasty by transplantation is utterly impossible. Nor have I learned that the experiments which M. Stilling instituted, during his sojourn at Paris, have confirmed those which he made in Germany. To express myself with all sincerity, I must say that such trials, in my opinion, only seem calculated to consume the time of the experimenters, and to impede the legitimate march of operative surgery.

CHAPTER VI.

ANAPLASTY OF THE LACHRYMAL SAC.

Some surgeons, particularly M. Dieffenbach, have had recourse to anaplasty for certain cases of fistula lachrymalis. We may indeed conceive that the integuments of the neighborhood, separated by one of the processes of blepharoplasty, might possibly be applied and secured by strips of adhesive plaster, or appropriate bandages, upon losses of substance at the great angle of the eye. But I do not believe that anaplasty can be of any great value in these cases, even though we should substitute for the other processes the tegumentary cork (*bouchon tégumentaire*) which in 1833 I proposed (*Gaz. Méd. de Paris*, 1833, p. 317) to apply to them. The cutaneous opening, in such cases, is but a trivial circumstance in the disease. I therefore do not see any reason for directing our attention to this, when we wish to relieve a fistula lachrymalis. In order that anaplasty in the great angle of the eye should be indicated, it would be necessary that there should have been gangrene, ulceration, or some wound that has caused there a loss of substance, in which the front part of the lachrymal sac has been involved. Then, in truth, the borrowed flap would have the same object to effect as on any other part of the body. It remains to be seen, if such conditions shall present themselves in practice.

CHAPTER VII.

CHEILOPLASTY.

The art of repairing and restoring the lips, when mutilated or destroyed, has in our day made the most astonishing progress. Until recently, a loss of substance sufficiently extensive to render simple cheiloraphy impracticable, seemed to be beyond the resources of surgery; now, on the contrary, the most hideous deformities do not appal the skilful operator. Whether a lip be wanting on one side or the other, whether it be deficient in whole or in part, alone or with a portion of the cheek, it is almost almost always in our power to reproduce it, by borrowing what we stand in need of from the surrounding parts. Therefore the surgeon is rather to plan out, (*doit deviner*,) than to learn cheiloplasty. It is an operation which can scarcely be submitted to detailed rules, and which we have to modify almost as often as we practise it. Every process of anaplasty has been applied to it. Tagliacozzi says he succeeded by the *Italian method*, that is, by borrowing from the arm the materials for the new lip. Delpech, M. Lallemand, Dupuytren, M. Dieffenbach, and M. Textor, have used the *Indian method*. Finally, the *French method* now counts a great number of trials. There are none of these methods, not excepting that of Celsus, in which the incisions were made either vertical, horizontal, internal, or external, outside the deformity, that have not found their advocates. Having for their object to remedy lesions of various form and character, it was to be presumed that each one of those methods would soon include a number of distinct processes.

Article I.—The French Method.

The method of detaching the tissues, (*décollements*,) is in these cases applicable in all its processes.

§ I.—*Process of Horn, or of Roonhuysen.*

If there is only a notch in one of the lips, provided its breadth transversely is of no great extent, even if it should be very deep, the cheiloplasty differs but very little from the operation of hare-lip. The first thing to be done, is to transform the abnormal notch into a fresh wound, and to give it the form of a V, by excising its borders and every thing about it which is diseased, with a scissors or a bistoury. In the second place, the surgeon dissects in succession, down to beyond the point of the bleeding triangle, and in a space proportioned to the width of the void to be filled, the two flaps of

soft parts, separates them from the maxillary bone, and turns them outward. Nothing afterwards is more easy than to elongate them, and to put them in contact, by drawing them towards each other. The suture is applied, as in the hare-lip, and with the same precautions. The posterior surface of the new lip unites to the subjacent parts at the same time that its two halves become agglutinated together; and its free border, after the cure, differs in reality from what it was before the disease, only in having a little less length. Nevertheless, this process has the disadvantage of narrowing the mouth to a very considerable degree, and of sometimes giving to its aperture a very disagreeable deformity.

§ II.—*The Ancient Process.*

Celsus, it is very probable, had something analogous in view, when he advised to make a transverse incision, then a semilunar one, upon the internal surface of each cheek, between the cheek bone (*pommette*) and the commissure of the lips, in order to admit of the elongation of the two halves of the divided lip. Every thing, in short, induces us to believe that this kind of cheiloplasty, of which Galen and Paul of Egina also say a few words, had been already reflected upon in those times.

§ III.—*Process of Guillemeau.*

After having freely dissected off the parts, M. Dieffenbach often finds it useful to relax them, by means of the lateral incisions of Guillemeau, or of Thévenin.

§ IV.—*Process of Chopart.*

The preceding operations may suffice very well, when the loss of substance has not been very considerable in breadth; in the other cases, however, we must renounce it and give the preference to one of the processes which I am about to describe. That which appears to have originated with Chopart, and which I have seen succeed completely in many cases, is one of the most valuable. If the case is one of cancer, the surgeon commences by making, external to and upon each side of the disease, an incision which descends vertically from the free border of the lip to beneath the lower jaw; afterwards dissecting the quadrangular flap traced out by these two incisions, he detaches it from above downward, preserves to it all the thickness possible, and taking care not to graze too near the periosteum, prolongs his dissection to a greater or less distance below the chin, according to the greater or less quantity of diseased parts he thinks he shall have to remove, (*détruire.*) This being done, he cuts out, in a square shape, every thing which is changed, trenching a little, at the same time, upon the sound tissues; removing thus with a single cut the whole of the cancer, he immediately seizes the flap that he has just dissected, adjusts it in front

of the chin, and by gentle tractions raises its upper border to a line with the upper lip, or with what remains of the border of the lower lip outside; three or four stitches of twisted suture on each side, serve afterwards to secure it to the lateral parts of the face, beginning always with the upper needle; nothing more remains to be done, than to recommend the patient to keep his head inclined forward, in order to prevent all traction or tearing. To understand with what facility these flaps yield and become elongated, we must have been witness to it. In one of the cases which I had an opportunity of seeing, the operator being compelled to remove the whole extent (*épaisseur*) of the tissues, up to the limits of the orbicularis muscle, did not terminate the root of his flap until he had reached towards the middle of the supra-hyoidean region. Nothing, however, was easier than to bring up its border to a level with the line which the lip formerly occupied. In four days the reunion appeared to be completed, and all the needles could be removed. No suppuration came on, neither at the lateral borders nor upon the posterior surface of the flap, while its upper margin soon became covered with a reddish pellicle, to a great degree resembling that which naturally covers the vermilion border of the lips, (*l'ouverture buccal ;*) on the fifteenth day, the patient, who was forty-eight years of age, exhibited scarcely any trace of the operation. Another case was not less fortunate, and I have not learned that any accident has since happened to them. This new lip, however, having no constrictor muscle, ordinarily remains without motion, (*immobile,*) resting against the teeth, and as if drawn backward; but such trifling inconveniences cannot enter into comparison with those that are caused by the necessity of wearing a silver lip, and patients are fortunate indeed, when they can be relieved at such a price as this.

§ V.—*Process of M. Serre,* (*Rev. Méd.,* 1835, t. ii., p. 134.)

If the mucous membrane is not degenerated, M. Serre dissects and preserves it, in order to bring it forward (*raméner*) and sew it, as a covering, (*bordure,*) to the skin of the free border of the flap, or new lip, as he terminates the operation. We thus obtain a more regular conformation, and one more in correspondence with the original condition of the parts, than by a pure and simple excision. The only difficulty in this modification is, that it is not practicable but in a very small number of cases.

§ VI.—*Process of M. Viguerie,* (*Journ. Hebd.,* 1834, t. i., p. 186.)

Upon the supposition that the disease has not involved the mouth, but extended rather in the direction of the chin, we might, while cutting and dissecting the flap as in the preceding cases, leave a bridle above. After having removed from it the diseased tissues, the flap should be raised up towards the mouth, and fastened by means of the suture by its upper border, to the preserved bridle of

the lip. The patient thus treated by M. Viguerie, recovered perfectly.

§ VII.—*Process of J. N. Roux.*

M. J. N. Roux (*Revue Méd.*, 1828, t. i., p. 30) has several times employed cheiloplasty by a process which he considers as his own, and from which he has obtained remarkable results. In the place of cutting a flap which is to be raised up after the diseased parts have been excised from it, this practitioner begins by circumscribing, by means of incisions made in proper directions, every thing which it is important to destroy, and thus removes the cancer. By a careful dissection, he then detaches the surrounding soft parts from the maxillary bone, and from the anterior region of the neck; he thus forms, out of the skin and cellular tissue, a kind of apron, (*tablier*,) which he raises up to a level with the upper lip, and with which he encloses (*emboite*) the front part of the jaw; he secures it there either with strips of adhesive plaster, or, when it has been necessary previously to prolong the commissures by a transverse incision, he fastens and suspends it, by some stitches of suture on each side, to the upper border of the wound. The patient, assistants, and surgeon place themselves as in the operation for hare-lip.

If the disease extends somewhat beyond the transverse limits of the lower lip, M. Roux makes, with the scissors, a first incision of a semilunar shape, an incision which dilates each commissure in the same proportion, by prolonging them towards the masseters; he then, with the bistoury, makes another incision on each side, commencing with them at the outer extremity of the first, and carrying them down to below the cancer, so as to unite them in front of the chin; in removing all the diseased (*dégénérées*) parts, he proceeds sometimes to the extent of laying bare the entire body of the jaw; he then dissects upon their inner surface what remains of the cheeks, returns to the chin, descends to the sub-maxillary border, and to the supra-hyoidean region, preserves as much thickness as possible to the integuments, draws them upward, attaches their extremities to the extended wound of the commissures in such manner as to leave a sufficient length of flap free, to represent the border of the lower lip; finally, he supports the whole with some strips of adhesive plaster, and a sling and containing bandage. When, on the contrary, one side of the lip is sound, (*intact*,) and the disease extends to a certain distance upon the cheek of the opposite side, there are three incisions required to circumscribe the cancer; one somewhat short and transverse, above the affected commissure; the second, straight or curved, it is of no importance which, is equal in length to the first, is made continuous with it, and descends obliquely in front towards the chin; the third, finally, which commences near the sound commissure, and terminates by uniting with the second. After dissecting the border cut by this last, we bring it towards the first incision, and the suture is applied, to maintain

the whole in contact. By this transportation, the last wound ascends to the position of the free border of the lip destroyed, which it represents sufficiently well, and the form of the mouth is preserved.

Operating upon these principles, or those of Chopart, M. Cambrelin, (*Arch. Gén. de Méd.*, t. xxvi., p. 263,) M. Thomas, (*Journ. des Conn. Méd. Chir.*, t. iii., p. 269,) and M. Nichet, (*Bouchacourt, Rev. Méd.*, 1838, t. iii., p. 242,) have each had a fortunate result. I have myself, in conforming to the precepts of M. J. N. Roux, succeeded in repairing, in part, a deformity in an old man, in whom I had to extirpate the whole contour of the mouth; and also in a young girl, who had lost her lower lip in infancy, in consequence of a gangrenous affection. It is nevertheless true, that the simple process of Chopart, when it is applicable, merits the preference, and that it answers the purpose where the lower lip alone requires to be repaired. If we have also to fill up some void near the commissures, or upon the upper lip, the process of dissections, (*décollements*,) either simple or associated with the incisions either of Chopart, or of Dieffenbach, are evidently to be preferred. I should add, also, that in regard to transverse elongations, we should do wrong to count much upon the method of dissections practised at the lips; and that young subjects, well made and of firm flesh, are the least favorable to this kind of anaplasty.

§ VIII.—*Process of Ph. Roux.*

In a young girl, who had nothing remaining but a very small portion of the lower lip, and who had also lost, from her infancy, more than the half of her upper lip, the maxillary bones were so deviated outward that they projected to a considerable extent, through the loss of substance. To remedy this horrible deformity, M. Ph. Roux (*Rev. Méd.*, 1830, t. i., p. 5) concluded to make the operation in two stages, (*en deux temps*,) and proceeded in the following manner:—After having transformed the lower half of the wound into a triangle, by the excision of its borders, and after having detached its two halves to the extent of several inches, he had recourse to two cuts of the saw, and removed about an inch of the jaw. Then having approximated the two portions of the bone, he brought the two flaps of the fresh wound together, kept them united by the twisted suture, and succeeded thus in restoring the lower lip, and in more than half curing the young patient, without much difficulty. The success of this first stage was complete; but M. Roux, who wished to proceed in the same manner with the second, and to destroy also a portion of the upper jaw, found an insurmountable obstacle in the opposition of his patient. It is evident, however, that the excision of bone would have presented much more difficulty there than below, and that to effect it, he would have been obliged to make much more use of the gouge and mallet, or of the cutting nippers, (*tenailles incisives*,) than of the saw.

By the exsection of bone, the surgeon hoped to diminish sufficient-

ly the transverse dimensions of the face, to be enabled to bring into coaptation the opposite sides of the wound.

§ IX.—*Modification by M. Morgan*, (*The Lancet*, July 1829, vol. ii., p. 537.)

In 1829, M. Morgan had a case of an old man, whose lower lip was entirely destroyed by a cancer. A semilunar incision, with its concavity above, enabled him to detach and excise all the diseased tissues. From the middle of this incision he made another, which he directed perpendicularly towards the os hyoides; dissected off successively the two flaps thus traced out, as in the T incision, from the median line towards the sides, and from above downward; and thus was enabled to bring them up in front of the lower jaw, and make use of them to replace the lip which he had just removed. Some stitches of twisted suture held them in contact, and sufficed, together with the sling bandage and plumasseaux of lint, to prevent them from descending to their natural position. The success appears to have been complete; but another old man, operated upon in the same manner at a little later period, October, 1829, by M. Lisfranc, was less fortunate. Towards the fifth or sixth day, the patient suddenly died. The operation is assuredly more easy by this process than by that of M. J. N. Roux; but it is doubtful if we can by this means give as much regularity to the free border of the new lip, as by the original process of M. Chopart. It is, however, a modification which may have its value, and may in part be admitted into the French method, of which, in fact, the process of M. J. N. Roux itself is nothing more than a slight variety.

The great point here is the dissection of the tissues which envelop the bones about the circumference of the wound; all the rest has reference to the modifications required by the nature of the lesion to be remedied. Guided by this principle, M. Nichet (*Gaz. Méd. de Paris*, 1836, p. 454) was enabled, by merely dissecting a flap of integuments rolled up under the chin, and by paring the contour of the wound, to cure a large fistula in the supra-hyoidean region, produced by a discharge of fire-arms. It is for the surgeon to multiply or diminish the number of incisions, and to determine their form, direction, and depth, as often as he is called upon to put in practice the French method of cheiloplasty.

Article II.—Indian Method.

Delpech is the first, I believe, who applied the Indian method of anaplasty to the lips. After having cut and dissected his flap upon the supra-hyoidean region, he raised it, twisted it upon itself, and doubled it upon its cellular face, before attaching it, by numerous points of suture, to the two sides of the deformity which had been previously pared. This folding (*doublure*) of the flap, suggested by Delpech, had for its object to give to the new lip two cutaneous surfaces, instead of one, and to prevent the adhesions of its free

border to the alveolar arch. The operation thus performed, was not successful. Gangrene ultimately destroyed nearly the whole of the flap.

Appreciation.—Delpech was not more fortunate in a second case of Indian cheiloplasty. M. Lynn had, in the year 1817, performed it, according to M. Brodie, with better results, and M. Textor (*Bull. de Férussac*, t. xv., p. 326; *Journ. de Progrès*, t. xiv., p. 246) takes to himself the credit of having once performed it in 1827. M. Dieffenbach also appears to have cured some cases by it, (*Gaz. Méd. de Paris*, 1831, No. 2;) but these practitioners took very good care not to follow the example of Delpech, by doubling the flap which they had borrowed from the neck. In a case where a large trapezoidal flap was taken from below, raised up but not doubled, and then fixed by means of suture to the contour of the part where the loss of substance was, M. Voisin (*Ib.*, 1836, p. 366) of Limoges, was enabled to reconstruct for his patient all the parts of a lower lip and chin.

The advantages of the method of dissecting the tissues, which M. Roland (*Serre, de la Réun. Imméd.*, p. 514) of Toulouse, once put in practice with success, which M. Blandin (*Thèse de Concours.*, p. 151) has also made trial of, and which I myself tested in 1830, (*Romand. Thèse*, p. 24,) at the hospital of St. Antoine, at La Pitié in 1831, after the removal of the inferior maxillary bone, and since then on four or five patients at La Charité, are not less indisputable. The two unsuccessful trials of Delpech (*Clin. Chir. de Montpellier*, t. i.) with the Indian method, prove that it is but of secondary importance, and then only when the loss of substance is too deep or too extensive to allow of remedying it by stretching the tissues over it. The processes of Celsus, (lib. vii., cap. 3, sect. 4,) and of Franco, (*Traité des Hernies*, 1561, p. 462, ch. 122,) are in reality nothing more than varieties of this method, a variety which ought only to be called to our aid in certain particular cases. As to the Italian method, it is no more suitable at the present day, to the restoration of lips, than it is to rhinoplasty. The following article will enable us still better to appreciate the force of these remarks.

Article III.—Cheiloplasty by a Hem (*ourlet*) of the Mucous Membrane.

In consequence of cutaneous affections, burns, ulcerations, etc., the anterior orifice of the mouth sometimes becomes so contracted and indurated as to disfigure the patient, and interfere with the functions of the lips. [These abnormal contractions of the mouth are sometimes congenital.—*T.*]

§ I.

In view of such an evil, the first remedy which presents itself to the mind is, mechanical *dilatation*. Unfortunately, this means can give only temporary relief, and has rarely effected any permanent cures.

§ II.

After dilatation, comes *incision* of the labial commissures, which we should take care to prolong a little beyond what would be really required, since the wound, in cicatrizing, never fails to contract itself more than we desire. If we could without difficulty cause the two borders of the solution of continuity to cicatrize separately, this first operation would effect, as well as we could wish, the object we have in view; but it is not so. In spite of compresses spread with cerate, pieces of sheet-lead, and the small hooks that are made to draw constantly upon the angles of the wound, it nevertheless finally becomes reagglutinated, and places matters in the same condition in which they were before, if in truth the deformity does not thereby ultimately become considerably aggravated.

§ III.

Some practitioners have thought that they could more effectually overcome the difficulty by treating the contraction (*coarctation*) of the lips by means of *lead wires*, (*fil de plomb.*) A trochar plunged through the skin near the mouth, at the place where the commissure on each side should be, drills (*fraie*) a hole for the wire, one extremity of which in the mouth, brought through the natural opening, should be united to the other, in order that the surgeon may twist them as in fistula in ano, and gradually cut through the included tissues. This process, though less alarming to the patient, is much longer than the preceding, and can scarcely be considered more certain. In proportion as the wire cuts the parts, they reunite outside of it, so that in reality the ligature is not more effectual than the incision.

§ IV.—*Process of M. Serre*, (*Gaz. Méd. de Paris*, 1835, p. 317.)

This difficulty now, however, seems no longer to exist. The incision being made, M. Serre, by means of the suture, puts in contact the mucous border with the cutaneous border of each lip, and thus prevents all new agglutination. Operating in this manner on a young girl, I have obtained the same successful result as the professor of Montpellier.

§ V.—*The Hem*, (*Ourlet.*)

Reflecting upon these difficulties, and the insufficiency of the known means, M. Dieffenbach (*Journ. des Progrès*, t. ix., p. 268) supposed that by excising a portion from the tissues of each labial angle, to the extent, for example, of an inch, and leaving the mucous membrane wholly intact, we should probably obtain complete success. Facts have justified his theory, and already it has been attended with successful results, that leave nothing to desire. His

process, which is more easy to understand than to perform, is nevertheless available to every one. The surgeon introduces into the mouth of the patient the point of his finger, to support and protect the organic layer which it is his intention to preserve. With the other hand, he directs the blade of his scissors upon the border of the contracted opening, a little above the commissure, and introduces it with caution from before backward, between the mucous membrane and the other tissues, and horizontally to the point where he wishes to place the corresponding angle of the lips; having cut with a single stroke, and square through, (*carrément*,) every thing which is found included between the branches of his instrument, he makes, a little lower down, another incision parallel with, and in every respect similar to, the first, including as much of the tissues in the lower lip as he had in the upper; then reuniting the two wounds by a small semilunar section at the outer extremity, he isolates the little strip thus circumscribed, and excises it, without touching the mucous membrane, which he also afterwards lays bare all around the wound; after having done the same on the opposite side, he gently separates the jaws of the patient, as if to stretch the membrane which forms the bottom of the wound, and divides it transversely into two equal portions, and to within three lines of its genal extremity, [i. e., the extremity towards the cheek.—*T.*,] draws it out and turns it over upon the labial commissure which he has just made, first on the lower and then on the upper border of the division, in both which places he fastens it, and also to the vermilion pellicle of each border of the lips, by means of a sufficient number of fine short needles, or by the twisted suture, either alone or combined with the interrupted suture. The operator here makes use of the mucous membrane as a lining, which he unites to the integuments by a sort of hemming operation, (*par une sort d'ourlage*,) as the shoemaker unites to the leather of his shoes the last side of the riband which is to cover its borders.

Operating in this manner upon a young girl, whose mouth was strongly contracted in consequence of a phagedenic eruptive disease, I made use of a bistoury in lieu of a scissors, and it appeared to me that by this means the section of the tissues was accomplished with greater ease.

Another modification, which would also have its advantages, would be the following:—The excision of the tissues is completed; the mucous layer (*la couche muqueuse*) gently thinned down, (*modérément amincie*,) and stretched like a piece of linen, alone remains at the bottom of the wound. Before slitting (*fendre*) this membrane, we insert all the threads, one after the other, from the mouth into the wound, after which we carry them outward from the wound through (*à travers*) the cutaneous border of the division, commencing with the lower range and finishing with the superior range of each commissure. Then dividing the membrane between the two lines of threads, the surgeon has only to take hold of the ends of these latter and tie them, to complete the operation. I have found that I have in this manner been enabled to give great regu-

larity to the suture, while rendering the operation evidently more easy.

§ VI.

M. Campbell, (*Gaz. Méd. de Paris*, 1833, p. 153,) who has repeated the operation of M. Dieffenbach with success, also used the bistoury instead of the scissors; but the scissors were preferred in the young lady whom M. Mutter (*Cases of Autoplasty, &c.*, Philadelphia, 1838) recently operated upon in America, with complete success.

If the mucous membrane, which should not be too much thinned down, is well stretched, and well hemmed upon the bleeding borders of this wound, it agglutinates to it (*s'y colle*) with the greatest facility, and in the space of a few days. The artificial portion of the lips afterwards acquiring the same state of organization as the natural portion, their reunion is hardly any more to be apprehended at the sides than at the middle.

There is nothing more ingenious than this process, and every thing induces to the belief that it will be generally adopted. Applicable to every modification and degree of the disease, whether acquired or congenital, and whatever be the age of the patient, the only objection to it is, that it requires great delicacy in its execution. It is an operation that should be made trial of wherever the contraction is not surrounded with too extensive an alteration of the mucous membrane of the lips.

[Dr. Eve, of Georgia, (U. States,) has recently, says Dr. Reese, (*Loc. Cit.*,) successfully removed a cancerous lip by the method of Velpeau, (see *North Am. Med. and Surg. Jour.*,) separating the lip by the French method of anaplasty, and terminating with the continued suture.—*T.*]

CHAPTER VIII.

GENOPLASTY.

The cheeks, also, are of a nature to admit, to a greater or less extent, of a perfect restoration. Their loss of substance, also, almost always includes at the same time a portion of the lips, and renders the face truly hideous. And there is scarcely any description of means, that within the last twenty years have not been resorted to, to remedy this difficulty. Delpech, and M. Lallemand, (*Archiv. Gén. de Méd.*, t. iv., p. 242,) appear to have been the first who have paid particular attention to it among the moderns.

Article I.—The Indian Method.

A young girl, ten years of age, had at the lower part of the left cheek, in consequence of gangrene, a wound of an irregularly circular shape, two inches in extent in both its diameters, involving half an inch nearly of the lower lip, but only some lines in extent of the upper lip. To fill up this void, M. Lallemand commenced by trimming off (*aviver*) its whole circumference, giving it the form of an ellipse rather more curved above than below, and the outer extremity of the longer diameter of which reached to the space between the masseter and triangular muscle of the lips, while the other rested upon the upper and outer side of the tuft (*houpe*) of the chin. He then proceeded to cut upon the side of the neck, under the angle of the jaw, and in front of the sterno-mastoid muscle, a flap of the same form, but full one third larger. This flap, oblique from above downward, and from behind forward, and no farther attached to the living parts than by a kind of root of about an inch width, and the upper border of which flap, moreover, made part of the wound, was brought gradually and without torsion, by drawing the whole of it from below upward, on to the wound, where the operator fastened it by several stitches of interrupted suture, strips of adhesive plaster, layers (*gateaux*) of lint, and some turns of bandage. The elliptical form was preferred, with the view of facilitating the reunion of the wound in the neck, and the torsion avoided, because the surgeon apprehended it might tend to a gangrene of the borrowed parts, as had happened in the case of Delpech.

The operation of M. Lallemand did not succeed without being attended with some accidents. The wound was torn apart (*se déchira*) several times, in consequence of the cries and restlessness of the child, and perhaps still more owing to the presence of a canine tooth, which projected outwardly, and which it became necessary to extract. Nevertheless, the cure was ultimately effected.

Since then, Dupuytren (*Journ. Hebd.*, t. v., p. 110) has made an attempt of the same kind, but in a case much more complicated. His operation came under the head both of cheiloplasty and genoplasty. The patient was a child nine years of age, who, in consequence of gangrene, had lost the left half of the lower lip, as well as of the corresponding cheek, under the labial commissure, and to within three lines of the masseter muscle. The flap was taken in front of the sterno-mastoid muscle, twisted upon itself, and fastened to the abraded (*refrâichis*) borders of the wound by five stitches of suture. The anterior needle at first, and then the one next to it below, having cut through the tissues, were detached. The lower border alone mortified and suppurated. A notch of an inch long, having its base upon the free border of the lip, was the result. Everywhere else, the union took place. To make this new void disappear, Dupuytren treated it as a simple hare-lip; but the tongue, which had for a long time contracted morbid adhesions upon this

side, was an obstacle to the ultimate completion of an agglutination which at first seemed to have promised entire success. The fact nevertheless proves, that torsion, so much dreaded by M. Lallemand, does not necessarily involve the mortification of the flap which has been submitted to it, and that, in a case of necessity, we may with great propriety take from the neck the integuments that we may require, to fill up wounds of the face that are attended with loss of substance.

Article II.—The French Method.

§ I.—*Process of J. N. Roux.*

In a similar case to that of M. Lallemand, M. J. N. Roux (*Rev. Méd.*, 1828, t. i., p. 30) adopted another mode. The cancer, which had destroyed the left cheek, and trenched upon the lips, represented at this point an ulcer, two inches in width from above downward, and an inch and a half transversely. By means of two semilunar incisions, which commenced at the lips and united in front of the masseter muscle, the surgeon effected the excision of the carcinoma, and obtained in its place a fresh elliptical wound, a little longer transversely than from above downward, (*un peu plus large que haute*,*) in order to be able to bring its lips together. He dissected the whole lower lip to near the masseters, and to below the chin. The sides of the wound were then easily brought into contact. The twisted suture, the strips of adhesive plaster, and the containing bandage, applied as usual, prevented all displacement, and the cure was completed in a very short time.

§ II.—*Process of Gensoul.*

A woman, aged fifty years, had, when nine years old, her left cheek destroyed by gangrene. When admitted into the hospital of Lyon, in the month of June, 1829, she presented on the left side of her mouth an enormous loss of substance, which left bare a great portion of the two jaws, the two lateral incisor teeth, the two canine, and the first three molars upon that side, all of them projecting very much outwardly. The circumference of the ulcer, which had cicatrized a long time before, was closely adherent to the bones, and had caused an anchylosis of the lower jaw. After having separated it from the bones, and abraded it, M. Gensoul (*Journ. des Hôpit. de Lyon*, t. i., p. 16) then detached from the subjacent tissues, from above downward, and then backward, both the remainder of the cheek, as well as the corresponding extremity of the lips, as far as the neck in one direction, and to the masseter in the other. Compelled to resort to the gouge and mallet to remove the projecting portion of the prominent jaw, as well as the teeth that were implanted in it, he was afterwards enabled to approximate the two

* [To avoid mistake, we have translated this phrase by a circumlocution.—*T.*]

borders of the wound, and to apply the suture. A small salivary fistula, scarcely visible, was all that remained in this woman, after so vast a destruction of parts.

§ III.—*Process of Ph. Roux.*

Here is a case to which I have been witness, and which, while it blends with the preceding cases, nevertheless, in some respects differs from them. A young girl about twenty years of age, endowed with determined courage, and of remarkable docility, had had, two years before, the ala of the nose, and the half of the upper lip and of the cheek, situated above the horizontal line of the mouth, destroyed by gangrene. A portion of the maxillary bone having also been necrosed, there resulted from it a communication from the wound to the nasal fossæ, as well as the sinus maxillaris and the tongue constantly hung out of the mouth. Admitted into La Charité in the summer of 1826, M. Roux yielded to her entreaties, and undertook the cure. To effect this object he performed seven different operations, which extended through a whole year. A first attempt permitted him to dissect the left side of the lower lip, and to displace it, by carrying it upward to make use of it for supplying the destroyed portion of the upper lip. Every thing, in this trial, succeeded to the satisfaction of the operator. The buccal opening was then found completely separated from the wound, which latter was itself reduced to a large ulcer of a rounded shape, and which M. Roux in vain endeavored to close by abrading its borders, and by attempting to approximate them by means of a suture. A flap, detached from the posterior surface of the lip by dissecting off its mucous lining, (*par dédoublement*,) and then reversing and bringing it out, was followed by no better result. It was the same with an attempt by means of integuments from the palm of the hand. It was then determined to draw from above and outward, in order to unite it to the ala of the nose, and to the corresponding half of the wound, the flap which the upper lip had at first borrowed from the lower. A triangular fissure (*fente*) at the left commissure of the mouth, and of the shape of a hare-lip of considerable width, was the consequence of this new displacement. The surgeon did not hesitate to abrade its edges, at a little later period; then brought them together with ease, and applied the suture to them, this trial being the least difficult of all. There remains in this patient no other traces of her ancient deformity, than a certain narrowness of the mouth, and on the cheek some scars, (*stygmates*,) as if produced by a burn.

§ IV.—*Remarks.*

Almost all the attempts at genoplasty since 1831, have been made upon the French method of anaplasty, or that of dissection of the tissues, (*décollement*;) a patient thus operated upon by M. Serre (*Compte rendu de la Clin. de Montpellier, &c.*, 1837) was completely

cured. M. Dieffenbach, who also often joins the remote incisions (*incisions à distance*) of Thévenin to the dissections (*décollements*) of Franco, likewise mentions many successful operations upon the same method, and I may now add to those which science already possesses, three new cases taken from my own practice.

Since all the modes of performing genoplasty have been devised for so many specific and dissimilar cases, it would be superfluous to compare them in order to point out their differences. It is for the skilful surgeon to determine what answers best for the case immediately before him. It is nearly the same with cheiloplasty. Therefore, I feel that I ought to leave the decision of this matter to the sagacity of the reader. Franco also had already looked upon it in the same light, and his observation demonstrates indisputably that he understood cheiloplasty, and especially genoplasty, almost as well as modern operators: "A man named Jacques Janot," says he, "had a defluxion which descended upon the cheek, which or the greatest part of it was destroyed, (*tomba*,) and also portions of the jaws with several of the teeth, whence there remained an opening of about the size of a goose egg .... To effect the cure, I took a small razor and cut the border or skin all around it. Afterwards I slit the skin opposite the ear, and towards the eye and lower jaw; then I cut within and lengthwise, and crosswise to elongate the flaps (*labis*,) taking care not to cut through outwardly, for it was not necessary to cut through the skin. I [then] immediately applied seven sharp needles, three of which at the end of four or five days fell out, in the place of which it became necessary to insert others. In short, he was cured within fourteen days."* But we must read in the author himself the quaint narrative of this long case, and bear in mind that the dissection of the parts is attended with much more difficulty, and procures much less elongation to the cheeks than to the lower lip. In conclusion, I do not think that the Italian method, which has been attempted in one case, as we have seen, by M. Roux, answers better for genoplasty than cheiloplasty. It is to the Indian method that we must have recourse, if it should in reality be impracticable to adopt the French process. [Genoplasty has been successfully performed by Dr. M'Clellan of Philadelphia, (*see Reese's Cooper.*) —*T.*]

[An interesting operation in *cheiloplasty* I recently saw performed

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* [As this quotation is from one of the most ancient authors in Surgery, and the style therefore now obsolete, I will give it here in the original, that it may be seen whether in the judgment of others I have caught the true meaning: "Un Jacques Janot eust une defluxion qui lui descendit en la joue, et tomba la dite joue ou la plus grande partie d'icelle, et pareillement des mandibules dont il perdit plusieurs dents; et demeura un pertuis par lequel un œuf d'oye pu passer ..... Pour venir à la cure, je prins un petit rasoir, et coppay le bord ou cuir tout à l'environ. Après je fendoys la peau contre l'oreille et vers l'œil, et vers la mandibule inférieure; puis je coppay au-dedans en long et à travers pour allonger les labis, me gardant toutefois de venir jusques au dehors, car il ne fallait pas copper le cuir. J'appliquay incontinent sept aiguilles enfilées, desquelles, au bout de quatres ou cinq jours, en tombèrent trois, dont il fallut en remettre d'autres. Bref, il fut guéry dedans quatorze jours."—*T.*]

by Dr. Mott, upon a patient aged about 62, (Judge E., from the state of Missouri.) The whole of the lower lip down to the chin was removed, together with the cancer which occupied it, by means of a free semilunar incision, which was prolonged on the right side to a little beyond the commissure, in consequence of the disease extending in that direction. The soft parts covering the extreme point of the chin, and on each side of it and below it upon the neck, were separated to some extent to within an inch from the os hyoides. The sound margin of soft parts was now brought up from the chin and neck to meet the upper lip. To prevent the puckering which this elevation of parts must necessarily have occasioned, a horizontal incision of an inch or more in extent was made through the cheek, close to each commissure. A stitch was introduced into each angle of the mouth, and a second one outside of that, through the cheek on each side. These nicely approximated the parts, and perfectly sustained the newly-formed under lip. Adhesive plasters, and a double-headed roller were used to assist in firmly supporting and keeping in place the newly-elevated parts and the lower jaw. The stitches were removed on the seventh day, and adhesion having taken place, the cure was soon after readily accomplished. During the first ten days the patient was supplied by liquid nourishment, passed into his mouth by a quill inserted into the mouth of a teapot. For some time after the stitches had been removed, the chin and soft parts continued to be supported by a double-headed roller. The cure was rapid and complete, without the slightest unpleasant symptom. The mouth looked exceedingly natural, and he conversed with ease. The carcinomatous ulceration had existed twenty years, having been unusually slow in its progress. The patient, as may be supposed, went home delighted. Being corpulent, and the parts soft and pliant, transverse incisions below were rendered unnecessary.

Making an entire new mouth. Should a case present where there was necessity of making an entire new mouth, Dr. Mott suggests the measuring out a flap of the proper oval shape and size, transversely upon the supra-hyoid and sub-hyoid regions, with a long broad connecting pedicle. During the first days, and until adhesion of the edges of the flap to the excised edges of the corresponding opening to receive it should have perfectly taken place, breathing might be kept up by a small aperture of sufficient size, made in the centre of its longest diameter, and kept pervious by a curved piece of gum-elastic catheter. Dr. Mott has performed this operation on the dead subject, and it appeared to answer exceedingly well.—*T.*]

CHAPTER IX.

STAPHYLOPLASTY, (ANAPLASTY OF THE UVULA (*LUETTE*) AND OF THE VELUM PALATI.)

Since staphyloraphy came into use, surgeons have had it in their power to demonstrate that anaplasty to the velum of the palate might also have its advantages. M. Roux and M. Dieffenbach, (*Bulletin de Férussac*, t. x., p. 261; t. xv., p. 61,) who appear to have practised staphyloraphy most frequently, have also had recourse to staphyloplasty; one in conforming himself to the rules of the anaplastic method of *Chopart*, the other in following the principles of Celsus or of *Thévenin*. After having pared the borders of the primitive fissure, and united them by suture, M. Dieffenbach makes a long incision on each side to relax the tissues. M. Roux, proceeding at first in the same manner, afterwards divides transversely each half of the velum of the palate near its bony vault. It is then easy to draw the two sides of this velum together, whatever may have been the distance of their separation.

The two processes we are speaking of deserve to be retained in practice. That of M. Dieffenbach (*Arch. Gén. de Méd.*, t. xviii., p. 436) suffices when we have merely to guard against the tractions of the suture. A young man whom I treated in this manner recovered perfectly well. If the separation of the cleft is of considerable extent, the process of M. Roux should be preferred.

Indian anaplasty itself has been proposed to remedy the losses of substance in the velum of the palate. In a case of this kind, a surgeon of Nancy, M. Bonfils, (*Transactions Médicales*, t. ii., p. 293 à 308,) dissected upon the posterior part of the bottom of the mouth a flap, which he detached from before backwards, and which he then proceeded to attach by stitches of suture in the cleft in the pharynx. This operation succeeded but very imperfectly, and ought not, in my opinion, to be repeated; not that the hemorrhage which seems to alarm M. Burdin, (*Ibid.* p. 294,) or necrosis of which M. Jacquemin (*Ibid. ib.*) speaks, are really sources of apprehension, but because of the gangrene, or almost unavoidable retraction of the flap. I shall have occasion to speak again of the utility of staphyloplasty, in treating of staphyloraphy itself.

[Dr. J. M. Warren of Boston, (*Reese, Loc. Cit.*,) in a case of congenital fissures of the soft and hard parts of the roof of the mouth and palate, proceeded in this manner: The soft palate having been prepared for staphyloraphy by the usual abrasion of its edges, and the introduction of the necessary points of suture, the mucous membrane covering the roof of the mouth was carefully raised on each side of the fissure in the hard palate, and when thus detached

they were brought across the fissure, and united like the soft palate by the interrupted suture, the flaps formed by the mucous membrane of the mouth being continuous with the denuded edges of the soft palate. This difficult and delicate operation was completely successful, and is by no means diminished in value from having been first devised, and successfully performed, (as we shall see below,) many years before by a German surgeon, M. Krimer. Failure after failure, however, so often baffles the most elaborate processes hitherto contrived to remedy this disease, even in the hands of the most accomplished surgeons, that we can scarcely hope for success with all the aid of anaplasty, except in some rare instances and most favorable subjects.—*T.*]

CHAPTER X.

PALATOPLASTY, (ANAPLASTY OF THE VAULT OF THE PALATE.)

Anaplasty of the palate is an operation frequently indicated; three different conditions may require it. Surgeons have remarked that staphyloraphy often leaves at the root of the velum a hole which is very difficult to close up. It is also known, on the other hand, that the perforation of the vault of the palate may be congenital; it is not rare, in fact, to find holes produced in the palate by accidents or wounds. Even if it were true that, by means of obturators (*obturateurs*) properly constructed, like those that M. Toirac has contrived, we may succeed in perfectly closing up these holes, it is nevertheless also true, that their effectual obliteration by the living tissues would still be preferable. It is very natural, therefore, that in such cases the aid of anaplasty should have been called into requisition.

Process of Krimer.

The first case of palatoplasty that has been published, belongs to M. Krimer, (*Journal de Graefe et Walther*, t. x., p. 625.) This surgeon made an incision at the distance of some lines outside a cleft (*fente*) which remained in the vault of the palate after a staphyloraphy. He was thus enabled to dissect from the sides towards the middle two flaps, which he reversed upon themselves, and then united by some stitches of suture. The patient recovered perfectly. In the place of these two flaps, M. Bonfils (*Transact. Méd.*, 1830, t. ii., p. 307) proposes to cut one only behind, and to bring it afterwards into the hole, (*trou*,) of which the two anterior thirds only are to be abraded.

MM. Nelaton and Blandin (*Bulletin de Thérapeutique*, t. xi., p. 379) have, as it appears, modified the palatoplasty of M. Krimer,

by changing the form of the flap proposed by this author; but, as they have not applied it on the living subject, it is scarcely possible at the present time to appreciate the actual utility of their process.

If the hole in the vault of the palate is not merely the remains of a fissure of the velum, it scarcely ever closes up spontaneously. We should do wrong to count on cauterization in such cases; the successful results obtained by M. Henry of Lisieux, (*Bulletin de l'Acad. Roy. de Méd.*, t. i., p. 291,) those that are attributed to Dupuytren and Delpech, (*Bulletin de Thérapeut.*, t. xi., p. 379,) and those which belong to myself, all have reference to perforations in the velum of the palate, and not to holes in the vault of the palate. It is then to palatoplasty that we must actually have recourse in these last cases.

Process of the Author.

One important circumstance to be observed is, that the fibro-mucous membrane of the palate, with its firmness and little vascularity, admits but imperfectly of the formation of large flaps, and that, if it is required to give to these flaps more than half an inch in length, they almost inevitably mortify in whole or in part. Having tried it in that manner, and observed that the flap became gangrenous to one half its extent, though it had a large base, and had been borrowed from the root of the velum of the palate, I determined upon the following process.

Two strips of tissue, from six to ten lines long, and having the form of a somewhat elongated triangle, are cut, the one in front, the other behind the perforation. Dissected and brought down towards each other, and united by means of a stitch of suture at their apex, these flaps each leave a wound the approximation of the borders of which gradually closes up the fistula in every direction. We may also, in order to aid in the cure, make from time to time a longitudinal incision upon the two sides of the hole to be closed. We may make transverse ones, also, upon the root of each flap when they are sufficiently revivified, (*revivifiés.*) It was in this manner I proceeded in the case of a young man who has become unfortunately celebrated, and who, in consequence of a discharge from a pistol, had a hole eight lines long and six broad in the vault of the palate. This subject also will be recurred to again under the head of staphyloraphy.

[*Anaplasty applied to great loss of Substance in removing Cicatrices from Burns.*

If America owes to Europe the first-improved processes of anaplasty, there is one remarkable and recent case on record in which one of our surgeons, Dr. Mutter of Philadelphia, may lay claim to have carried the art to a higher perfection than elsewhere known. In an adult female, who had been shockingly burned when aged

5 years, and who, from the chin being drawn down by the cicatrix on the neck to an inch and a half from the sternum, had not been able to close her mouth but for a few seconds at a time during the space of 23 years, who could neither throw her head back or to the left side, and whose clavicle on the right side was imbedded in the lower part of an enormous cicatrix which filled up the space between the chin and the sternum; Dr. Mutter made a transverse incision across the middle of the cicatrix about three quarters of an inch above the sternum, commencing on sound skin near one side of the cicatrix, and terminating the incision in the sound skin on the other side. This was to get at the attachments of the sterno-cleido muscles, which muscles were not over three inches in length. Carefully dissecting down over this vital part, through the fascia superficialis colli, he exposed the sterno-cleido-mastoid muscle on the right side, and passing a director under it as low down as possible, divided both its attachments. He could thus raise the head an inch or two, but perceiving the retraction of the muscle on the other side unyielding, he divided its sternal attachment only, and was delighted to find he could replace the head completely in its natural position. The clavicular attachment offering little or no resistance, was not divided. A shocking wound *of six inches in length by five and a half in width* now presented itself, yet almost without hemorrhage, only three or four vessels requiring the ligature. He next detached an oval flap of sound skin *six inches and a half* in length by six in width, by continuing the first incision downward and outward over the deltoid muscle, leaving a pedicle at the upper part of the neck. This dissection was painful but not bloody, only one small vessel being opened. Making a half turn of the flap on its pedicle, it was brought over the chasm and carefully attached by several twisted sutures to the edges of the primary wound, the whole being supported by adhesive straps. The edges of the wound on the shoulder were completely brought together by straps and sutures, except its upper third only, on which raw surface was applied a pledget of lint wet with warm water, after which the patient was put to bed with the head maintained backward by a bandage. No unfavorable symptoms occurred, and union took place by the first intention. Twelve months after no contraction of the flap had taken place. Dr. Mutter has succeeded by this process in several other cases. Oleaginous frictions to the new parts are useful to give them flexibility and softness. He recommends this process in cicatrices from burns in the neck, cheek, eyelids, nose, lip, &c. In the three latter he has effected complete restoration of the organs. (Vide *American Journal of the Medical Sciences*, July, 1842; see also figures of the above extraordinary case in *Dr. Norris's American Edition of Fergusson's Surgery*, and in the more recent work (Philadelphia, 1844) on *Operative Surgery*, by Professor Pancoast; also, Professor Mutter's own late work on *Cases of Deformities from Burns.*)—*T.*]

CHAPTER XI.

BRONCHOPLASTY, (ANAPLASTY OF THE LARYNX AND OF THE TRACHEA.)

Wounds in the anterior region of the neck, always so dangerous from the large vessels that they may include, are still more so by their tendency to become fistulous when they involve the respiratory canal. It is important, nevertheless, to arrange them, in this respect, under distinct heads. Those of the trachea, unless the canal is completely divided through, in general cicatrize with facility. Over the cricoid and thyroid cartilages, also, art triumphs without much difficulty; but it is no longer so in the thyro-hyoidean space. Here position, bandages, and even the suture, do not always suffice to keep the lips of the wound properly approximated.

Article I.—Anatomy.

The cause of these differences lies in the anatomical arrangement of the parts. Under the laryngeal prominence, in fact, the skin and the subjacent tissues possess a thickness, and enjoy a mobility, almost everywhere equal. The trachea is sufficiently pliant, and endowed with a sufficient degree of vitality, for the process of cicatrization, when properly conducted, to close up its openings without difficulty. Nothing would prevent our applying the suture to them if we judged it proper, and the movements of the head have but little influence upon the progress of such wounds. In the thyro-hyoidean groove, (*rainure,*) it is entirely the reverse. There, the parts lose their parallelism as soon as they have been divided. The angle of the cartilage draws the lower lip of the wound forward and downward, while the os hyoides draws the upper one backward and upward. The first presents a complex structure. We remark there, at the same time, a solid cartilage, a very delicate skin, very irregular cellulo-fibrous tissues, and the attachment of some muscles. If, in the second, the tissues are more homogeneous, the os hyoides gives it such mobility that surgical remedies have but little hold upon it, when our object is to maintain it in connection with the other. The least movement of the chin, also, immediately deranges the coaptation. Mastication and deglutition, whether of solids or liquids, or of simple saliva, do the same every moment. If the epiglottis is below the wound, which is rare, the matters coming from the mouth almost always become entangled in the accidental opening. If, on the contrary, as generally happens, this part is found detached from the glottis, the air and mucous matters repelled by its postero-inferior surface are

still more easily driven into the wound. Thus, on the one side we have the tongue, and epiglottis, and fleshy, vascular, pliant and moveable tissues; and on the other, the thyroid cartilage solid and fixed, and but little vascularity in the tissues. Is there any thing more wanting, connecting these with the other peculiarities just mentioned, to explain the fistulas produced by transverse wounds in this part of the neck?

Anatomy, moreover, explains why divisions by cutting instruments more frequently take place in this place than elsewhere; as it is to attempts at assassination and suicide that they are most generally to be attributed. The projection of the chin, and the top of the larynx, thus in some degree strongly invite the arm of the murderer to this spot. In other respects, the upper border of the thyroid cartilage on each side terminating behind in a kind of horn of considerable length, it is rare that the instrument penetrates beyond that part. The carotids are by this means protected. The superior thyroid artery, and some other branches of still less volume, being alone accessible, the wounded person almost always survives, and the fistula has, in this manner, full time to establish itself.

Article II.—Indications.

Most authors have pointed out the dangers of wounds of the throat, and the difficulty of curing their fistulous openings. We may on this subject consult Paré, (*Liv.* x., ch. 30, p. 292,) Richter, (*Bibliothèque du Nord*, t. i., p. 167,) Bousquet, (*Thèses de Paris*, 1775,) the *Memoirs of the Academy of Surgery*, (tom. iv., p. 429,) J. Bell, (*Traité Des Plaies, Traduction d'Estor*, p. 474,) and the fourth volume of the *Clinique* of *M. Larrey*. Only that, inasmuch as these practitioners have, with the exception of a very small number of their cases, confined themselves merely to saying that the respiratory passage had been opened, without designating specifically the part wounded, their observations cannot be of any great assistance in such matters.

For the same reason that wounds of the thyro-hyoid space are, from the very first, difficult to cure, the fistulous openings which are produced by them must be still more difficult to close. Sabatier was so convinced of this, that he hardly deigns to devote a page to them in his excellent work. MM. Roche and Sanson, (*Element. de Pathol.*, t. v., p. 280,) who have not thought it necessary to treat of them at greater length, admit that they are almost always incurable. To such extent, in fact, has this opinion been carried, that to judge of these wounds by the silence of writers, they have not, up to the present time, been the object of any attempt at surgical relief. Our latest dictionaries, and treatises, give no more details on this subject, than the works of past ages, and there is no scientific work which makes particular mention of them. The cause of such an omission can only be explained, as I conceive, in three ways. Finding that it sufficed to pare (*aviver*) the borders of these thyro-hyoid fistulas, to cause them to agglutinate by means of su-

tures and bandages, has it not been that surgeons have deemed the treatment too simple and easy to be worthy of being made the object of special consideration? The assertions of Sabatier, however, and the facts that I am about to state, prove that such a version is not admissible.

May we not, on the contrary, be permitted to think, that, having failed in their efforts, practitioners have deemed it unnecessary to make the same known to the public? As they do not jeopardize life, and may be covered over by the cravat, or completely shut up by a tent of linen, lint, etc., is it not therefore still more probable, that patients making up their minds to take care of their fistulas themselves to an indefinite period, have thus thought proper to exclude surgery from an opportunity of interfering with them? The future will reveal to us if it is not these two last motives, as I think it is, to which more especially the blame must be imputed. Whatever, however, may be the cause, it is sufficient for me, at the present moment, to prove the difficulty of curing some of these fistulas by the methods now known.

[The presumption is, that in many instances this apparently most singular omission may be as satisfactorily explained, by the facility with which these fistulous openings sometimes rapidly close up spontaneously, (as in children especially,) as by the obstinacy with which, in other cases, they resist all remedial measures. Thus, remarks Dr. Mott, as recently happened to him in a successful case of tracheotomy which I had the satisfaction of seeing performed by him upon a child of three years of age; the clean incised wound, notwithstanding the great number of arteries and veins which necessarily had to be tied, (owing to the engorgement of all the vessels of the part, through the violent and strangulating efforts of the patient to relieve itself,) rapidly granulated, while the fistulous opening gradually contracted itself as the neighboring parts neatly cicatrized, and finally spontaneously closed up, leaving scarcely a trace behind, and without the slightest dressing whatever having been used. Dr. Mott, indeed, is of opinion, that it is better in such cases to leave open the artificial incision into the trachea to its own curative action, as the air passing a part of the time through this aperture, saves the portions of the trachea and larynx above, from the fatigue of the respiratory functions, and which exemption, partial as it is, they require, from the extent to which irritation has been produced there previously by the foreign body—in this case above, a large black straight pin, two and a half inches to three inches in extent, with the head of the size of a large pea, and lying downwards.

In adults, on the other hand, as is familiarly known, artificial fistulous openings between the ribs, and penetrating into the cavity of the thorax, are often exceedingly difficult to close up. But even in the greater part of these, also, the cure is readily effected, and the silence of authors, therefore, is upon the whole to be imputed to the fact, that such wounds in the trachea, at least, are, by the facility with which they are healed up, a matter of very little im-

portance. From the rapid and healthy curative process which took place in the case above mentioned, and which will be given in detail in the appropriate part of this work, ought not much of this result to be imputed to the clean incised and fresh wound made by the operation? And does not this therefore suggest that, in all cases of fistulous openings into the trachea, whether congenital or from ulceration, or lacerated wounds, it would be advisable to excise the edges completely, so as to make as straight an aperture as possible? And then, if aid were required to assist nature, as in cases of long standing, what more would be necessary than to approximate the lips together, either by strips of adhesive plaster, or the suture?

In making this excision, however, the utmost care is required, because of the extreme danger of suffocation from the introduction even of a single drop of blood into the air passages. To do it properly, therefore, we do not know of a better mode than to do it in the manner, and with the precautions, which Professor Velpeau very ingeniously proposes below, in his own process.—*T.*]

Article III.—Operative Process.

If it be true that all the modes of anaplasty may be applied to fistulas of the larynx, the French or the Indian method, however, have hitherto been the only ones had recourse to for their cure.

§ I.—*Process of the Author.*

One of the patients whom I cured of a fistula, had been already operated upon unsuccessfully, in a large hospital; another case belonged to M. P. Denis, ancient laureate of the school of Paris, who, fearing that he would not be sufficiently well attended to in the establishment which he has the management of, in one of the provinces, sent him to me, in the month of December, 1832. These facts of themselves showing that their disease was not easy of cure, I mention the circumstance to justify myself for having made use of a new method of anaplasty. This method consists, essentially, in the construction of a fold, or tent, (*bouchon,*) of sound tissues, which is introduced into and kept in the fistula. Here is the process:

First Stage, (*Premier Temps.*)—The patient being laid upon his back, as in bronchotomy, is held down in a proper manner by assistants. The surgeon, placed on the right, cuts on the front part of the larynx, below the ulcer, with a straight or convex bistoury, a flap of integuments, an inch in width and two inches in length, more or less, according to the breadth or depth of the aperture to be closed. shapes this flap into a cushion, or square form below, gives it a little less width above than at its under part, dissects it, and raises it from its free border towards its root, reversing with it as much cellular tissue as possible, but without denuding the cartilage, and stops then to proceed to the second stage of the operation.

Second Stage, (*Deuxième Temps.*)—This second stage includes the

paring of the edges (*l'avivement*) of the fistula. As it fatigues the patient by the cough that it excites, and the repeated movements of deglutition which it causes, it requires some precautions and patience. In place of doing this by removing layer after layer horizontally, (*en dédolant,*) which would seem to be the most easy mode of performing it, I would remark, that it would be better to force in at first the point of the bistoury outside of and upon a part of the circle to be excised, in order afterwards to go round its whole circumference, before dividing, in any part of it, the continuity of the pellicle that we wish to detach. We thus excise an annular band of tissues, which is held successively, at its different points, by the forceps, in proportion as the instrument separates it from before backward, until the operation is completed. As its deep border [i. e., the bottom of the incision—*T.*] is not to be detached until the last step, the blood escapes on the side of the wound. Not entering, unless in very minute quantity, into the laryngo-pharyngeal cavity, this fluid cannot, therefore, excite in the patient a violent desire to cough, or expose to any risk of suffocation. It is, moreover, better to excise in such manner that the wound may be made a little wider superficially, than at its bottom, [i. e., flare outward.—*T.*,] and that it may present, in some degree, the form of a cone or funnel.

Third Stage, (*Troisième Temps.*)—After allowing a minute or two to the patient to repose, which is required also to suspend the oozing of blood from the wound, we proceed to the third stage, that is, to the adjustment of the flap. This part of the operation presents two modifications, sufficiently distinct.

First Process.—If the fistula has more extent crosswise, than from above below, we begin by folding the flap double, (*par mettre le lambeau en double,*) taking care, however, in making this fold, not to carry up its point quite as high as the root. We reverse it in this state, without twisting it. Its cellulo-adipose surface only being free, the surgeon then adjusts its heel, that is, its middle part, into the fistula. There is nothing more to be done than to insert, from left to right, a long needle, which perforates at the same time the lips of the wound, and the whole thickness of the body which fills it up. A few turns of twisted suture, a perforated linen spread with cerate, some lint, one or two compresses, and some turns of bandage, support the whole. The flap requires here a certain degree of attention. Its point being free, opposite to the internal or cutaneous surface of the pedicle, would easily escape by slipping backwards, if the needle, by being badly adjusted, should pass between its two folded halves, in place of actually perforating them.

This accident happened to my second patient, and made me fear, for a moment, that I should be obliged to begin again. It may be avoided with certainty, by previously fastening together, with one stitch of suture, the apex and root of the tegumentary fold. Then the deep-seated needle and the twisted suture would not be indispensable. A strip of diachylon plaster from before backwards, and

sufficiently long to surround the neck, could be readily substituted for them.

Second Process.—When the fistula has its greatest diameter in the vertical direction, or takes on the circular form, it is sufficient to roll up the flap, cut as we have described it, upon its cutaneous surface, and parallel with its length, in order to form with it a cylinder or tent, (*bouchon.*) The operator, then reversing it, inserts its free extremity to a certain depth into the abnormal opening, fastens it as in the preceding case, and is careful to leave no void between the pared (*refraîchies*) surfaces.

If any circumstance, moreover, should require it, this flap could just as well be taken from the side, or above, as in front of the thyroid cartilage. It is for the practitioner to determine in what direction the tissues are best adapted for this purpose. It is important only, that he should give to it one half more length and breadth, than the size of the opening to be closed would at first sight appear to require, seeing that its natural contraction necessarily diminishes its size considerably, as soon as it is in its place.

As to the wound which results from its dissection, we might, in the greatest number of cases, reunite it immediately by two or three stitches of twisted suture; but the difficulty of establishing a uniform compression in the neighborhood, would expose to the risk of an erysipelas, or suppuration throughout the entire neck. Prudence therefore suggests, that we should confine ourselves to approximating its edges gradually, in place of attempting a perfect contact.

I have yet had, it is true, but two occasions to put this method in practice; but in both the success was complete.

First Case.—One of the patients, twenty-eight years of age, and in other respects in good health, had had his throat cut four months before, between the os hyoides and thyroid cartilage, and from one sterno-mastoid muscle to the other. Stitches of suture, a bandage, and the flexed position of the head, had recourse to on the spot by M. Dænis, physician of the Hospital of Commercy, procured only an imperfect union of the wound. When he came under my care, December 15th, 1832, the borders of the wound had cicatrized apart, to the distance of about six lines. When his head was raised up, it was easy to insert into the fistula the point of the little finger. In this state he could scarcely make himself heard. In depressing the chin, on the contrary, he regained his voice and speech. A curved sound, introduced into the bottom of the wound, and the left forefinger inserted deep into the back part of the mouth, enabled me to ascertain that the division penetrated directly above the glottis, and under the epiglottis. The deglutition of liquids caused more cough than that of solids. Mucous matters escaped in abundance by the fistula. Much caution, also, was required, to prevent the ingesta from also becoming entangled in it. The least contact with these bodies, or of any foreign body whatever, with the interior of the wound, produced immediately a paroxysm of coughing so violent as to render it impossible to make any continued approx-

imation of the borders of the wound. I operated on the twenty-second of the same month, after the first process above described. The flap, after being dissected, was doubled, reversed from below upward, and then introduced, thus folded, into the excised (*avivée*) fistula, and finally attached by a single pin. I did not remove the dressing until on the fourth day. The point of the flap being a little too short, or badly fastened against its root, had slipped off and got into the larynx. The swelling, in fact, of the tissues, made me think, for an instant, that the whole cutaneous fold had succeeded in getting into the passage. A violent spasm of coughing, which had come on the day before, still more confirmed this opinion; but the event showed that there was no such thing. In fact, it was by retracting itself from behind forward, that this flap succeeded in stopping up the fistula, and its pedicle was found, so to speak, distinct, before the cicatrization was completed. A hole, which scarcely admitted the head of a pin, and which was with difficulty cicatrized by cauterization with nitrate of mercury, the red-hot iron, and nitrate of silver, did not become entirely obliterated until after the beginning of March, 1833. The strangulation caused by a long strip of adhesive plaster, placed above to depress its upper lip, prevented also the wound of the flap from cicatrizing till very late, and caused an abscess which had formed on the outer side, to reappear several times afterwards, but not in any manner, however, to endanger the success of the first operation, the cure of which had been completed a long time previous.

Second Case.—In the other patient, the wound was in the same place, and was produced by the same cause as in the preceding case. Its size was rather larger, at least in the vertical direction; its borders. also, were a little thicker, and the epiglottis was not separated from the back part of the larynx, but to the extent of two thirds of its breadth. When the patient obtained admission into the Hôtel-Dieu, in the month of October, 1831, his fistula had existed six months. The publications at the time (*Lancette Française*, t. v., p. 240, 310–315) state that Dupuytren dissected laterally the lips of the wound, to a certain extent, in order afterwards to approximate them, and to unite them in this position by some turns of twisted suture. Doubting the success of his essay, the skilful professor had, as it also appears, (*Ibid.*, t. v., p. 315,) formed the project of making trial of another method, that is, "of borrowing from the neighboring parts, and of plugging up the fistula with the detached flap;" but the patient left the hospital and came to La Pitié, in January, 1832. A flap, borrowed from the anterior surface of the larynx, dissected, raised up, and rolled upon its axis, was inserted into the fistula, which had been previously excised, (*refraîchie*,) and was fastened in its place by means of pins. The two fissures which were at first left upon the sides, yielded, at a later period, to the application of the actual cautery, and another point of suture.

The patient did not leave the hospital until a long time after the completion of his cure.

§ II.—*Ancient Processes.*

The method which I propose, is not the only one that may be applied to fistulas in the air passages. I know, like M. Larrey, (*Clinique Chir.*, t. iv., p. 290,) that to cure a number of these fistulas, it suffices to prolong their angles above and below, then to excise (*aviver*) their borders, and to keep them approximated, either by means of a bandage or suture. A cut of the bistoury crosswise on each lip of the wound, to detach its lower extremity, would also favor its coaptation. The lateral incisions of Thévenin would have the same effect.

When the perforation is larger, the method employed by Dupuytren, or anaplasty by dissection of the tissues, is also of a nature to procure some advantages. We might also imitate the first processes of rhinoplasty, and confine ourselves to sewing the borders of the borrowed flap by the Indian method to the excised borders of the fistula. But even cauterization and simple bandages alone, are sometimes quite sufficient. I even think that these two last means, which have since succeeded with me in two different cases, and the simple suture, will be preferred to the bronchoplasty which I have made use of, provided their efficacy should not appear to be questionable. But the process, nevetheless, which I have suggested, appears to me of a more certain efficacy, more easy in its application, and better adapted to the ability of all surgeons, than the other methods hitherto employed, and which, moreover, certain fistulas obstinately resist.

When it has been decided upon to separate, transversely, the thyroid angle from the perforation, in order more effectually to bring the lips of the latter into contact, there remains, most frequently, a transverse fistula underneath the vertical division which has been cured. The solidity of the cartilage, and the projection which it makes in front, explain this fact. The lateral dissection of the tissues, presents an inconvenience much more serious still; the mucous discharges which come from the trachea, even the saliva, gliding between the approximated flaps and the subjacent tissues, almost inevitably produce an erysipelatous inflammation, which may speedily involve a great part of the neck. Then, in fact, it becomes an ulcer, whose orifice we close before having cleansed its bottom. The state of the parts, moreover, scarcely ever admit of giving sufficient thickness or regularity to the flaps, to remove all fear of gangrene or suppuration.

The skin in the neighborhood is too thin and pliant to enable us to form a suitable covering by the mode of the Koomas, or of Chopart, and to apply it after the rules laid down by MM. Roux, (*Arch. Gén. de Méd.*, t. xv., p. 468,) Lallemand, (*Ibid.*, t. iv., p. 242,) and Dupuytren, (*Lancette Française*, t. iii., p. 273,) for cheiloplasty. The numerous stitches of suture that it would require, and the tendency of the laryngo-pharyngeal fluids to escape by the fistula, would, in most cases, prevent its agglutination from succeeding.

This last method, in fact, has all the inconveniences of that which I brought into practice, without affording any of its advantages. In reality, it merits the preference only in fistulas too large to admit of being closed by a tent, or simple cutaneous fold.

CHAPTER XII.

ANAPLASTY OF THE THORAX.

It is scarcely other than large wounds in the chest, with great loss of substance, that can require the assistance of anaplasty; and among these wounds, those which result from the removal of the breast, are the only ones to which it has hitherto been applied. When the adhesions of the skin, or the extent of the tumor, require a wound whose edges it is impossible to place in immediate contact, we may in reality ask ourselves if there would not be an advantage in filling the void by some one of the processes of anaplasty. Various reasons may be advanced in support of this proposition. If after the amputation of the breast, the borders of the wound remain at a great distance from one another, we have to wait a long time for the cicatrix, and it is not effected but by the intervention of a new tissue, whose retraction produces a constant tendency to the return of the disease. The suppuration which such solutions of continuity involve, and the tractions which such cicatrices exercise, fatigue and torment the patient, and render the radical cure of such wounds a difficult matter. If, then, the surgeon could at the commencement fill up the whole of the wound, the patient operated upon would find great advantage and security from it. For these reasons, various kinds of anaplasty have been made trial of, after amputations of the mammæ.

Article I.

The *anaplasty* known as that of Chopart, or that *by drawing*, (*en tiroir*,) has been made trial of by myself. I had been obliged to remove the integuments with an encephaloid tumor, which extended from the right clavicle to below the breast. The woman was thin, and her skin very adherent. It was impossible to leave a space of less than three inches between the borders of the wound; prolonging the sides of this wound to the extent of four inches below, I circumscribed in this manner a quadrilateral flap, which I dissected to the same extent, and which I endeavored then to raise upward, in order to sew its free border to the upper lip of the primitive wound. I here experienced serious difficulties; for, owing to the density of the dermoid tissue, the flap elongated but very little under my tractions. Having, however, united it by a great many stitches

of suture, to the entire circumference of the wound of the breast, I succeeded in fastening it in a suitable manner; but the operation was long and painful, and the borrowed flap finally mortified, after having given me, during the space of a week, some hopes that it would agglutinate to the neighboring parts.

Article II.—Indian Anaplasty.

A surgeon of La Creuze, M. Martinet, speaks of several women operated upon by him, and who did very well under the Indian method of anaplasty. After cutting a large flap, either from without and near the axilla, or from below and near the flank, M. Martinet says that he then isolated, twisted, (*contourné*,) and reversed it, as is done with the flap of the forehead in Indian rhinoplasty. He adds, that patients operated upon in this manner, and in whom the disease had already reappeared twice, were ultimately cured, and that it is a means which may protect the patient from a return of cancer.

For myself, I fear that anaplasty, whatever may be the process, has hardly fewer inconveniences than advantages in the mammary region. Whether the wound, resulting from amputation of the breast, be closed immediately, or left to cicatrize by second intention, the surgeon is not on that account either more or less secure against the return of the disease. Even though he should succeed in closing this wound by anaplasty, either by the drawing method, or by a reversed flap, the cure, to be complete, will require not less than fifteen days, or a month. We cannot fill up a great loss of substance in this region without producing a wound in the neighborhood still larger. The teguments thus dissected, also, are very much disposed to become gangrenous, in consequence of the manner in which the vessels penetrate into or are distributed to them. The accessory operation, sometimes worse than the principal one, scarcely therefore merits being preserved here, under the form in which I have described it.

Article III.—Anaplasty of Franco.

All that it would be proper to do, if, in order to obtain a complete union, a slight elongation only was necessary, would be to separate the tissues of the circumference of the wound to a certain extent, after the manner of Franco, or to incise the integuments upon the sides, after the method of Thévenin. We would thus cause a relaxation, which would effect, without much difficulty, an elongation of an inch or two in the lips of the wound. In fine, anaplasty in the mammary region, does not appear to me destined to occupy a high rank in surgery.

CHAPTER XIII.

ANAPLASTY OF STERCORAL FISTULAS, AND ARTIFICIAL ANUS.

Fistulas of different kinds may be established in the abdomen, and in the inguinal regions. When these fistulas are not kept up except by an exudation (*suintement*) from the peritoneum, the cure is generally easy. Those that are connected with a wound of the liver, also disappear without difficulty. When caused by a disease of the kidneys, or a perforation of the gall bladder, they ordinarily resist every remedy. Those of the stomach would yield, probably, to some of the processes of anaplasty; but they are so rare, that they have not hitherto occupied the serious attention of practitioners. Those which are caused by a perforation of the intestines, alone merit consideration. Whatever, then, may be the part of the belly where the fistula exists, it takes the name of artificial anus, (*anus contre nature.*) Nevertheless, this last name is applied more particularly to fistulas that remain divided at the bottom by a kind of partition or spur, (*éperon.*) While this éperon exists, the intestinal fistula requires a treatment foreign to that of anaplasty, and which I shall recur to in treating of artificial anus.

If the two ends of the intestine, on the contrary, communicate sufficiently freely with each other, and in such manner that the digestive canal is in some sort divided only on one of its sides. or on its convexity, there is an opportunity of calling in the assistance of anaplasty. When reduced to the state of stercoral fistulas, artificial anus, in other respects difficult to close by the other modes known, has already been treated by several processes of anaplasty.

Article I.—Anaplasty by Dissection of the Tissues, (*par Décollement.*)

Having to treat a case of this kind, *M. Collier* detached the integuments on the contour of the fistula, then pared (*aviva*) its borders, and immediately proceeded to their reunion. The patient recovered. Dupuytren, (*Dict. de Méd., et de Chir. Prat.*, t. iii., p. 157,) however, who attempted this method, states that it proved unsuccessful. It is moreover evident, that it would incur the risk of an infiltration of stercoral fluids into the tissues of the parietes of the abdomen, and that it might then be difficult to prevent gangrene, or erysipelas of a bad character. The process of M. Collier, therefore, has found but a very small number of partisans.

Article II.—The Indian Process.

Very recently, in 1838, M. Blandin, (*Bull. de l'Acad. Royale de Méd.*, t. ii.,) having cut a tegumentary flap in the inguinal region, succeeded in twisting (*a pu contourner*) this flap, and in attaching it to the circumference of a large artificial anus. The agglutination of the parts was effected, and the borrowed operculum, though thin and flabby, effectually closed all exit to the matters. It resulted, however, in this, that the intestine, with the constant tendency to produce a hernia, pushed it out like a valve, (*soupape,*) and obliged the patient to wear a bandage. This case of success, however, to which I have alluded, will not be sufficient to bring into general use the anaplasty of the Koomas. This method, at the most, could only in fact be adapted to large fistulas, and to cases where the parts admit of cutting from the neighborhood a flap of sufficient thickness.

Article III.—Processes of the Author.

§ I.—*The Plug*, (*Bouchon.*)

Desirous of transferring to stercoral fistulas the method which I had tried to the larynx, I endeavored, in 1832 and 1833, by means of a tent (*bouchon*) of integuments, to shut up a fistula of this kind in a boy aged about fifteen years. The anus, about an inch in width, was entirely free of an éperon. Many operations had already been attempted for it in vain. It had its seat in the right iliac region. I cut on its outside a triangular flap, three inches long, and twelve lines in breadth. This flap, reversed upon its cutaneous surface, then rolled in the form of a plug, (*bouchon,*) was introduced by its cellular surface into the fistula, which had been previously abraded, (*avivée.*) I fastened it there by means of several stitches of suture, and kept it in its place by the aid of a slightly compressing bandage. Violent colics supervened on the third day, which were soon succeeded by a stercoral exudation at the circumference of the flap, which soon mortified and fell out in a state of putridity, (*putrilage.*)

The acrid penetrating humors which pass under the fistula, insinuate themselves so readily between the parts, and render the agglutination of the tissues so difficult afterwards, that to succeed in such cases would require a concurrence of circumstances which we could scarcely be permitted to hope for.

§ II.—*French Anaplasty.*

In other cases I have proceeded differently. After having pared (*avivé*) the fistula, in order to transform it into a sort of a slit, (*fente,*) and to unite it by three or four stitches of simple suture, I made, at the distance of an inch on each side, an incision which

extended beyond its two extremities, and which went through the whole thickness of the integuments and penetrated down to the aponeurosis. I in this manner obtained a considerable degree of relaxation, and the patient was completely cured, (*Jour. Hebdomad.*, 1836, t. iii., p. 5, 33, 65, 70.) But, as I shall return to these different methods in treating of artificial anus, I have no occasion of alluding further to this subject at the present moment.

CHAPTER XIV.

ANAPLASTY OF THE SCROTUM AND PENIS.

Article I.—Prepuce. Different Causes may produce the Partial or Total Destruction of the Prepuce.

Gangrene, chancres, and certain operations, as circumcision for example, all tend to this morbid conformation. The desire to remedy it has been felt from the earliest antiquity. Galen, in quoting Antylus, had already described the kind of anaplasty which was formerly used for it, viz.: by dissecting off the surrounding tissues, (*par décollement périphérique.*) After having separated from the corpora cavernosa the integuments of the penis in their whole circumference, and to the extent of about an inch, Antylus, drawing upon this sheath, brought it forward so as to cover the glans penis with it. The operation in itself presents neither difficulty nor danger; but by the effect of their contractility alone, the integuments gradually retract backward, and soon reassume their former position. In becoming agglutinated to the circumference of the glans, they produce a more serious deformity than the first. I, therefore, am of opinion that anaplasty of the penis, such as we understand it up to the present time, is not worthy of being preserved. Composed as it is of a mere fold of the integuments, the prepuce is not an organ of sufficient importance in the animal economy to justify operations of this kind.

Article II.—The Penis, Properly so Called.

It happens sometimes that the surgeon is obliged to deprive the penis, either wholly or partially, of its cutaneous covering. We may conceive that in a case of this kind it would be practicable to borrow, either from the scrotum if it was sound, or from the fold of the groin, or the hypogastrium, flaps capable of subserving the uses of the penis. It is very doubtful also if Indian anaplasty would succeed here, and I do not believe that it has ever yet been tried for this purpose. It might, however, possibly become necessary after the removal of certain tumors of the scrotum, (*tumeurs des bourses.*)

Article III.—Scrotum.

The scrotum is very often the seat of tumors, which, notwithstanding their very great volume, include nothing more than the integuments, and leave uninvolved both the body of the penis and the testicles. In such cases, surgeons have conceived that it might be possible to save (*ménager*) these last-mentioned organs, though the entire diseased tissues were removed. It is what Delpech (*Clin. Chirurg. de Montpellier*, t. i.)—[See the first account of this case, published soon after its occurrence, in the *New York Medical and Physical Journal* for the year 1822, as the same was communicated to me at the house of the lamented Delpech at Montpellier that year, together with his original manuscript in French, and the original colored plates, all of which I treasure as a precious relic of that truly accomplished surgeon.—*T.*]—appears to have been the first to do with success, in a man from whom he had removed a scrotal tumor of the weight of sixteen pounds; it is what I also did in 1835, (*Lancette Française*, 1835, t. ix., p. 177,) in the removal of a similar tumor, but infinitely less voluminous. In these cases we circumscribe exactly all the parts to be removed, taking care to avoid the testicles and penis. After having dissected the integuments in the direction of the perineum, thighs, and hypogastrium, we reverse them, and trim (*découpe*) them to make the flaps out of them. All the flaps are then brought together, a portion of them below and inward to reconstruct the scrotum, the others upon the body of the penis, in order to remake a sheath and prepuce for this organ. Numerous stitches of suture, and a bandage making moderate compression, maintain the whole in its place, and promote the agglutination of the parts.

CHAPTER XV.

URETROPLASTY.

The great losses of substance in the urethra, ordinarily lead to the formation of incurable urinary fistulas. Various practitioners, however, have, in these cases and some other obstinate fistulas, made trial of different modes of anaplasty.

Article I.—Indian Uretroplasty.

To cut a flap of integuments on the upper part of the thigh, and afterwards to transport it and fasten it by means of the suture to a urethral fistula previously pared, (*rafraîchie*,) is a method which M. Earle appears to have been the first to have essayed with suc-

cess, (*Archiv. Gén. de Méd.*, t. i., p. 102.) M. A. Cooper (*Surgical Essays*, vol. ii., p. 221; *Journ. Hebd.*, t. v., p. 108) has not been less fortunate in one out of two of his cases; but Delpech, operating in the same manner, completely failed at two different times on the same patient, (*Lancette Fran.*, t. iv., p. 264, 278, 285, 288, 295.) Attempted afterwards by other practitioners, this kind of anaplasty has been equally unsuccessful. The objections I have made to Indian anaplasty, in speaking of stercoral fistulas, exist in all their force in reference to urethral fistulas. In order to succeed, two things are required:—1. That for four or five days no urinary discharge should infiltrate into the contours of the fistula; 2. That the borrowed flap should be thicker and more vascular, and less disposed to mortify in fact, than it necessarily is in those regions.

Article II.—Uretroplasty by Drawing, (*en Tiroir.*)

Desirous of avoiding this double inconvenience, M. Alliot (*Gaz. Méd. de Paris*, 1834, p. 348) has proposed to pare (*aviver*) the fistula freely upon one side of the urethra, in the direction of its tegumentary tissues, then to dissect and draw over to that side, by a sort of slipping motion, (*glissement*,) the same tissues from the opposite side, so that the convex border of the flap may be compelled to cross and go several lines beyond the opening in the urethra, in order to rejoin the excised border of the integuments. The fistula, resting then upon tissues perfectly sound, is reduced to the state of a simple ulcer opening into the urethra. The patient of M. Alliot was completely restored, and I doubt not that in transporting thus the integuments from one side of the fistula to the other, we may succeed in establishing a process of uretroplasty of great efficacy.

Article III.—Uretroplasty by Lateral Incisions.

Desirous of avoiding all dissection or detachment of the surrounding parts, M. Dieffenbach conceived that in order to cure urethral fistulas, it would suffice to pare their edges, to unite them together by suture, and then to make a deep and long incision on each side.

Article IV.—Uretroplasty by Dissecting the Tissues, (*par Décollement.*)

In the place of seeking for a flap near the rectum, or upon the lateral parts of the penis, as the English surgeons have done; of borrowing it from the groin, or the inner surface of the thigh, as is preferred by the Professor of Montpellier; it would, probably, be better to proceed by dissection and approximation. In this mode, the fistula being arranged as for an ordinary suture, we should successively dissect off the two sides from within outward, so as to form two flaps, which we should preserve as thick as possible. The border of these flaps being afterwards pared, either by the

bistoury or a pair of good scissors, allows, in fact, of our effecting the coaptation with the simple or twisted suture. A methodical compression made upon these lateral parts, would keep them in exact contact with the subjacent tissues, and would serve to prevent the urinary infiltration. But experience not having yet pronounced upon this operation, I do not think it necessary to say any more upon the subject.

I would say the same of the process which I have already spoken of in treating of bronchoplasty; since, from not having yet tested it in cases of urinary fistulas, I cannot regard its success as any thing more than very probable.

Article V.—Appreciation.

We cannot deny that all these varieties of anaplasty may sometimes be useful in these cases, and that each one of them may have its indications; but we should, nevertheless, do wrong to repose any great degree of confidence in any of them, or to have recourse to them before assuring ourselves of the inefficacy of other therapeutic means. It is evident, also, that the details of the manipulating process would be superfluous, and that these are operations that the surgeon ought in some measure to devise for each particular case. The important point is to know that the stitches of suture cannot be too numerous; that we ought not, if the attempt is practicable, to leave any void, or any separation of tissue, (*décollement,*) in the neighborhood of the fistula; that the integuments and the flaps ought not to be detached but to such extent as is absolutely necessary; that it is requisite to leave a gum-elastic catheter in the urethra, or to use the catheter every time the bladder has need of being emptied, in order that the urine in passing out cannot possibly touch the walls of the canal. (See *Operations which are performed on the Urethra.*

CHAPTER XVI.

VAGINAL ANAPLASTY, OR ELYTROPLASTY.

Of the three kinds of fistulas which may be formed in the vagina, vesico-vaginal, recto-vaginal, and entero-vaginal, there are two at least in which anaplasty may be proposed, and which have, in fact, been submitted to some trials of this operation.

Article I.—Vesico-Vaginal Fistulas.

Whether the fistula which opens a communication between the urinary passage and the vagina, commences at the urethra or

bladder, it is, nevertheless, always very difficult of cure. Having ascertained that neither cauterization, the suture, hooks, (*érignes*,) nor other operative processes, have ever hardly succeeded in these cases, surgeons very naturally welcomed the suggestion of any thing like a new operation.

§ I.

Nevertheless, it is scarcely any other than Indian anaplasty which has been employed to remedy fistulas in the vagina. No one had spoken of it previous to my having suggested, in 1832, the shutting up of laryngeal fistulas, by means of a plug (*bouchon*) of integuments. I added at that time: "If analogy does not deceive me, this method would answer equally well for other fistulas, and for the closing up of a great number of other openings. Deep narrow fistulas with loss of substance in the urethra, thoracic and abdominal fistulas, artificial anus when the obstruction to the course of matters no longer exists, and certain salivary and lachrymal fistulas, would probably derive more advantage from it than from the different anaplastic methods hitherto used."

It is, nevertheless, proper to say, that in expressing myself thus, I was guided only by analogy, and that my assertions were not yet sustained upon any known fact in practice. We have seen above that my predictions were in part realized, in respect to artificial anus and fistula lachrymalis. A surgeon of the hospitals of Paris, M. Jobert, (*Bullet. de l'Acad. Roy. de Méd.*, t. ii.,) has taken advantage of this idea, and appears to have made up to the present time numerous applications of it to vaginal fistulas, whether of the bladder or urethra. It appears also to have been demonstrated that one of the patients, operated upon by him for a fistula at the bas-fond of the bladder, has now been radically cured of it for more than two years past. It is true that this process proved unsuccessful in most of the women he tried it upon, and that M. Roux on his part (*Journ. des Conn. Méd. Chirurg.*, t. iv., p. 107) has completely failed with it. It is even to be feared that by this method we must often anticipate a failure. Nevertheless, as it is an easy process, and one which any one may perform, it deserves, as I think, to be retained, at least for cases where the fistula is of little extent, and where its edges are neither too much thinned nor too indurated.

The operative process of M. Jobert is copied precisely after that which I have described in treating of bronchoplasty. The fistula is abraded (*avivé*) by means of caustic, or a cutting instrument; a flap of much greater length than width, and also of greater or less length or breadth, according as the fistula itself is of greater or less size, or more or less deeply situated, is then cut upon one of the sides of the vulva, so that its point shall be turned towards the sub-ischiatic groove, (*rainure*,) and that its root may be continuous with the vulvar opening of the vagina. Dissected and separated from its apex towards its base, this flap should be sufficiently long to

be drawn without difficulty through the fistula into the bladder, or urethra. Having folded it upon its cutaneous face, we pierce the fold with a double thread; this thread, which is to serve as its conductor, being attached to the head of Bellocque's sound, previously introduced into the urethra through the vagina, easily draws the tegumentary plug towards the fistula, and prevents it afterwards from falling back into the vagina. As the presence of the thread in the urethra might cause an ulceration, there would be some advantage, perhaps, in passing it through a female catheter, which would serve as a support, at the same time that it would give egress to the urine. It is evident, also, that the flap may be taken almost indifferently from the tissue of one of the labia majora, or from the inner surface of the thigh, or from near the breech. The important point is, that it may have a certain degree of thickness, especially on the side of its pedicle; otherwise, with the length we are obliged to give to it, it would be next to impossible to prevent its mortification. Perhaps it would be well, also, after having doubled it, to keep it thus folded at its point by means of one stitch of suture, and to let it contract itself and become vascularized, before introducing it into the fistula. It would also be advantageous, as I think, to draw it by its larger extremity, and to use some force to make it enter, in order that its largest portion, being in the bladder, might in some measure be retained underneath by the fistula itself, which would then perform the office of a constricting ring. What is also necessary is, that the flap should be placed in contact with the fistula by its cellular, and not by its cutaneous surface, and that the edge of the fistula should be in a state of complete abrasion, (*avivement.*)

In this manner no stitches of suture are necessary, and the parts may remain in their place of themselves. Moreover, we should not think of dividing the pedicle of the flap till at the end of some weeks, and after having positively ascertained that a solid agglutination has taken place between the new substance and the periphery of the fistulous opening. This section, also, should be made towards the middle of the length of the flap, in order that in retracting by its new extremity, it may ultimately form a sort of button with two heads, one in the vagina, the other in the bladder. As to the external wound, it should be treated by suture and other uniting means, to its outer half, and with the view of preventing all constriction of the pedicle of the flap, it would be advantageous not to approximate its edges too near to the base of the flap. In the case mentioned above, the obturator (*obturateur*) flap consolidated so perfectly, that it remained covered with a tuft of hair in the interior of the vagina.

I have no occasion to remark, that in regard to attention to cleanliness, and the precautions which the excretion of the urine requires, we must, when elytroplasty is decided upon, proceed according to the rules laid down in treating of vesico-vaginal fistulas in general.

M. Roux, having to close a vesico-vaginal fistula, of two to three

lines in breadth, concluded to cut his flap upon the wall of the vagina itself. Having reversed this flap upon its mucous face, he introduced it into the fistula in the manner we have described, but the apex of the plug soon mortified, and the operation proved unsuccessful.

§ II.—*Elytroplasty by Raising up a Tegumentary Arcade.*

Having met with many women who had been unsuccessfully operated upon by elytroplasty with the process of the plug, (*bouchon,*) [literally a cork.—*T.*,] I determined to make trial, in these cases, of another mode of anaplasty. Grasping, by means of an érigne with a double hook, the posterior wall of the vagina opposite the fistula, and drawing towards the vulva this part, which the forefinger introduced into the rectum pushes forward, and raises up in front, I give the érigne to an assistant, in order to have my hand free. I then use a straight bistoury, held as a pen, to incise the vaginal wall to the extent of an inch, or an inch and a half, above and then below the point raised up by the érigne, taking care not to penetrate to the interior of the rectum. The limits of the arcade to be formed being thus defined, I glide the point of the bistoury flatwise from the lower to the upper incision, and through the tissue of the partition, so as to detach the middle part of this patch (*plaque*) of the vagina from right to left, and to the extent of about an inch, without opening into the rectum, and also without detaching its two extremities. The fistula, previously pared, is immediately treated by suture. Each thread, armed with its curved needle, is first passed from before backward, or from below upward, under the vaginal bridge, then from the bladder into the vagina, through the posterior lip of the fistula, and afterwards brought under the bridge, and then outside. A second stage of the operation consists in traversing, from behind forward, and from the bladder into the vagina, the anterior lip of the hole with the other extremity of each thread, each of which is alike armed with a needle. Desiring now, as the last step, to tie these threads, we force up the dissected arcade into the fistula, to be placed in the bladder at the same time that the lips of the fistula have been brought into contact underneath. The flap thus borrowed from the vagina, projects into the bladder, and is in reality placed astride upon the suture, (*à cheval sur la suture.*)

This process, which appeared to me to present some chances of success, nevertheless failed, in the only case in which I tried it; but it is to be remarked, that the fistula had more than an inch diameter, and that all the parts of the vagina had been for a long time changed, by all kinds of attempts at operations. My intention was, in the supposition that the agglutination could have been made, to divide, at the end of ten or fifteen days, first one of the extremities of the flap, and at a little later period, the other extremity, then to let the wound gradually cicatrize.

§ III.—*Direct Agglutination.*

Another method which I have wished to apply in two cases, but which the women would not consent to undergo, would consist in actively cauterizing the edges of the fistula, and the corresponding wall of the recto-vaginal partition, then to keep this partition raised up by means of plugs (*tampons*) of lint, and dilating bodies introduced into the rectum. An agglutination obtained in this manner would, at a later period, allow of re-establishing the continuity of the vagina, and of leaving, as an operculum on the fistula, the portion of tissue which would have been thus dissected. To what extent do these processes deserve to be employed? It is what I do not venture to say, having myself failed when I have wished to put them in practice.

§ IV.—*Excisions in the Neighborhood.*

Would we perhaps succeed better by excising, at each extremity of the fistula, an elongated triangle to half the thickness of the vesico-vaginal wall? The cicatrization of these new wounds are of a nature, it seems to me, to retract, and perhaps completely to shut up the old one.

§ V.—*Depressing the Uterus.*

Another process which might be borrowed from anaplasty, when the fistula is very high up, would consist in actively (*fortement*) cauterizing its vaginal region, then in hooking the neck of the uterus with an érigne, or a noose of thread, in order to pull it down and cause it to slide as a drawer to below the vesical opening. But I repeat, all these suggestions want a foundation to rest upon; none of them can yet adduce any success in their favor.

Article II.—Recto-Vaginal Anaplasty, or Elytroplasty.

All that I have said of vesical elytroplasty, is applicable to those fistulas by which the rectum communicates with the vagina. It is true, however, that the attempts in respect to these have been less numerous than for the other, either because this kind of fistula yields better to ordinary means, or that it is less frequent, or because females are less annoyed by it. The suture to the perineum, however, is an operation which will perhaps draw attention to this subject, since when that has been performed, it is not unfrequent to find a hole remain above, in the lower part of the recto-vaginal partition. A lady who was in this state, in consequence of a suture in the perineum, which M. Roux had introduced, was operated upon by me in 1837, by means of the Indian mode of anaplasty. I cut a flap in the tissue of the left labium majus, two inches long, and eight to ten lines in breadth at its root. A thread, affixed to

the upper extremity of this flap, enabled me to draw it from the vagina into the fistula in the rectum, and to hold it fastened in this manner near the anus. It mortified to two-thirds of its extent, and contracted adhesions only on one of its sides; so that the fistula, in fact, was diminished only by one third of its size. It is nevertheless true, that in patients more tractable, and by taking every possible precaution not to weaken the vitality of the flap, elytroplasty by the tegumentary plug will offer some prospect of success in this kind of fistula.

CHAPTER XVII.

ANAPLASTY OF THE PERINEUM.

Clefts (*fentes*) and fistulas of the perineum in women, might, in fact, allow of many kinds of anaplasty. From the pliancy of the tissues, however, and the ability to bring the lips of the division in contact, the incisions of Celsus only have been applied to them. Thus, after having pared and united these fissures, we may, if the parts seem too tense, make on each side a long incision, and one of sufficient depth to prevent the elasticity of the tissues exercising any further resistance to the action of the suture. Only it would be necessary then, in order not to lose the advantage of these incisions, to fill them with dilating bodies, for example, with rolls (*bourrelets*) of lint covered with cerate. I shall have occasion to refer to all these chapters, in treating of the genital organs and the anus.

[CONCLUDING AMERICAN APPENDIX.

MANY things of interest, and some of much importance in surgery, having occurred while this first volume of this American edition has been in the press, we take the occasion, in a concluding appendix, to subjoin whatever has reached us of particular value of this kind to the student or surgeon, and which directly appertains to the matters treated of in this volume; more especially to those new, useful, and attractive departments of modern surgery, which constitute happily the leading feature of this first portion of M. Velpeau's great work. We mean *anaplasty* and *tenotomy;* in the contributions to which our own American surgeons, as will be seen by the liberal citations we have made from Professor Pancoast's, Professor Mütter's, and other publications recently issued from the press, furnish a very considerable and creditable amount.—*T.*]

Acupuncture.

The Chinese and Japanese, from whom this practice, like the *massage*, (shampooing,) *rhinoplasty*, and much other valuable and practical surgery is derived, as the fruit of the reiterated and established experience of centuries, prefer gold and silver needles. Those of steel, provided they are finely polished, are most in use with us, and are probably better, from their direct and doubtless salutary chemical action on the tissues, as well as from the fact that the metal, iron, from its being the only one of the metals which is ascertained to be a constituent and important element of the blood, must necessarily be more congenial in its adaptation to the organism. The number of needles varies from one or two to twenty or thirty; and in order that they may be well polished, it is advisable, before using them, to pass them through an emery-bag, as recommended by Dr. Elliotson, of London. In the East, the usage is to keep them in for one or two minutes only; but M. Cloquet and Dr. Elliotson prefer to leave them in for several days, while Professor Bache, of Philadelphia, who has used them to great extent, and with much benefit in chronic rheumatism, leaves them in for a still longer time, regulating the period according to the time the disease has existed. Mr. Lewis, of England, has employed acupuncture with some success in hydrocele and anasarca, and for œdema of the scrotum, penis, and eyelids.

Electro, or Galvano-Puncture.

The recent and extraordinary developments of *electro-galvanic* power, (as in our countryman Morse's Telegraph, &c..) lead to the belief that this mysterious agent is destined, at some future time, to play an important *rôle* as a therapeutic means in the animal economy. We have for years had a department of mechanical operators, in the application of the galvanic or electric fluid for various chronic diseases, more particularly for the forms of chronic rheumatism; but the subject has never, as far as we have learned, since the time of the empirical (though, as it now turns out, *scientific*) contrivance of Perkins' Tractors, (also an American invention,) been investigated by competent persons in the profession. That time, perhaps, is soon to come, and we count on some curious, if not valuable discoveries. We have recently known of a well-attested instance in this city, (New York,) in which an inveterate and long-continued permanent contraction of the flexors of the fingers, in a gentleman advanced in life, has been as effectually cured almost, by the repeated tranfusion through them of the electro-galvanic currents, as it could have been by the *tenotome;* or even more so, considering the now-ascertained danger of the application of tenotomy to this part. (See in the body of the work; Discussion at the Academy of Medicine of Paris, on the subject of Tenotomy.) The fingers were almost completely restored to their natural position and uses.

Hæmostatic Means.

The ball, or point of the thumb, or both thumbs, are generally preferable for the temporary compression of arteries, where there is bone to press against; but where the large trunks are rolling, and separate from the bones, as in the course of the thigh and arm, the *four fingers* are most convenient, aided by a *point d'appui* for the grasp of the thumb and palm of the hand on the opposite side of the limb.

On the subclavian in the supra-clavicular fossa, between the scaleni, we may use the thumb and finger as directed by Camper, or the hand-pad. This latter should have a large pad when used for the aorta, as recommended by Trehan, Baudelocque, and others, for uterine hæmorrhage after parturition. The *whole hand*, in thin subjects, and where the abdominal muscles are placed in as relaxed a condition as possible, may also be used.

The artery-pad of Charrière, with its buckles and strap, is a very convenient instrument for the temporal artery in front of the ear and above the zygomatic arch, while the double compress under the jaw protects the skin from the pressure of the strap.

The newly-devised compressors for the subclavian, by Bourgery, Malapert, &c., though complicated, are well adapted to effect the object desired, in a secure and perfect manner. We doubt, how-

ever, their applicability to the carotids, for the compression of one alone would, from the free anastomosis, be of little avail, while the compression of both would certainly be extremely hazardous, if not immediately fatal.

The *axillary* artery, in persons not thin or emaciated, is difficult of compression, as the pectoral muscles lie in front of it as it passes over the second and third ribs. To effect it, however, these muscles should be relaxed as much as possible, by bringing the arm partly over the chest in front. The upper part of the middle third of the arm is preferable for the humeral, or brachial, as the *median* nerve is here some distance within it. Professor Fergusson prefers the application of the tourniquet to the femoral, in the *popliteal* region, rather than at the usual place in front of the thigh above. There is then, he thinks, less venous hemorrhage.

Where the artery is large, and in a state of *ossification*, Professor Mutter, of Philadelphia, has obtained a serviceable plug by detaching a portion of the adjacent muscular tissue, leaving one extremity of it unseparated, as in making a flap, or *bouchon*, in anaplastic operations.

Torsion unquestionably was suggested by the fact, that *limbs, &c., torn off*, scarcely bleed, the external coat of the artery, in these cases, having been found to be drawn out and twisted spirally, beyond and around the two ruptured and receded coats within, and the clots of blood blended with them. This has suggested, also, the *tearing out certain tumors* in vascular and cellular tissues, after making the first free incisions and separations.

It has recently been proposed, with more ingenuity than good sense, to arrest the hemorrhage of a divided artery, by passing its bleeding extremity through a slit in the tube above. The *hot iron* after all, and that repeated, is one of the most valuable styptics in the small arteries. This is most beautifully illustrated in the new and admirable treatment of *nævi* by *red-hot needles*, (vid. supra.)

Metallic Ligatures have been, according to Dr. Levert, (*Amer. Journ. Med. Sc.*, 1829,) in his experiments upon animals, found to answer very well; but we should, until more accurate knowledge on this head, doubt their adaptation to organic tissues.

In Phlebotomy, much stress is laid by some on the danger of selecting the median basilic, from its proximity to the brachial artery, the filaments of nerves that surround it, and the number of absorbent vessels that pass over it. It is even recommended, before opening it, to pronate the forearm strongly, in order to twist, as it were, the tendon and aponeurosis of the biceps around the radius, and so remove the artery further off from the vein. This, however, would be apt to disturb the parallelism of the apertures in the teguments and vessel.

SUB-CUTANEOUS SECTIONS IN TENOTOMY AND MYOTOMY.

Strabismus.

Professor Joseph Pancoast, of Jefferson Medical College, Philadelphia, (in his recent work on *Operative Surgery*, Philadelphia, 1844, p. 221,) says he has performed the operation three hundred times, a considerable proportion of which were in public. He recommends unhesitatingly the following method, which he claims as his own :—The lids are to be kept open by a small instrument which he calls the spring-dilator, or speculum, a kind of wide forceps, (made of silver-gilt steel wire, it is presumed,) and with one or two convolutions or circles of wire at its angle of union, so as to give it the elasticity or spring required. The prongs are thus kept wide asunder, and their extremities respectively applied to the cuticular surface of the lids, thus causing but little pain, but requiring the substitution of Pellier's elevator where there is much spasm. In nearly one-sixth of his cases, he found the separation with the fingers quite sufficient. The sound eye he advises to be bandaged, as (in internal strabismus) this has the effect to make the corresponding or diseased eye naturally turn more or less outwardly, and thereby facilitates the operation. A double hook (supposing the case to be internal strabismus) is then inserted *through the conjunctiva into the fibrous expansion of the tendon*, at the distance of two and a half to three lines behind the margin of the cornea. This hook should not, he thinks, be made as generally directed, to force the ball strongly outward, as this would occasion unnecessary pain, and lay the tendon to be divided too flat upon the ball to be easily raised with a blunt hook. It is sufficient to turn the cornea a little beyond the middle of the orbit, steadying it securely in that position. A fold of the conjunctiva and subjacent fascia, a little below the lower edge of the tendon, is then perforated and raised by the sharp point of a pair of angular scissors, and immediately divided. The cellular tissue, and intermuscular fascia, may next be snipped with the scissors, at the upper and lower edge of the tendon. A blunt hook is then passed from below upward, under the muscle, when the sharp hook is to be removed. The blunt-pointed branch of the scissors is now to be introduced beneath the muscle, between it and the hook, and the muscle thus divided. The surgeon should be careful to cut on the outer side of the plica semilunaris, to avoid hemorrhage. If the eye has not acquired its position correctly, the fascia may be still further dilated afterwards, (by another operation,) either above or below, according as the torsion of the ball is upward or downward. So also, (as enjoined by Velpeau, vid. supra,) it may be necessary to divide a part of the insertion of the upper or inferior rectus, or some of the deep-seated bands of cellular tissue at their place of connection with the inner surface of the ball. If this, however, is carried too far, it may (as is well known) occasion a strabismus in an opposite direction, or a protrusion of the ball.

This process we have thought it just to give, as coming from an accredited practitioner; but it appears to us to be too complicated and tedious, compared with some others given in the text of the work. The *spring dilator*, if really practicable in its application, would seem to be an improvement, not, however, altogether new. We regret the author has not given an abrégé of his three hundred cases, that we might derive advantage from the results, whether cures or failures.

Excision of a Portion of an Elongated or Paralyzed Rectus, and its Tendinous Expansion.

In witnessing a great number of operations for strabismus by various processes, and the failure in the eye to regain its normal position, as frequently as could be desired, it has occurred to me that it might be advisable, after the present ingenious mode in talipes from paralysis, of exsecting a portion of an elongated paralyzed tendon, (vid. our notes in the text, supra,) to excise, after the simple division of the rectus internus, (in convergent strabismus, for example,) in the same manner, a sufficiently large segment of the rectus externus, when greatly relaxed, to enable the cut extremities of the externus to unite so far forward on the ball as to give that muscle its proper antagonist force, and restore the ball to its normal position. The elongated and paralyzed rectus, on whichever side it may be, might also, in such cases, in order more perfectly to secure the reunion of the divided extremities, have these brought into coaptation by suture. This modification of the operation, we believe, has never yet been suggested or performed for strabismus.—[*P. S. T.*]

The Tendo-Achillis.

We take occasion to correct an error in the recent quarto volume of Professor Pancoast, of Philadelphia, on *Operative Surgery*, (1844, p. 363,) wherein he imputes a misconception, on the part of Tulpius, Heister, and others, in the supposition they entertained, that club-foot might be caused by a paralysis of the muscles opposite to those contracted. It will be seen by our notes in the text, under the head of Tenotomy, that this was and is a sound pathology, and that the consideration of these cases, and the admirable adaptation of the tenotome to their relief, by the exsection of a segment of the elongated paralyzed muscle or muscles, in addition to the simple division of the contracted muscle or muscles, form a most important department of sub-cutaneous surgery. It is not, therefore, (as Professor P. seems to think,) only in cases of *fibrous* degeneration of the muscles (*Ib.*, p. 364) that the use of the knife is ordinarily needed. This author is of opinion from dissections, that, although the retracted muscles are shrivelled and shortened from defective nutrition, caused by the vessels being greatly diminished, [for want, probably, of the stimulus of the contractions of the mus-

cle.—*T.*,] the *nerves* are, in fact, occasionally hypertrophied, or enlarged, when compared with those on the sound side, (*Ib.*) This, if generally true, is, we think, a new and curious fact; and, upon the supposition that galvano-electric currents are the motive power of muscular action, might, perhaps, from their being constantly but unavailingly called into requisition on the contracted side, account for this morbid organic growth of the nerves. We differ entirely with this author (*Ib.*) in the rather equivocal approbation he seems to bestow upon *tendon-cutting* surgery, as he terms it; but agree with him, that if *orthopedy* has in reality fallen into disuse, it has been from the anatomical ignorance, or empirical presumption, of those who have unadvisedly been permitted to plunge the tenotome (as has been done in plunging the lancet into an aneurism for abscess, or applying the ligature to the femoral vein for the artery) into regions where it could be of no use, or should not have been introduced.

In reference to the injudicious severe application of *mechanical apparatus*, in lieu of subsections, Professor Pancoast says he has seen some melancholy instances, in which this treatment has, by the constitutional irritation thereby induced, awakened some dormant affection of the heart or lungs. In this, we believe the more rational, discreet, and experienced portion of the profession, in all parts of the world, will be found to be of accord. And no one can too strongly proscribe and deprecate the practices of those empirical and ignorant *orthopedic machinists*, who, with their crude and violent contrivances, impose too successfully upon the credulity of parents and the community, in their professed but impotent attempts to cure curvatures, and even *angulations* of the spine, &c., while the harsh machines they employ not only exhaust the muscular energies, and atrophize the muscles by confinement, irritation, and pain, but too often aggravate the distortions, and accelerate the death of the patient.

All other things being equal, no apparatus or machines, as a substitute for *myo-tenotomy*, (as we have ventured to designate the general branch of division of the muscles, tendons, aponeurotic and fibrous bridles, &c.,) can be of value, unless, as is now universally conceded, they admit of, or are associated with, well-timed periodical, steadily-continued, but not immoderate exercise of the locomotive organs implicated.

Sub-Cutaneous Section of Muscles of the Face, for Contraction.

Since the division of the masseter by Dr. Schmidt, of New York, followed by Dr. Mutter, of Philadelphia, Dieffenbach, of Berlin, and Fergusson, of London, this section has been applied by Dieffenbach to most of the muscles of the face, in cases of severe retraction and distortion, more especially of the angle of the mouth. It would seem that there has been too much of a wholesale application of myotomy, by some who have undertaken these sections, and that a sweeping division has been made of most of the sub-cutaneous

muscles of the face, without reference to those specifically implicated in the deformity; the consequence of which is, that the paralyzed bloated appearance afterwards, of the side of the face operated upon, constitutes a state of things more repulsive in appearance, than the original deformity. Prof. Pancoast, of Philadelphia, in June, 1842, (see his *Operative Surgery*, Phil., 1844, pp. 368–9,) in a case of retraction of the right commissure of the mouth, divided by puncture with the tenotome in the mucous lining of the mouth, not only the *zygomatic* muscles, and the *buccinator*, (in part,) but also the *orbicularis*, and levator and depressor muscles of the angle of the mouth; which, *not effecting the object desired*, the remaining portion of the buccinator, and also the depressor labii inferioris, were also divided. This, it is asserted, removed every trace of the deformity; but the division of these two last-mentioned muscles might have been quite sufficient at first, instead of indiscreetly (as we think it to have been) making such extensive sections as the operator did at the very onset, with the hazard of wounding important parts, and without, it seems, accomplishing the purpose he had in view.

The *orbicularis occuli* has been divided successfully by Dieffenbach, for *spasmodic contraction*, and by Messrs. Cunier and Phillips, for *ectropion*.

Talipes, or Club-Foot.

Prof. Pancoast, of Philadelphia, considers those cases in which the fleshy part of the gastrocnemii is permanently contracted into an indurated ball or knot, as in cramp, and where their tendons are thicker and stronger than natural, as most difficult of cure. He also remarks, that after the deformity commences, the insertion of the tendo-Achillis may have the natural obliquity of its insertion a little to the inner side of the os calcis increased by the twist of this bone, so as to aggravate the torsion, and produce a pes equinus varus. (See his *Oper. Surgery*, p. 371.) In *talipes equinus*, in its worst forms, (*Ib.*, pp. 371–2,) Prof. Pancoast says he has found, on dissection, the whole of the upper articular surface of the astragalus turned forward, so that the tibia and fibula rest only on the back part of the astragalus, and the upper surface of the os calcis. The posterior part of the articular surface of the astragalus is then rendered flat by the pressure of the bones of the leg, while the front portion, no longer subjected to pressure, or lubricated with synovia, becomes roughened and covered with bony deposit, so as to offer an almost insurmountable obstacle to any thing like a perfect cure of the deformity. The whole structure of the foot is found, as it were, twisted from before backward, the tarsal bones, as a consequence, being separated on their dorsal face, and compressed on their plantar. The ligaments undergo corresponding changes; they are lengthened and thinned above, and shortened and thickened below.

In *talipes varus*, (the torsion inward,) the scaphoid bone, which

in its normal position should be placed at the internal margin of the dorsal surface, is, he says, (*Ib.*,) found rotated from within outward on its smaller axis, so as to have its internal border placed obliquely near the internal malleolus, while its external tuberosity is placed transversely on the back of the foot, looking downward. In consequence of this rotation, the internal border of the foot forms an acute angle with the internal malleolus, and the outer two-thirds of the head of the astragalus leave the cavity of the scaphoid bone. The os cuboides undergoes a similar rotation, so as to form, at its place of articulation with the head of the os calcis, an angle, obtuse outward and acute inward, consequently leaving uncovered, so as to be felt on the outer side through the skin, a portion of the articular face of the anterior tuberosity of the latter bone. The os calcis is also changed, so that its tuberosity presents more or less downward, while its posterior tuberosity is turned to an equal extent inward and upward; the calcis being thus semi-luxated at its articulation with the astragalus. The ligaments which join the calcis to the cuboides, are found generally in a state of great relaxation. The anterior tarsal and the metatarsal bones, are usually deviated in like manner upon those to which they are articulated, the toes being thrown in a vertical line, with the greater one projecting upward, rendering the dorsal surface of the foot very convex. From the general twisting of the foot, the inner margin of the heel is also thrown upward, to near the internal malleolus, and turned backward so as to bring the external malleolus near the surface of the ground, the weight of the body being sustained on the external border, which in time becomes covered with a hard corn. The bones, in middle life, will generally be found atrophied, and, in some few cases of congenital club-foot, the astragalus has been found twisted on its axis, and disproportionately lengthened. The twist of the foot also tends to rotate the leg inward, causing more or less deformity, and difficulty of motion in the knee joint. The deltoid, or internal lateral ligament of the ankle joint, is shortened, while the external lateral ligaments are lengthened. A new band of fibres, or accidental ligament, is often found tying the internal malleolus to the os calcis. The inferior calcaneo-scaphoid ligament is shortened, and tends to keep up the mal-position of the foot, while the superior calcaneo-cuboid, in accordance with Scarpa's observation, is found materially lengthened. The leg is thin from the atrophy of the muscles, and their tendons are commonly smaller and longer than usual.

In the *talipes valgus*, (outward,) which is very rare, the *three peronei* muscles are considered the usual cause of the deformity, and their division generally effects a cure, unless there is an equinus accompanying, requiring the section also of the tendo-Achillis, (*Ib.*)

In *talipes talus*, that is, where the foot is drawn upward, and which is the rarest of all, the contraction of the tibialis anticus, extensor digitorum, and extensor pollicis pedis muscles, are, in the opinion of Prof. Pancoast, deemed to be the cause of the displacement, (*Ib.*)

In *talipes plantaris*, a new or fifth variety, recently described by M. Guérin, the deformity is produced by a shortening of the muscles on the plantar surface of the foot, which diminishes the length of the organ, and causes a marked increase of the convexity of the dorsal surface. It may be accompanied with an inclination of the plantar surface inward or outward, causing the complications which he has denominated *planti-varus* and *planti-valgus*.

Where, (says Prof. Pancoast, *Ib.*, p. 373,) from the weakened and atrophied condition of the elongated antagonist muscles, in all the above varieties of talipes, there is, as frequently happens after the division and cicatrization of the shortened muscles, a constant tendency to secondary retraction, the apparatus should be continued for months, or a longer time, until this tendency is overcome, (*Ib.*) [See our notes on Tenotomy of the Tendo-Achillis, in the body of the text, supra.]

In the *division of the tendo-Achillis*, the point selected in an adult is about an inch, or an inch and a half, above the os calcis, as the tendon is there least in diameter, (*Ib.*) He prefers inserting the tenotome between the tendon and skin, and dividing from without inward. If, after the tendon is divided, the anterior part of its sheath is found so indurated as to impede the replacement of the foot, we should take care to divide that also, carefully avoiding the neighboring vessel and nerve, (*Ib.*) If the heel cannot be made to descend at once, after the complete section of the tendon, the cause, if it lie in the distorted end of the astragalus hitting against the upper edge of the ankle joint, may often be removed by gentle and well-directed efforts upon the foot; but if it be found in some resisting and prominent tendon, which has given a varus or valgus inclination to the foot, it will be best at once to divide it, (*Ib.*, p. 374.)

Prof. Pancoast considers the usual division of the *tibialis anticus*, in talipes varus, *rarely ever called for*, when the point of the foot can be elevated after the section of the tendo-Achillis, for this movement itself will place the muscle in a state of relaxation. If necessary, however, to divide it, and this is done from before backward, care should be taken not to wound the ligaments of the joints, or the anterior tibial artery. To avoid this latter effectually, Prof. Pancoast prefers introducing a curved knife between the tendon and the artery, (*Ib.*)

The section of the *tibialis posticus* is rarely required in club-foot, unless the scaphoid bone is so drawn around that its anterior end is nearly in contact with the internal malleolus. Prof. Pancoast recommends the division to be made from within outward, at the posterior and internal angle of the tibia, *just above the malleolus*, where it will be found tense, though not very prominent, in consequence of its being confined in its groove. The nail of the left forefinger should be inserted between the tendon and the posterior tibial vessels and nerve, so as to separate the tendon from the latter structures, and at the same time roll it forward and inward, and fix it against the tibia, the foot being held extended and abducted

by an assistant. A slightly concave bistoury is to be then passed from before backward, under the anterior face of the tendon, and next the bone, till the point is felt under the nail. The handle of the knife is then to be depressed, and the tendon severed. The tendon of the flexor of the toes may, if necessary, be divided at the same time. Professor Pancoast prefers this method to that of M. Velpeau, of making the section lower down, near the insertion of the tendon on the scaphoid bone, because the latter incurs more risk of wounding the vessels and nerve, and the new articulation formed here by the distorted joint, in cases of strong inversion of that bone—the only circumstance which Prof. P. thinks can render the operation at all necessary, (*Ib.*)

In regard to the section of the ham-strings, for flexion of the leg, it is remarked by Prof. Pancoast, that in the middle of the popliteal space the great nerve of the thigh sometimes forms a resisting cord below the skin, which might be mistaken for a tendon; but that it may be identified by its position and course through the notch between the condyles, while the tendons are recognised by their direction above to their muscular attachments, and below to the lateral faces of the joint, (*Ib.*, p. 377.)

Dieffenbach has successfully divided the tendon of the *triceps extensor cubiti*, and restored the flexion of the limb in a case of permanent extension from anchylosis, consequent upon a fracture.

ANAPLASTY.

In the formation of a *double undetached flap* over fistulous openings, by the ingenious *bridge-like* process of M. Velpeau, (see the text of this work, supra,—Anaplasty,) an auxiliary means of sustaining the proximate sutured edges of the longitudinal flaps in coaptation, has been suggested and successfully practised by Dr. Mettauer, of Virginia, and Prof. Mutter, of Philadelphia. It consists in inserting a slender roll of some soft substance like buckskin, in the new sulcus on each side the flaps, so as to raise a growth of granulations from their bottom, and thus contribute [on the principle of the action of a quilled suture.—*T.*] to sustain the flaps and promote their union. (Vid. *Pancoast's Oper. Surg.*, Phil., 1844, p. 344.)

Professor Pancoast, of Philadelphia, has, since the new impulse given to *anaplasty*, performed (we should judge by the accounts he gives in his late work on *Operative Surgery*) more difficult operations, and with eminent success, in the restoration of the nose, lips, &c., than perhaps any other American surgeon.

In *rhinoplasty*, he recommends the pedicle of the flap at the root of the nose to be left from half an inch to five-eighths of an inch in width, so as to preserve, for its nourishment, one or both the angu-

lar arteries of the nose. (*Ib.*, 345.) He approves of Lisfranc's recommendation, to bring the incision down between the eyebrows, a little lower upon the side opposite to that upon which we intend to make the twist, as it facilitates this manœuvre. He disapproves of the practice of Mr. Liston, and Dieffenbach, of lodging the pedicle in a groove cut into the integuments upward from the chasm of the nose; as the shaving down the bulky prominence which afterwards forms by cicatrization, is attended with difficulties, or leaves a deformity. Prof. Pancoast proposes some ingenious, and, as it appears to us, valuable modifications, to the usual Indian process of the flap from the forehead. He has, he states, met with entire success by this mode, in SIX CASES of rhinoplasty; and, in his work on Operative Surgery, just published, (1844,) and so frequently cited by us in this appendix, he enters minutely, and with the aid of numerous well-delineated sketches, into the mode he adopts. The first case, and which he published first in the American Journal of Medical Sciences of Philadelphia, for October, 1842, is exceedingly instructive from its formidable character, as involving, not only the soft parts of the nose, and septum narium and turbinated bones, but also the tôtal destruction of the upper lip; all of which losses of substance were happily restored by the Professor, who thus did as much honor to himself, professionally, as he conferred happiness and comfort upon the individual whose afflictions had rendered him a spectacle of revolting deformity.

The patient, Jno. Glover, an Englishman, aged fifty-three, according to his own statement had, some eight years before, received a violent contusion in the face, which resulted in the destruction of parts mentioned. His healthy florid look, as described, and the rapid recovery, and firm granulations in one of his age, seem indeed to imply that there could not have been any syphilitic or mercurial taint in his system. The cavities of the *antra* laid bare, and now shallow by the destruction of bone, exposed to view also the sphenoidal sinuses. The teeth, and alveolar processes of each jaw, were entirely gone—all that was left of the upper jaw being a thin plate two lines thick. The free margin of the lower lip, when closed, thus covered the edge of the upper gum, and reached the nasal cavern. The mouth was diminished by the previous disease, and ulceration, having been followed by union of the lower lip for about half an inch from each corner, to the flesh of the cheek above. So that the mouth, in fact, when opened, formed a *rigid circular orifice*, three quarters of an inch in diameter.

The operation consisted of two stages:—In the first, the contracted mouth was widened, by the beautiful operation of Dieffenbach, at the commissures, [see text of this edition of Velpeau.—*T.*,] and the *upper lip* not less adroitly restored, by Professor Pancoast taking two right-angled flaps (their angles pointing upward and outward) from either side of the cheek, near the ala of the nose. These cutaneous flaps, each about an inch and a quarter in length and breadth, were, together with their subjacent adipose tissue, dissected off from the muscles of the cheeks, while these latter were

loosened from the malar bones and gums, and the surface of the upper gum made raw. The flaps were so ingeniously shaped and disposed by the Professor, that, when stretched down, their inner edges came into perfect coaptation, forming a perpendicular line where the groove of the upper lip formerly existed. The general integuments of the cheek, which, as we have said, had been loosened, were also advanced forward by this adjustment, so as greatly to diminish the space from whence the flaps were removed—the whole of the space remaining being now effectually closed by pins. "The integument by the side of the nasal cavern, was loosened with the knife on each side, and fastened with a cross-pin, so as to give a cuticular covering to the raw margin of the new upper lip. The face was covered with lint, kept wet with lead water, and the two operations, performed in presence of the class at Jefferson College, consumed an hour and a half. In two months, the upper lip being firm and solidly united to the gum, the *second* stage of the operation, that of making a new nose, was also performed before his class."

The value of the Professor's process, or modification, as differing from others, seems to consist, *first:* in *bevelling* the edge of the flap while dissecting it from the forehead, which he does by inclining the blade of the knife outwardly. By this means, he found the lips of the wound in the forehead could be much more approximated by the four hare-lip sutures used. The surface of the new lip and gums were now made raw. But, *secondly*, the most important part of Professor Pancoast's process, and the one upon which he appears to rest (as far as we are acquainted with what has been done in this part of anaplasty) a just claim to originality, and for sound pathological reasoning, is that which we shall now describe in his own words. After abrading the new lip and gums, he "carried an incision down to the bone, just at the outer side of the margin of the nasal chasm. The integuments were then dissected each way from this incision, so as to leave a groove between them for the lodgment of the edges of the new nose. The inner margin was raised up so as to form a vertical wall, for the purpose of bringing the raw surface into contact with the raw side of the flap, and thus give an increased probability to the adhesion of the graft; to render the union still more certain, the triangular piece of skin enclosed by the two grooves at the end of the ossa nasi, was cut away, and the cuticle pared off from the edges of the flap, with which the new nose was to be formed. Three waxed silken ligatures, with a needle at each end, were placed at each side, by passing one needle from without inward through the inner wall of the groove, and again in the opposite direction, about an eighth of an inch above the first puncture, so as to leave the two needles of each ligature resting on the cheek, with a loop through the inner wall of the groove." The flap from the forehead was then rotated to the right upon its root, and in such way as not to make tension on the pedicle. "The two needles at the end of each ligature were then passed through the margin of the flap, from within out-

ward, and again through the integuments on the outer side of the groove, so that when they were drawn tight, they necessarily sunk the edge of the flap to the bottom of the groove, and brought *four* raw surfaces into contact. The threads were tied over small rolls of adhesive plaster, after the manner of Graefe and Labat, so as not to strangulate the parts included in the loop. The middle of the three ligatures were placed a little farthest from the free margin, and knotted over a roll of adhesive plaster three quarters of an inch long, which rested against the flap, and sunk it in so as to support the side of the nose, and give the depression naturally existing above the oval cartilage. The left margin of the new nose was secured before the right, in order to give greater facility in the nice adjustment of the ligatures. A small ligature was then passed through each edge of the integuments of the new column (of the flap) near its root, and tied upon one side, so as to give a rounded form to the column, by bringing the two lateral surfaces together posteriorly, as well as prevent its adhering to the margins of the new alæ. The cuticle was removed from the lower end of the column by a bevelled cut; the column was then pushed in upon the gum, and secured upon the new upper lip by two pins, one of which was semicircular. A piece of lint, dipped in oil, was passed on each side up the new nostril; another was laid on each side of the nose over the ligatures. Lint spread with cerate was placed upon the sides of the nose, and over the wound between the eyebrows—the whole secured with a split adhesive strap brought down from the forehead." The operation was performed in the space of an hour. Prof. Pancoast says his process of *attaching the graft* has been since successfully employed by Dr. W. P. Johnson, of Philadelphia, and Professor Baxley, of Baltimore, union taking place in each of these instances by first intention.

The loss of blood, in the above described case, was not over six ounces. This novel and certainly very ingenious mode of Prof. P., of grafting by a species of *bevelling* and *dove-tailing* of the parts, seems, indeed, well calculated to promote cicatrization and solidity, the two great points or desiderata chiefly to be attained, and which have so long baffled most nose-makers, giving them, for the fruits of their dexterous manipulations, most frequently little else than pug-shaped, flabby, and moveable knobs, that looked more like small shrivelled potatoes, than bona fide human noses. Professor Pancoast says, however, that his process was no sooner completed than the patient (who at no time made any complaint) immediately presented a new nose which had much of the natural appearance, "and was held so firm in its place as to be incapable of being moved by the respiratory efforts," which latter inconvenience is a very serious one in the ordinary modes of fastening, which consists of only two bevelled edges in contact, viz., that of the flap and nostril. The flap retained its sensibility and color, and on the *fourth day* was found united, throughout its whole insertion in the grooves, by first intention, and after the second dressing, preserved its position so perfectly as to require no stuffing of the cavity. The wound

of the forehead healed up finely, leaving a very small cicatrix only, notwithstanding the flap had been made so large (near three inches at its base) to allow for retraction. In five weeks, the pedicle which contained the angular arteries was divided obliquely upward, from the left to the right side, leaving thus a loose triangular lamina attached to the new nose. The arteries were stopped by pinching. "The triangular piece was diminished by paring off the sides, and shaving away a portion of its inner surface; it was then smoothly fitted down over the root of the ossa nasi, into a cavity made by the excision of a portion of the subjacent integument for the purpose. A few stitches of the interrupted suture, and a compress and bandage, completed the dressing. On the third day, the sutures were removed. Some suppuration had taken place along the left line of the junction, and there was considerable tumefaction of both canthi. By the twelfth day the union was smooth and perfect."

The drawings which the Professor gives, (figures 1, 2, 3, 4, 5, 6, 7, plate 71, page 348, of his recent work on *Operative Surgery*, Phil., 1844, and especially figs. 1, 2, 6, and 7,) seem fully to corroborate his assertion, that the nose was, as it must have been from these representations, so good a one and so natural and symmetrical, as to attract the particular observation of no one. There was, it appears on inspection, "a slight drooping at the apex, and a sort of abruptness at its line of connection with the cheeks," which, however, was scarcely distinguishable. These, undoubtedly, were produced by bracing down the nose on the sides, and by its new columna, so firmly; but it was better to make this trifling sacrifice, when the great paramount object of resistant firmness and solidity in this projecting organ was, it would seem, so admirably attained. Fig. 7 represents the patient sixteen months after the operation, with a very decent mouth and upper lip, and a nose (according to the plate) of really elegant contour, presenting altogether a physiognomy so passable, if not comely, as to render it inconceivable how the same face could have exhibited the hideous aspect it does in fig. 1, a few months before.

The last of his six rhinoplastic operations, which the Professor says took place during the past winter, (1843–44,) was performed, and the dressing completed, in little else than half an hour, (*Oper. Surg., Loc. Cit.*, pp. 345–9.)

Professor Pancoast was equally successful in an ingenious application of anaplasty, where the *entire middle portion* of the nose was destroyed, in a young man, by scrofulous ulceration. This operation was performed at the Philadelphia Hospital, January 9, 1841. (see his *Oper. Surg.*, 1844, pp. 349—52; also, *Amer. Journ. of Med. Sc.*, 1842.) The destruction of parts was as follows:—A great portion of the hard palate, the sockets of all the upper incisor teeth, all the cartilaginous portion of the septum narium, the inferior turbinated bones, the whole of the superior lateral cartilages of the nose, and a considerable part of the inferior oval cartilages, as well as the integments of the nose; leaving an open cavity, three quar-

ters of an inch long, between the ends of the ossa nasi and the tip of the nose, which latter, with the columna nasi and the anterior margin of the nostrils, were uninjured. This cavity, on the cicatrization and closure of the ulcer, drew up the tip of the nose half an inch, and at the same time depressed it to nearly on a level with the cheek, while the left ala, which had suffered most destruction by the ulceration, was retracted most. The soft palate was uninjured, but the hard palate was destroyed by a fissure which extended backward an inch and a quarter from the upper lip, and had, in its widest part, three quarters of an inch in diameter. The gums, uniting across, had formed a fleshy band in front of this opening, while the upper lip was flattened and depressed. The tegumentary covering of the cicatrix was first dissected off, and the tip of the nose separated from the ossa nasi—leaving a triangular space with an abraded bevelled margin. The normal position of the tip of the nose was still more effectually obtained. by extending the incision of the cheek outward and downward through the root of the oval cartilage, and by nicking the inner margin of the same with a probe-pointed bistoury, introduced through the nostril on each side. It was also found necessary to divide some adventitious bridles within the nasal passages. The cheeks being full and fleshy, as thick a triangular flap as possible, and of proper dimensions, was then dissected out from below the malar protuberances, by an incision which was made to bevel inward towards the centre, in order to adjust correctly with the bevelled raw edges of the cavity of the nose. The base of these V-shaped flaps, and which faced outward, was rounded so as to give a prominence to the ridge of the new nose. The pedicle of each flap was left opposite the attachment of the oval cartilage upon the cheeks, and the flaps then twisted around and brought into coaptation, so as to make that which was the lower margin on the cheek become the upper margin on the nose, while the bases formed the ridge of the nose. The effect of the twisting, as had been anticipated and desired, was that the pedicle on each side respectively hitched up the root of each ala, and thus kept the tip properly depressed. The flaps were now neatly fastened and adjusted on the dorsum by palladium pins and twisted sutures. No stitches were used. Before the pins were adjusted, the fragment of cartilage left upon the ossa nasi having a disposition to curve, was divided vertically on either side of it, which brought it up to a proper level. The sides of the two wounds on the cheeks were united by hare-lip sutures, the stress being made to act upward towards the canthi, and not on the middle of the lower eyelids, which might have caused ectropion. The oblique direction of the pins at the same time prevented any distortion of the upper lip. Mr. Liston's dressing of wet lint over the nose, covered with oiled silk to prevent evaporation, was the one preferred. The eyes were covered and kept shut, and the patient directed not to speak. The whole process occupied an hour, and though painful, was borne well. The flaps, immediately after the dressing, were cold, blue, and insensible; but soon regained their

natural temperature, but not their color till four hours subsequently. Complete union by first intention had taken place, and all the loose ligatures were removed, on the tenth day. Some suppuration, however, had taken place at the median line of the ridge of the nose, at the junction of the flaps, from a pin which had been overlooked having ulcerated through. The nose was somewhat flabby for want of cartilage, but the patient breathed through it freely. Adhesive straps were applied over the ulcerated portion, which soon closed, leaving, however, a depression at this point, though the tip preserved its natural position. Owing apparently to the traction of the cicatrix, the pedicles projected on the cheeks, and the flaps themselves rose upon the sides of the nose a little above the general level. This defect was removed by the following ingenious operation:—"I divided (says the Professor) the pedicle transversely on a level with the cheek; cut out a V-shaped piece of integument, with the point downward upon the cheek, and closed the edges with hare-lip suture; cut out a similar piece from the new flap, with the point upward upon the side of the nose, and closed the wound in like manner. This double operation was performed on both sides of the nose. Its object was to diminish the bulge of the flap, and render the junction between the nose and cheek smooth and even. To restore the natural sharpness of the ridge, and remove the sudden depression at the front part of the new structure, which gave a pug-like rising to the tip, I cut out at the same time, in front of the graft, a small triangular piece, the base of which was upward and included the depressed parts. I then made raw the edges of the flaps on the ridge of the nose; dissected up the margin of the grafted pieces on either side, stretched them forward and fastened the parts together with hare-lip pins. The pins were removed on the third day. Every step of the second operation succeeded perfectly, except the attempt to stretch the grafts on the ridge of the nose. The texture of these were [was] so altered that it would not bear extension like a fresh piece of skin, and a small portion of the margin on each side ulcerated. Simple dressings were first applied. In the course of a week, the ulcerated edges of the flaps on the ridge of the nose, being left too high for the general level of the nose, were rounded off by being lightly touched with caustic. Stimulant ointments were subsequently applied to encourage granulation. In this way, the deformity on the ridge of the nose was entirely removed, and the new organ was left presenting an appearance nearly natural. There was still some tendency in the roots of the new alæ to be drawn out on the cheek. In order to counteract this, I directed two pieces of sheet-zinc, moulded to the shape of the cheek and nose, to be worn, fastened together with strings over the bridge, and secured with a riband around the neck. This effected the object completely, but the patient was directed to wear it for two or three months at least, during the night, in order to preserve the shape of the nose." ..... "In the fastening of the flaps in their new position, I followed (says Professor P.) in this case the plan of Dieffenbach,

as described by Zeis—the introduction of a great number of pins close together, which were surrounded with circular ligatures and cut short. In subsequent operations, (however, he adds,) I have given a preference to the interrupted suture, as I have not found the nice adjustment of parts accomplished by means of the pins, to compensate for the greater irritation and liability to ulceration, to which these give rise."

The profile appearance of the patient's nose, ten months after the operation, as given by the Professor in fig. 4, plate 72, (p. 378 of his work on *Oper. Surg.*,) presenting, in fact, a graceful outline and contour to the new organ, is well calculated to impress the reader with the inappreciable advantages of anaplastic operations, conducted with the tact and skill which appear to be possessed by the Professor in this department of operative surgery.

In *partial losses of the nose*, as of one entire ala, and especially where the upper lateral part of the nose, and a portion of the cheek, are also destroyed with the ala, Prof. Pancoast prefers to take his flap from the forehead, as that from the cheek, which has been the usual method, constantly tends, by its cicatrization, to draw down and distort the organ. He thus obtained complete success in a case (see figs. 5 and 6, of pl. 72, of his *Op. Surg.*, p. 348–351,) in which, from a morbid ganglionic enlargement, and neuralgic affection of the infra-orbitar nerve in consequence of a lupus, he excised, also, the diseased portion of this nerve. When the defect is small, and the nose sunken, as in a case which resulted from ozæna, (see his *Op. Surg.*, p. 352; also, *Amer. Journ. of Med. Sc.* for 1842,) he has succeeded, to a great extent, in restoring the organ by cutting out an oval-shaped piece, and raising (i. e., stretching) and uniting the margins with the hare-lip suture. When the deformity consists merely of the *shrinking of the ala on one side*, Dieffenbach has proposed to reduce the other to the same dimensions, by removing from that also an oval piece. Where the *margin of one ala is deficient*, Dieffenbach splits the back and tip of the nose through the cartilaginous septum, loosening the defective side from the nasal bone so that it may be drawn down, and taking out a piece from the opposite side, and from the septum, by two transverse incisions. The two halves are then to be placed upon the same level, and united along the back by hare-lip sutures.

In *angular*, or *crescent-shaped* losses of substance, at the margin of one of the alæ, which have been found so difficult to repair, Professor Pancoast has exhibited his usual tact in anaplastic arrangements, and completely succeeded by the following sub-cutaneous process:—"Having pared off the edges of the fissure, a delicate scalpel was carried just below the skin upward and backward, from the angle of the fissure to the nasal process of the upper maxillary bone, and then turned with its edge inward, so as to cut into the cavity of the nose, dividing the cartilage across. Another incision was then made, from the junction of the stump of the ala with the upper lip, so as to divide the skin, and the curved border of the alar cartilage below it, by a semilunar incision, concave downward and

outward. The cartilaginous portion included between these two incisions was next divided from within outward, so as to separate with the cartilage the soft parts for a little distance from the bone, but without cutting through the skin. The lower segment of the ala was now left attached by little more than the integument, and by advancing the soft structures of the cheek, was readily drawn forward to the upper raw margin of the nose, to which it was attached by suture, restoring the organ at once to its proper shape, and without leaving any obvious wound. Some attention was required in filling the nostril with lint, in order to keep it sufficiently patulous. By this means the new margin of the nose is left *cartilaginous*, and retains its natural thickness and elasticity—a result which the author has not been able to attain by any other process." —(*Op. Surg.*, p. 352.)

This surgeon doubts the possibility of ever succeeding in Dieffenbach's proposed process for *elevating a depressed nose*, by slitting the sunken nose into a middle and two lateral strips, and then bevelling off the edges in such manner as to make the organ, in cicatrizing, assume the proper curvature as in the construction of an arch. Prof. Pancoast apprehends that the new nose would shrink again, from the slow contraction of the cicatrices. The flap from the forehead is, he thinks, to be preferred. The following process, however, again happily calling into service the principle of subcutaneous sections, was adopted in the winter of 1842–3, by Prof. Pancoast, with the most perfect and gratifying success. The patient had nearly the entire septum destroyed, by an ulceration of several years in both nasal cavities, leaving only the columna nasi. The two ossa nasi, up to their junction with the os frontis, and all the turbinated bones, were also destroyed. The case was one of hideous deformity, presenting no appearance of nose except the two apertures on either side respectively of the twisted and deformed columna, retracted upward and into the face beyond the level of the anterior margin of the nasal processes of the maxillary bones—all of which was rendered yet more disgusting, by the prominence of the forehead, cheeks, and alveolar processes, and the protuberance of the upper lip, which was also retracted upward by the cicatrization of the ancient ulcer:

"A narrow long-bladed tenotomy knife [tenotome] was introduced on either side, by puncture through the skin, over the edge of the nasal process of the upper maxillary bone. The knife was pushed up under the skin to the top of the nasal cavity, and then brought down, shaving the inside of the bony wall, so as to detach the adherent and inverted nose upon either side. The point of the nose could now be drawn out. The nose, however, still remained adherent to the top of the nasal chasm. The knife was a third time introduced under the skin, in a direction corresponding nearly with the long diameter of the orbits of the eyes, and the adhesions separated from the nasal spine and internal angular processes of the os frontis. This incision was exquisitely painful. The nose was now attached merely by the integuments, and was so com-

pletely loosened that the patient forced it out at once by a strong expiration through the passage, redeveloping, (continues the Professor,) to my surprise, an organ of good size and of the natural form. It was incapable, however, of retaining its position, as it moved with every respiratory effort. To increase the dimensions of the nose—which remained less than had been natural to the patient—and [to] diminish its tendency to fall a second time, the knife was again introduced through the lateral punctures, and the soft parts separated from the whole length of the outer surface of the nasal processes of the maxillary bones for the space of about five eighths of an inch on each side. This involved the division of the branches of the two infra-orbital nerves and arteries. The portions thus loosened on each side were pushed over towards the nasal cavity, so as to increase the prominence of the nose. In this position they were held by a quilled suture, made with two ligatures, passed across the cavity of the nose from one cheek to the other. Though there was considerable bleeding, no vessels needed to be tied. The sutures were removed on the third day, and the nose was found firm and well-shaped. In the course of a couple of weeks the skin at the root of the nose, having no bones to support it, became flattened out, so as to impair the form of the organ. This I proposed to relieve by cutting out an elliptical piece from its middle, and then turning down, in the space thus made, a small flap of skin from the forehead, with the cuticle shaved off so as to gain a raw surface for adhesion on both sides; which flap, when united vertically in the opening, should serve as a new septum, and by its tendency to contraction, keep the loose integument in its proper bridge-like shape. The patient, however, was so well satisfied with the organ as it was, as to be unwilling to submit to any thing more than the removal of the elliptical piece."—(*Oper. Surg.* of Pancoast, Phil., 1844, p. 352–3, and plate 72, figs. 7, 8, 9.)

The chief difficulty in the above very ingenious application of sub-cutaneous surgery, undoubtedly is, in contriving some substitute for the cartilaginous supports of the nose, and we know of none that could act as a better substitute than that which was suggested by the operator, and which would have proved more effectual, doubtless, could some mode be devised of giving greater condensation, or a semi-cartilaginous texture, to its tissues during the process of their granulation. As to the *transplantation of a cartilage*, the inherent low degree of organic vitality in such tissues, and their tendency, therefore, to gangrene, would perhaps render such an attempt quite chimerical; though, from what has taken place in all these new departments of surgery, (anaplasty and tenotomy,)—born and sprung up to a ripe maturity, it may be said, in the incredible short space of four years—it is certainly impossible to predict what human invention may not discover, in giving to them still greater perfection, and in disclosing curative processes that are now not even dreamed of. The extensive sub-cutaneous sections required, and the pain necessarily attendant upon them, would probably deter most persons from submitting to Prof. Pan-

coast's process, unless previously well assured that something could effectually be done to give prominence to the raised teguments.

Cheiloplasty.

In a case of cancer, in which it was found necessary to remove nearly the whole of the free border of the lower lip, Professor Pancoast, of Philadelphia, adopted the following process, with, however, only partial success. It is certainly worthy of consideration, although the semilunar incision downward, excising the cancer, as adopted by Prof. Mott, (as in the case of that surgeon already described, supra,) and then dissecting and loosening the teguments within freely down to the chin or further, and effecting the union of the incised semilunar border by sutures at the commissures to the lip above, and placing the new lip in situ by traction upward, steadily maintained by adhesive straps and bandages, is, it seems to us, much to be preferred, as the most simple as well as the most easy and natural method:—

Professor Pancoast excised the diseased structure also by a semicircular section through the lip. "A vertical incision was then run down over the symphysis of the chin nearly to the top of the os hyoides. This was converted into a crucial incision by a sweep of the knife along the upper edge of the base of the jaw. The two upper flaps were then dissected loose from the bone, and a triangular piece, with the base downward, removed from the free end of each, with a sharp pair of scissors. The two lower flaps of in tegument were in like manner loosened, and a triangular piece removed from the end of each, but with the base presenting in the opposite direction, so as to form a vacant space of a lozenge shape. The two upper flaps were then closed at their lower border by a hare-lip suture. The effect of the traction necessary to bring these together, carried the upper margin at once nearly to the proper level of the lip. A second pin was then introduced above the first. The two lower flaps were then raised and similarly closed, with a pin which was made to rest on the mental protuberance, the effect of which was to give some additional elevation to the new lip, though to a less extent than was expected, and nearly [to] efface the whole of the vacant space. The parts were covered with a light compress, secured with a few turns of a roller, and the head retained, for three days, lightly flexed on the chest. The saliva escaped for some time through the opening at the chin, rendering the cure tedious, but in the end the operation was in a good degree successful."—(See his *Oper. Surg.*, 1844, p. 355; also, *ib.*, figs. 3 and 4, of plate 73.)

To this, as to the greater part of the anaplastic suggestions of this surgeon, already noticed, we cannot deny much ingenuity; but the excision of the angles of the flap must have caused a countertraction downward, a result which is, in such cases, especially to be overcome if possible. We confess we cannot discover what the

intention of the author was in that part of his process, except to obtain the natural depression above the chin.

The principle which we have expressed a preference for, as the one upon which cheiloplastic operations should be guided, to wit, that of Dieffenbach, of separating and making traction upon the entire tissues of the face, and which has been adopted successfully by M. Meyer of Bruges, was also recently followed by Prof. Pancoast of Philadelphia, with most gratifying results, in a young lady of Virginia, (see his *Op. Surg.*, p. 355; also, *Am. Journ. of Med. Sc.*, Jan. 1843.) This case is so important that we must claim, in behalf of American surgery, the right of the author to be heard in his own words. The whole of the soft parts between the upper lip and the lower edge of the chin, and all the lower alveolar processes, had in early life been destroyed by gangrene. "The patient was seated upright in a chair. The cicatrized edges, which extended from the angles of the upper lip down to the chin, were pared off so as to present a large triangle, with the apex upon the chin. The corners of the mouth were next thrown widely open by an incision on each side, three fourths of an inch long, in the direction of the auditory meatus. This was made by a sharp-pointed curved bistoury, passed from the cavity of the mouth through the cheek, the whole thickness of which was divided on each side at one cut, to the commissure. From the distal ends of these incisions, a descending cut was made on either side, with a single sweep of the bistoury, obliquely downward and inward to the top of the lower jaw-bone. Two flaps were thus detached from the whole thickness of the cheeks, lined with skin on one surface, and mucous membrane on the other, and attached to the chin by a pedicle five eighths of an inch broad. The flow of blood was arrested, in a measure, on each side as the division was made, by the thumb and finger of an assistant. In order to diminish the hemorrhage, the horizontal and descending incisions were made on one side before the other was touched, and the divided vessels immediately secured by torsion and ligature. The flaps were then rapidly loosened from the gum on the inside, by a few strokes with the knife, and some few small arteries, which gave out blood, pinched and twisted. The loosened portions were then *rocked over* [i. e., slided by traction obliquely inward.—*T.*] upon their pedicles towards each other, till their inner margins met on the middle line, where they were secured with hare-lip sutures. The traction of the flaps caused the portion of the cheek in connection with the outer margin of the pedicle to advance forward, so as to supply, in part, the place occupied by the flaps previous to their change of position. An irregular triangular opening was still left at the corners of the mouth. This was filled up by drawing the cheek from above downward and forward, and passing on each side two hare-lip pins, to connect the three sides of the triangle together. Though as much stress was put on the ligatures as was thought at all prudent, the opening could not be completely closed, a small triangular fistulous orifice remaining. The immediate effect in regard to

the improvement of the features was magical. The flaps of the new lip, which, as they were rocked inward, moved forward in the direction of the line of their pedicular attachment, gave all the natural fulness and prominence to the lower lip. The descent of the protuberant cheeks restored, in a great degree, the natural roundness of the lower part of the face; and from a disagreeable, the patient presented, at once, a comely countenance. The result of the treatment of this case, which was necessarily somewhat protracted, was the restoration of the face to a form nearly perfectly natural. The new lip remained to a considerable degree moveable, and fulfilled completely its natural offices, of retaining the salivary fluid, and giving distinctness to the articulation."

Palatoplasty.

Prof. Pancoast partially succeeded, by an operation performed *four* years since, (see his *Op. Surg.*, p. 357, and plate 54, fig. 5, p. 258; also, Dr. McPheeter's account of the case in the *Philadelphia Medical Examiner*, Jan., 1844; also, *Amer. Journ. of Med. Sc.*, Jan., 1843,) in filling up, by flaps of mucous membrane from the roof of the mouth, an opening in the centre of the bony palate three quarters of an inch in diameter. The flaps were secured by stitches over the aperture, and their loops held up by a piece of bougie placed in the nasal passage, and crossing the opening. By this means, aided also by a curved pin fitting to the roof of the mouth, and passing through the edges of the flaps, the flaps were brought in close contact to the pared edges of the fissure. A violent spasmodic cough prevented the completion of the granulations.

Posthioplasty.

Prof. Pancoast (*Op. Surg.*, p. 358) gives this name to the restoration of the prepuce, if required, and which at one time was practised by the Jews to avoid persecution. He recommends the process of Galen, by drawing the skin of the penis over the glans, and dividing the same merely by an annular incision posterior to the corona—the skin thus loosened being retained in front of the glans by being secured to a catheter introduced through the urethral passage, till the raw surface left behind the glans has become cicatrized.

Chalinoplasty,

From χαλινος, frenum, is a name given by Professor Pancoast, of Philadelphia, (*Oper. Surg.*, p. 358–9,) to an operation which, to gratify the morbid sensibility of patients, he has twice successfully performed with very satisfactory results, for restoring the frenum of the prepuce when destroyed by disease. "Reversing the glans, and grasping it laterally between the thumb and finger, a couching needle is passed in the middle line under the mucous membrane, so as to elevate this at the natural place for the attach-

ment of the prepuce. An assistant then steadies the organ, while the surgeon, with a delicate scalpel, makes an incision on either side of the needle, in order to mark out a small triangular space, with the apex towards the orifice of the urethra. The membrane is next to be dissected off from this space. A longitudinal fold of the prepuce is then raised on the lower surface of the organ; through the base of this a sharp-pointed bistoury is passed, cutting out at its place of anterior attachment, so as to detach a small, thin, triangular flap, with its apex in front. This flap is then to be drawn forward, and secured by three delicate sutures on either side to the margins of the raw surface on the glans. Union readily takes place by first intention."

PLASTIC OPERATIONS FOR THE REPARATION OF DEFORMITIES FROM BURNS.

Since the remarkable and successful case of Professor Mutter, of Philadelphia, and which has been briefly described in our text, (supra,) that gentleman has repeated his admirable process in several similar cases, and has published a distinct work on the subject, (*Cases of Deformity from Burns, treated by Plastic Operations.* By Thomas D. Mutter, M. D., Professor of Surgery in Jefferson Medical College, Philadelphia, 1843,) of which we gladly avail ourselves to make some valuable additions in a most important department of anaplasty, which Prof. Mutter, by his surgical tact and eminent success, has almost made exclusively his own—having through means of anaplasty substituted, in lieu of the clumsy and ancient operations of excision of cicatrices, a method which in his hands has effected results which had been scarcely anticipated by any one.

The *dense laminated substance* found in cicatrices from burns, beneath the *inodular tissue* of Delpech, is composed, says Prof. Mutter, of original cellular substance, and that it binds the cicatrix down, and offers in many cases the chief obstacle to the success of our operations—especially in severe burns, exacting on that account, if we operate, most extensive dissections.

Another, but only occasional difficulty, is the *vascularity* of the cicatrix. It is then red, sensitive, soft, and moveable, and we have to fear hemorrhage, presenting therein a more unfavorable prognosis than when the parts are pale, firm, inelastic, and adherent.

The prognosis of course is also far more favorable when the cicatrix is only cutaneous and moveable, than when *thick and deep*, involving also the superficial fascia, cellular tissue, and muscles—throwing the inodular tissue into hard and nearly immoveable ridges—requiring severe and extensive operations. This condition must not be confounded, he says, with that contraction of the fascia superficialis sometimes accompanying cutaneous burns, but often the result of other causes, many of which are inappreciable. Thus Prof. Mutter has seen this fascia in the palm of the hand, without any apparent cause, gradually become thick and contract, while the skin over it remained pliable and soft.

Deep cicatrices over *important* organs, will add to the difficulty and danger of the prognosis and operation, though there is less hemorrhage than one would imagine, since many of the smaller blood-vessels are found to have been obliterated.

It is an important point, in a wide and extensive cicatrix, that the reparation does not make one of still greater deformity. Prof. Mutter approves of Dupuytren's directions in such cicatrices, as in adhesions of the arm and thorax, or thigh and pelvis, to *proceed by fractions*, and let the wound of one operation heal before we undertake another; as one operation would make too large and dangerous a wound—which rule is applicable to extensive callous prominences.

Prof. Mutter also accords, in general, with Dupuytren's remark that the *older* the cicatrix, the greater the success in operating, especially where the inodular tissue is superficial, and the cure requires only extension and pressure to keep the incisions apart.

The *peculiar deformity* of a cicatrix may arise from their extraordinary power to contract; thus, in a case of Mr. Earle, approximating the shoulders by causing partial absorption of the clavicles, and in a case of Cruveilhier, and another of Prof. Pancoast, where the cicatrix was on the back of the hand, luxating the carpus from the radius. Prof. Mutter alludes, also, to his own remarkable case, (already described in this work, supra,) as a sample of curvature of the lower jaw downward.

It is always desirable, if possible, not only to remove the deformity, but to restore the functions of the part.

In recent superficial narrow cicatrices, transverse incisions at several points, followed by slow, gradual, and permanent extension, continued for some time after the wounds have cicatrized, will generally effect a cure.

In prominent cicatrices, which are often accompanied with severe neuralgic pains, and which generally involve only the skin, without any contraction beneath, the diseased parts are, as recommended by Dupuytren, to be sliced off on a level with the skin, the wound kept apart by machinery, and the excrescent growths repressed by nitrate of silver.

In extensive adhesions, complicated with abnormal contraction or separation of natural parts, Prof. Mutter is of opinion that the process of Dupuytren, of dividing the adhesions and dissecting them freely beyond their origin, will very often fail. That of Hildanus, revived by Earle and Delpech, and much approved of by Brodie, James of Exeter, Hodgson, &c., which consists in *excising* the cicatrix completely, and then bringing the edges of the wound together, and using extension and splints, thus effecting a lateral instead of the previous longitudinal contraction, Professor Mutter deems altogether improper where the cicatrix is broad, or irregular, and situated on the neck or different parts of the face. In a case where the arm and forearm were rendered useless by a cicatrix, Prof. Mutter found, after excising the tissue, that it was impossible to bring the edges of the wound over the raw surface, until he had

made *lateral incisions* as in the process of urethroplasty by Dieffenbach. He could then cover the raw surface perfectly, and causing the two lateral wounds to granulate by dressing them with warm water, the operation, he says, succeeded beautifully. These lateral incisions he has found equally advantageous in the operation for cleft palate.

The process of Drs. J. Rhea Barton and G. W. Norris, of Philadelphia, derived from that of Celsus, viz., dissecting loose the integuments and cicatrix, is, he thinks, severe, and not much to be relied upon.

The operation which he prefers above all others, is his own *anaplastic* method, which we have already detailed at length, supra. It is especially valuable in cicatrices of the neck, cheek, eyelids, nose, and lips.

In his recent work, from which we make the above *abrégé*, he lays down the following rules, or principles, for this new, ingenious, and admirable triumph obtained for plastic surgery by the eminent practitioner in question:

"1. Dividing the cicatrix so as to produce a raw surface in some part of its extent, or cutting it out entirely as proposed by Hildanus.

"2. In applying to this raw surface a piece of healthy skin, taken from the neighboring parts.

"3. In attaching this skin by suture to the margins of the wound in which it is inserted.

"4. In approximating the edges of the wound from which the skin has been removed.

"5. In separating, by appropriate agents, the parts too closely approximated, and keeping them in this condition some time after the flap has united.

"6. In applying oleaginous frictions and motion to the new made parts, to give them flexibility and softness. [The almost extraordinary suppleness and elongation of tendinous parts which such frictions, as of camphorated oil, for example, steadily maintained effect, is remarkably seen in those contractions of the flexor tendons of the leg particularly, which are caused by confinement during fractures.—*T.*]

"Many shocking deformities from burns (he adds) have been relieved by the performance of operations conducted on these principles; for example, the eyelid, the cheek, the nose, and the lip, have all been restored: but I believe (he modestly continues) I may claim the merit (if merit there be in adapting an old principle to a new operation) of having first performed an operation of the kind, for the relief of extensive cicatrices of the throat."

How true and just it is, however, that there is unqualified and pre-eminent merit in this most ingenious and happy application, by an American surgeon, even of a well-known plastic principle, is made strikingly manifest by the paragraph in Professor Mutter's work, which immediately follows the above:

"Mr. Liston, whose surgical acumen and boldness no one will

deny, distinctly states, in his last edition of the *Elements of Surgery*, p. 263, that 'SUCH DEFECTS ARE BEYOND THE REACH OF SURGERY,' and gives a drawing illustrative of the appearance of a person so afflicted; which drawing *is almost* a fac simile of my case No. I. I have also carefully examined nearly all the modern works on the subject, and find no mention of such an operation having ever been performed. Velpeau, in his *Médecine Operatoire*, [vid. this present work, supra.—*T.*,] article *Cicatrices vicieuses*, merely hints at the possibility of such an operation, but this is all. [In our opinion, however, this is much, considering the desponding tone of cotemporaneous surgeons on this subject, up to the time of Professor Mutter's discovery.—*T.*]

"In very extensive cicatrices of the neck, (says Prof. Mutter,) it may be well to modify the operation so as to take *a flap from each side*, by which means we shall avoid the risk of a very large single flap.

"In *cicatrices complicated with obliteration of cavities*, where the cicatrix produces partial or complete obliteration of a natural opening, as the mouth, &c., incision of the angles, and introduction of tents *larger* than the *natural* opening, will occasionally do good; but for the most part all such attempts fail, and it becomes necessary to perform the operation of Dieffenbach, (vid. text, supra, and also this appendix, supra.)

"In *cicatrices complicated with loss of organs*, where organs are entirely destroyed, nothing short of a plastic operation, the aim of which will be the construction of an organ as much like the original as possible, offers the slightest prospect of benefit to the patient."

Mr. H. James, surgeon to the Devon and Exeter Hospital, (Eng.,) in a recent paper on this subject remarks, that in the limbs, from there being but one joint concerned, there is no difficulty after the removal of the cicatrix, in maintaining the parts in proper position. But in the neck it is different, from the peculiar mobility of that part, arising from the numerous joints in the cervical spine, so that the chin and sternum gradually reapproximate as the wound continues to cicatrize, shortening the cervical spine and incurvating it sidewise or backward. In one case of severe burn, (and most of the cases are in children and females,) he has seen the orbit on the contracted side much depressed, and the lower incisors pushed horizontally by the pressure of the tongue, from the counter-pressure of the muscles of the lower lip being wholly wanting. To effect steady, firm, and permanent extension, Mr. James proposes, in burns of the neck, after excising the cicatrix only, or adopting also Prof. Mutter's anaplastic process, to apply an apparatus which he calls the *screw collar*, and which he has found, he says, exceedingly useful. It is to be applied as soon as suppuration of the wound is established, and the screw is to be lengthened as greater extension of the head upward and backward is obtained. In reference to Prof. Mutter's operation, he says the degeneration of the neighboring integuments, in the greater number of cases, will prevent

the possibility of procuring flaps. He thinks the *screw collar* will be found always requisite, also, after that process. In small cicatrices he has sometimes found it useful to destroy them with caustic potash, as the ulcer left opposes no obstacle to necessary extension, and the cicatrix is of a very different character from that of burns, (*Provincial Medical Journal*, Aug. 19, 1843; also, Braithwaite's *Retrospect of Practical Medicine and Surgery*, part viii., p. 120—New York edition, 1844.) In respect to the objection of degeneration of the skin, that can rarely much involve, as we think, the shoulder, whence Prof. Mutter took his flap in his great operation, and from whence, or from some other neighboring undegenerated part, it would probably be practicable in most cases to take the necessary supply of tegumentary tissues.

In *vesico-vaginoplasty*, as we shall take the liberty of designating those plastic operations which are proposed for the closure of fistulous openings communicating between the vagina and bladder, (as those between the rectum and vagina, or between the rectum and bladder, might perhaps with equal propriety be termed, respectively, *recto-vaginoplasty* and *recto-vesicoplasty*,) M. *Leroy D'Etiolles* of Paris has, as we perceive, recently suggested the following process: He raises a flap from the posterior wall of the vagina, penetrating with the knife only into the cellular space between the vagina and rectum, and stopping where the point of union between these passages becomes more intimate at the recto-vaginal septum. A short thick flap may thus be obtained, which is to be applied, by its raw surface, to the edges of the fistula, which should be made raw and bleeding. The flap is to be fastened by a double quilled suture, (vid. Pancoast's *Operative Surgery*, Philadelphia, 1844, p. 342, plate 70, figs. 7 and 8.) This is virtually the same as M. Velpeau's process, (see text supra.)

To prevent the inconvenience arising from the constant flow of urine, M. Leroy D'Etiolles tampons the vagina with *caoutchouc*, in leaves or in paste—a substance which is elastic and unalterable, and, as he says, freer from the objections which to this day have rendered all permanent plugging of the vagina nearly impracticable, (*Ib.*)

Mr. Barnes of Exeter, (Eng.,) employs an elongated caoutchouc bottle, which, when placed in the vagina, presents an opening corresponding to the fissure. Prof. Pancoast of Philadelphia, however, says he has had better success with a boot-shaped silver or silver-gilt trough, devised by M. Feburier of Paris, which, when accurately fitted to the vulva, is easily held in position, and effectually prevents the escape of urine by any other channel, (*Op. Surg.*, loc. cit., p. 342.)

OPTICAL STRABISMUS.

Though this has been slightly adverted to in the abrégé we have made (supra) from Professor Velpeau's Treatise on Strabismus, it

is due perhaps to M. Guérin to hear his own account of this variety of the disease, as noticed by him.

Optical strabismus is a phrase by which M. Guérin contradistinguishes from mechanical or primitive muscular strabismus, that form of deviation which is consecutive of secondarily muscular deviation, and which arises from a disjunction of the axis of vision and the axis of the eye; which, he says, may be produced in three ways: 1. From an obstacle to the passage of the visual axis along the course of the ocular axis; 2. By a change of relation in the refracting media, without alteration of their transparency; 3. By an insensibility of the retina at the proper point for the reception of luminous rays. 1. The first is characterized by the squint existing only *while the patient is looking at an object.* In these cases the two visual axes, though no longer concurring with the ocular axes, converge towards one point. A squint, then, existing only during active or intentional vision, cannot depend on permanent muscular contraction. A young person, aged nineteen, who had a moveable clot of blood in the posterior chamber, was observed to squint from the attempt to place a transparent portion of the medium opposite to the object looked at, and thereby to avoid the inconvenience produced by the presence of the clot in different parts of the chamber. As soon as she ceased to look at an object, she ceased to squint. 2. A disturbance in the relation of the refracting media, M. Guérin thinks, is the only way of accounting for some cases of strabismus which are produced suddenly after a blow, or a jarring fall on the seat or on the feet. The first effect of displacement is double vision; and the squint, at first temporary, lasting only during attentive vision, is gradually made permanent by the repeated endeavor to escape from this fatiguing symptom. 3. The third form, viz.: from partial paralysis of the retina, is more difficult of actual demonstration, though its presence may be inferred by induction rigorous enough for practical purposes. Amaurotic patients, when endeavoring to distinguish a light, are seen to turn the eye in different directions, where they know the light does not exist; they present the various surfaces as it were *feeling* for it. Those in whom the paralysis is but partial, contract a habit of subjecting to the influence of the rays, that part which is most sensible. The author believes that in no case of secondary optical strabismus, will the texture of a muscle be found fibrous, and that in no case of primary mechanical muscular strabismus, will such a fibrous state of the muscle be wanting. Where myotomy has been performed in cases of optical secondary strabismus, he believes that one of three things must have happened—either the case has not been watched long enough to ascertain the result, or a positive failure has followed, or the primary cause, whatever it may have been, has really been removed by the operation, (see *Gazette Médicale* of M. Jules Guérin, Paris, 1843; also, *London Medical Gazette*, May, 1843, p. 254, and Braithwaite's *Retrospect*, part viii., p. 156.)

Treatment of Erysipelas.

Mr. J. Higginbottom, (Eng.,) in an essay on this disease, states that he has met with great success in the cure, by freely pencilling over the inflamed and previously cleansed and moistened surface, and to some distance beyond it, with a stick of the nitrate of silver; to be applied once in slight cases, two or three times in common cases, or more frequently if quick vesication is required. Though the inflammation may be spread, it will, he says, be found of a feeble character. Where deep-seated, he uses also emollient poultices. He totally disapproves the mild solutions of a few grains of the nitrate to an ounce of water, as recommended by Mr. Erasmus Wilson and Mr. Nunneley, but says where he has substituted a solution, he uses it highly concentrated, viz.: eight scruples of nitrate of silver with twelve drops of nitric acid, in one ounce of distilled water, applied with a dossil of linen tied on the end of a small stick, in preference to a camel's-hair pencil. (See *London Medical Lancet*, July 8, 1843.)

On extensive surfaces, we should apprehend some danger of absorption of so potent a drug as the nitrate, as has happened in some melancholy cases where the color of the whole surface has been permanently changed to an almost Ethiopian hue, by its reckless internal administration for epilepsy, &c. In circumscribed regions, as upon the scalp and neck, (such common localities of this disease,) we have known it used recently with much advantage. In most cases, we should prefer making trial of Professor Velpeau's new remedy of *sulphate of iron*, an application which in his hands, as will be seen by the full abrégé we have made (vid. supra, in the body of this work) of the brochure he was so kind as to transmit to us for this edition, was attended with the most promising results.

Blepharoplasty for Nævus Maternus.—Dr. Mott's Process.

In a case of large oval nævus in a child aged six months, on the lower lid of the right eye, and extending down upon the cheek, Dr. Baumgarten recently effected a radical cure by excising the nævus, (during which he was obliged to divide the orbicularis and penetrate into the orbit,) and then bringing down a flap from the temple. The constant application of cold water to the sutured lid abated the somewhat formidable tumefaction, on the third day union by the first intention had taken place, and on the fourth the last suture was removed. The wound on the temple suppurated freely, and the edges being drawn together, soon became filled with healthy granulations. In another week the loss of substance was replaced, and the cicatrices of the eyelid were scarcely visible, (*Annales de Chirurgie*, Jan., 1843.) M. Ammon performed a similar operation on an old man, for cancer of the lower lid, but the disease returned, (*Ib.*)

In the above case of nævus, or *aneurism by anastamosis*, as more correctly named, it might not have been impracticable, perhaps, to have had recourse to the admirable and radically effective and successful process now employed (but not yet generalized in Europe or in this country) in its worst forms, even in infants of but few months old. This new process, (the name of the author of which, whether English, French, German, or American, we have never yet been enabled to ascertain, and of which we have seen no published account,) which Dr. Mott is now constantly in the habit of employing, to a greater extent, we believe, than any other American surgeon, and with unvarying success, as has been repeatedly seen at his public clinique for the poor at the University of this city, and in his private practice for three years past, consists in inserting horizontally through the base of the vascular meshwork or tumor, and close to the skin, a considerable number (from four to six or eight, according to the size of the nævus) of strong but very slender needles, furnished with small wooden handles; the needles being kept red hot on a small chafing dish held near the patient. The needles are inserted rapidly and successively, and as quickly removed. The little patient appears to bear the operation with far less pain than would be imagined, and the diseased mesh of vessels, so effectually cauterized into an eschar by the needles as to prevent even the issue of a drop of blood, (thus precluding the hemorrhage hitherto deemed so formidable in the ordinary mode by excision,) sloughs off clean in a few days without the slightest trouble, leaving a healthy granulated surface, any irregularities upon which may be afterwards easily removed by the nitrate of silver. For *nævi*, in future all other processes, as that by the *kali purum*, &c., directly applied, or by means of threads saturated with it, introduced after the manner of a seton, as recommended by Prof. N. R. Smith, of Baltimore, (*Amer. Journ. of Med. Sc.*, July, 1843, p. 260,) &c., must be discarded. The process with *red-hot needles* for the cure of nævi materni, might probably, as we conceive, be employed fully as effectively for the removal of certain superficial cutaneous tumors (lipomatous, for example) where the subjacent tissues are not implicated or degenerated, and where the patient might dread the knife or ligature, or the operator apprehend unpleasant hemorrhage.

The actual Cautery, or Red-hot Iron in Phlebitis.

While on this subject it is proper to mention, that M. Bonnet, of Lyons, has met with remarkable success in the cure and prevention of phlebitis, from dissection and otherwise, by the use of *potassa cum calce*, the chloride of zinc, and the red-hot iron. The red-hot iron, superficially applied, produces a very superficial eschar; the potassa cum calce acts much more deeply; the pain with either, though sharp, soon ceases, and the inflammation that succeeds is slight. The chloride of zinc produces much deeper eschars than either of the others, and the pain and inflammation are severe; but

it is followed by the rapid clearing off of the eschars. The author gives a case of phlebitis from venesection, and four of severe constitutional disturbance *following wounds received in dissection*, which were treated by the red-hot iron with immediate and complete success. As many as *ten cauterizing irons* were used at once in the case of phlebitis, the sub-cutaneous tissue being found in a semi-gangrenous state. In the *dissection wounds*, the seat of the injury alone was deeply seared; the iron was elsewhere carried superficially along the course of the red lines. The author has employed the same method to the treatment of hemorrhoidal tumors and prolapsus ani, (vid. *Lond. and Edinb. Monthly Journ. of Medical Science*, July, 1843, p. 650.)

Certainly, if we reason upon the sound pathology of the terrific disease from dissection wounds, as laid down by Professor Velpeau, its author, in this present work, (vid. supra,) and reflect how utterly futile have hitherto been all curative agents attempted, we ought to feel it incumbent upon us to recommend, in as strong language as possible, the trial of the therapeutic mode with the red-hot iron, as introduced in this truly formidable and fatal disease, whose assemblage of symptoms are as peculiar and anomalous as they are painfully distressing. If any thing could possibly exterminate the *infectious gangreno-typhoid* or erysipelatous inflammation of the worst character, which seems in such cases to run continuously along the course of the veins from the purulent point of departure, most assuredly the red-hot iron would appear to be the remedy appropriately calculated for this purpose. Its almost specific power, as we have stated in aneurism by anastomosis, in obliterating the congeries of blood-vessels of which these nævi are composed, and in establishing a new and healthy action in their sub-cutaneous trunks, naturally conducts us to the inference that a similar happy result would, as is fortunately shown in M. Bonnet's cases, follow from the early employment of the actual cautery, where inflammation has gained possession of the internal coat of the veins from *purulent infection*. We hope M. Bonnet, or others, will put this treatment completely to the test, and it may not seem improper to suggest, that the veins or absorbents beyond the wounded part, and whose implication in the purulent inflammation is made manifest by the red lines, and also the glands themselves in the axilla or elsewhere, where accessible, should also be subjected to the red-hot needles, or, by a new application of acupuncture, be actually entered or perforated by them as in the treatment of nævi. Those who have witnessed cases of purulent inflammation and death from dissection wounds, know well the necessity of some bold curative means, which shall no longer make this disease one of the opprobria for which our art has much reason to feel humiliated, and the too generally fatal consequences of which, it cannot be denied, have proved a lamentable obstacle in retarding those anatomical researches which are the very keystone and basis, if not the only true and legitimate foundation, of all sound pathology and therapeutics, both in the practice of medicine and in operative surgery.

The *actual cautery* was, in the earliest periods of recorded medical history, always deemed one of the most favorite and successful surgical remedies among the most primitive nations, and it is well known that among the Arabs of the African desert, and the Hindoos of Asia, as among the barbarous aboriginal tribes of our own country, this potent instrument is their great and prompt reliance, not only (which common sense and ages of accumulated traditionary experience had pointed out to them) as an admirable process of effecting speedy counter-irritation, and establishing a local disease and an abundant healthy suppurative drain of humors in constitutional affections; but also for the immediate and total eradication of foul and degenerate ulcers, and tumors, and growths of every description, by substituting a pure and healthy action and inflammation, for one of a morbid character.

Veterinary surgeons, also, in this as in many other branches of surgery, by the more or less irresponsible character of their profession, and the consequent daring expedients to which they may resort with impunity, (in the same way as living dissections throw such vast light on physiology, &c.,) have, by their frequent and successful use of the actual cautery, continued to uphold the character of this invaluable resource.

In conclusion on this subject, we may remark, that the value of nitrate of silver as an external application in erysipelas, (see this appendix, supra,) is founded in reality, as it seems to us, on the same well-established principles of pathology, as those we have adduced in behalf of the ancient, and now soon, we hope, to be generally revived curative agent, the actual cautery or red-hot iron.—*T.*

CASES OF GENO-CHEILOPLASTY (ANAPLASTY OF THE CHEEK AND LIPS) BY DR. MOTT.

It will be seen by the following cases of restoration of the commissure of the mouth, and portions of the cheek, performed at New York by Dr. Mott, the one as early as about the year 1825, (the precise date of the year being lost,) at the New York Hospital, the other in 1831, that the *French anaplastic method*, so called, the ruling principle of which is *déplacement*, was adopted in the practice of that surgeon at a very early date for the history of this department of surgery.

Case I.—*By Displacement.*

This was a middle-aged man, (see plate A,) in whom the left commissure, and several inches of the cheek on that side in a horizontal direction, were totally destroyed, together with a corresponding portion of the alveolar processes and teeth of the lower jaw, by necrosis, and all the result of violent mercurial action.

Upon removing the necrosis, and allowing a few days to elapse for the jaw to heal, I performed (says Dr. Mott) the following op-

(Dr. Mott's case of *Geno-Cheiloplasty*, about the year 1825.)
(Plate A.)

eration :— The hardened edges of the cicatrized margin of the chasm were pared off, the cheek was then freely detached above and below, and as far back as the edge of the masseter muscle. The fresh surfaces were now readily, by distension of the parts, brought into contact by several stitches of the interrupted suture, one stitch being applied to the neat adjustment of the angle of the mouth. The stitches were then supported by strips of adhesive plaster. The wound readily united by the adhesive process.

The yielding nature of the tissues involved enabled me to effect so complete and natural a restoration of the parts, that the little deformity that remained was truly surprising. Nothing but a mere seam of cicatrix was left. This result seemed then the more remarkable, as but few or no operations of geno-cheiloplasty, by the French method at least, had then been performed anywhere. This case has never been published until in the present work.

Case II.—*By Displacement and Flaps.*

This case of geno-cheiloplasty was involved also with immobility of the lower jaw, and comprised the double operation of flaps and *déplacement*. We annex Dr. Mott's own published account of this case, from Dr. Hayes' American Journal of the Medical Sciences for November, 1831 :

"On the 7th of April, 1831, I was consulted in the case of Miss Mary Park, aged seventeen, of Southbridge, Massachusetts.

"Her attending physician, Dr. Samuel Hartwell, gave the following relation of the case. 'In the autumn of 1822, she had an attack of typhus fever : the symptoms were mild in the commencement of the disease, and nothing unusual occurred until the middle of the third week, when tumefaction and redness were discovered on the left cheek, accompanied with slight delirium and general aggravation of fever.

"'At the end of the third week, a dark vesicle, about the size of a pea, appeared at the angle of the mouth, announcing the existence of sphacelus, and in a few days extended to about two inches

in diameter upon the side of the face. A crisis of fever now supervened, which was followed by sloughing of the whole gangrenous portion, leaving the teeth and gums exposed. Upon its cicatrization the jaws remained immoveably fixed, being apparently tied together by a ligamentous band within and about the cicatrix. Her food was introduced into the mouth through a space formed by the removal of a tooth on the right side. The first set of teeth and the alveolar process of the diseased side, were detached by caries. Most of the second teeth were developed in a few years afterward.

"'No mercury was used in the treatment of the fever. Her general health is now very good.'

"Her countenance was much disfigured, and presented the appearance represented. [See Plate B. fig. 1.]

"As the only means of permanently overcoming the closure of the jaw was the removal of the cicatrix, I determined upon excising and replacing it by sound integument from the face and neck."

The operation was performed by Dr. Mott on the 8th of April, as follows:—

"It was commenced by carrying an incision from a little within the upper angle of the mouth, around the outer margin of the cicatrix, to a little within the lower angle of the under lip, and by the immediate removal of the newly-formed parts included within it. The adhesions between the jaws were next divided, which enabled me, in consequence of the relaxation thus produced, to insinuate between the teeth of the opposite side, the point of the lever used in my former cases, with which I finally succeeded in opening the mouth.

"This point accomplished, the lips were brought together at the angle of the mouth by a suture, and I proceeded to detach a portion of integument sufficiently large and of corresponding shape to replace the part removed. [See dotted lines, Plate B. fig. 1.] It was turned into the space it was intended to fill, leaving a tongue three quarters of an inch in breadth connected with the adjacent part, and sufficient for all the purposes of circulation. The cut edges were adjusted with extreme accuracy, by means of interrupted sutures and adhesive straps: the lower wound was contracted as much as possible by adhesive plasters, and the whole covered with lint, compress, and bandage.

"Previous to the operation she took sol. sulp. morphine, double strength of Majendie's formula, gtt. xiv. The operation occupied about an hour, and was sustained with a firmness peculiar to the female sex.

"*Evening.*—Had been sick at her stomach, and vomited some coagulated blood, which had no doubt been swallowed during the operation.

"*April 9th.* Found her sitting up at the side of the bed. She felt, she said, very comfortable, and had passed a good night. Hardly any perceptible swelling of the face. As far as the parts can be seen, all looks favorable. Ordered her a dose of sulph. magnesiæ. She can depress the lower jaw, by the effort of the will, to

the extent of about half the width of the finger. I advised her to continue the motion of the jaw, from time to time, as much as the soreness at the angle of the mouth would permit.

"10*th* and 11*th*. Continues to do well.

"12*th*. Some little tumefaction under the eye, but she makes no complaint. Directed an emollient poultice to the hard dressings upon the wounds on the neck.

"13*th*. Several poultices have been applied to the neck, which have softened the lint; upon carefully removing it and the plasters, the wound was again dressed in the same manner.

"14*th*. Complains of a little headache from not sleeping well last night. Felt great comfort from the removal of the stiff dressings yesterday. Bowels are in a good state. Cannot say to what the headache is to be attributed; she thinks it owing to the loss of sleep last night. The swelling of the cheek has subsided. Changed the lint again to-day.

"15*th*. Found her in bed this morning, with pains in her limbs generally, and with some swelling of the right knee, and tenderness to the touch; passed a bad night; her pulse is much more frequent than natural. Is not aware that she ever had rheumatism before. Directed general and local treatment for her disease. She makes no complaint of her face, which in all respects is very promising. I removed three of the stitches from around the angle of the mouth, and reapplied lint and plasters.

"16*th*. Still in bed. Has less pain and swelling in the knee, but more in the foot and ankle; generally she feels better. Removed another stitch from the lower part of the patch. The wound of the neck looks well; dressed it with ungt. resinæ and plasters.

"17*th*. To-day she is generally better, but feels most pain and tenderness in the knee and ankle of the other leg. Says her face feels very comfortable. I removed three stitches from the upper part of the patch, and for the first time all the plasters, and washed the whole surface. Adhesion seems to have taken place at every point of the flap. Dressed the face as yesterday.

"18*th*. Every part of the flap appears to have united. Dressed the wounds with dry lint. Advised her to move the lower jaw a little downward, every day, several times. The rheumatic affection is seated in the right wrist and fingers. Ordered the use of tinct. colchici.

"19*th*. Passed a better night; but both arms are now nearly useless. Consented to-day to be bled. Repeated the infus. sennæ as a cathartic; dressed the face, which looks very well.

"20*th*. Feels generally better. Both arms still much affected. Drew the edges of the wound in the neck together with adhesive straps. Directed the tinct. colchici to be increased.

"21*st*. In all respects better; a slight rheumatism yet continues in the left hand and arm. The colchicum has produced some cathartic action on the bowels. I dressed the face and wound as yesterday; directed her to open the jaw more frequently; and to continue the colchicum.

"22*d*. Found her sitting up, and says she is more comfortable. The left hand and wrist still a little tumefied and painful. Face and wound continue to improve; dressed them as yesterday. Has more motion in the lower jaw.

"23*d*. Is free from all pain to-day, and feels quite well again. Ordered the colchicum to be discontinued. Dressed the wound as before.

"25*th*. Continues free from rheumatism. The wound improves, and was dressed as yesterday. The jaw moves more freely.

"*May* 12*th*. Patch in the cheek entirely healed, [see Plate B. fig. 2.] The wound in the neck is nearly closed. She can open the jaws sufficiently wide to admit solid food.

"14*th*. She leaves town to-day in good spirits, and delighted with the result of the operation.

"Although I have before often operated for immobility of the jaw, and with the happiest results, and have once removed a deformity occasioned by a hole in the cheek, by the Tagliacotian method, in the New York Hospital, with perfect success, [see Case I., above,] I have never before seen it necessary to combine both operations in one individual; and the gratifying termination of this long and arduous case, is a convincing proof of the excellence of the means employed, and of the power of art in repairing the ravages of disease, and in relieving its distressing consequences.

"25 *Park Place, New York.*

"N. B. A letter was received from Miss P. by the lady with whom she resided here, in which she stated her health to be excellent, the jaw to have acquired increased motion, and her friends much pleased with her improved appearance.—*July.*"

(Dr. Mott's case of *Geno-Cheiloplasty*, New York, 1831.)
(Plate B.)

Fig. 1. Fig. 2.

Since the date of the last operation, Dr. Mott has performed various operations of a similar kind, as well as *blepharoplasty*, *rhinoplasty*, and *uretroplasty*,—of which last more particular mention will be made under the head of Injuries and Diseases of the Urethra.

INTERESTING CASE OF METOPOPLASTY, BY DR. JNO. WATSON OF NEW YORK.

[Communicated by Dr. Watson for this work, and never before published.]

Metopoplasty, or Forehead-Mending.

An anaplastic operation on the forehead, probably the first of the kind, was recently performed, with marked advantage to the patient, at the New York Hospital, by Dr. John Watson, one of the surgeons of that institution.

Hugh McCabe, a native of Ireland, a carpenter, aged forty-two, was admitted into the hospital on the 19th of April, 1844, with necrosis of the os frontis of six years standing, probably the result of syphilis, which he contracted some twenty years ago, but of which for many years past he had supposed himself entirely cured. According to his own account, the disease on the forehead was the result of a local injury.

At the date of admission a large ulcer, exposing a considerable portion of the os frontis, existed on the forehead. The greater part of the external table of the bone had already exfoliated, and was held in place merely by the overlapping of the soft parts. A fistulous opening existed at the upper border of each orbit, and another in the left temple, and through these there was a considerable flow of purulent matter. The upper eyelids were somewhat elevated and deformed by adventitious adhesions around these fistulæ.

A few days after admission, the exfoliated portion of bone was removed by Dr. J. K. Rodgers, who, in order to effect this removal, was obliged to increase the size of the opening by a short incision on the scalp, at the upper and left angle of the ulcer. The undermined integuments, now deprived of support, rolled in upon themselves, turning a portion of the hair of the scalp inwards upon the face of the sore, and adhering in this folded form along the left border of the ulcer.

On the first of June, the date at which Dr. Watson took charge of the case, the central portion of the ulcer appeared to be covered by a sort of cuticular cicatrix. The whole aspect of the forehead was exceedingly disgusting. The cavity was about two inches and a half wide in its shortest diameter; its borders were rugged, abrupt, and irregular. A portion of diseased bone lay still exposed and adherent near the upper and right angle of the opening, another under the fold of integuments along the left border. A deep sulcus, exposing some points of diseased bone, existed above the root of

the nose. The left frontal sinus was exposed to view, and the rim of bone along its outer and lower boundary was carious. From these several points of diseased bone there was a free discharge of purulent matter.

The patient's general health was good. After deliberating for some time on the case, finding the internal table unaffected, and all the carious portions apparently within reach, Dr. W. advised the patient to submit to an operation, with a view of removing the diseased bone, and of closing the cavity in the forehead. To this he readily acceded, and the operation was accordingly undertaken on the 27th of July of the present year, 1844.

After shaving the scalp, and removing the cuticle from the centre of the ulcer by washing it with concentrated aqua ammoniæ, the operation was commenced by unfolding the integuments along the left border of the ulcer. This required the free use of the scalpel. A small fragment of bone, which lay buried in this fold of skin, was removed during this first step of the operation.

The next step was to carry the point of the knife completely around the circumference of the opening, and through the whole thickness of soft parts; and to remove a strip of integument, varying from an eighth to a quarter of an inch in width, throughout the whole of this extent, thus making a smooth and fresh border for the subsequent adjustment of the flaps.

The third step consisted in raising two large quadrilateral flaps, the one on the left, and the other on the right side of the opening in the forehead. This was effected by four incisions running somewhat horizontally backward, nearly parallel with each other, two on each side, one from each upper, the other from each lower angle of the opening; and afterwards detaching the flaps from the periosteum.

The fourth step consisted in the removal of the diseased portions of bone, as far as they could be detected. This was effected mostly by the cutting pliers. The largest of these portions was the projecting rim of bone at the left frontal sinus, the removal of which caused a slight depression over the left orbit. The hemorrhage, which hitherto had been rather free, was now checked by the application of ligatures to such vessels as required them. The most obstinate point of issue was from the minute vessels of the glabella, where ligatures were out of the question.

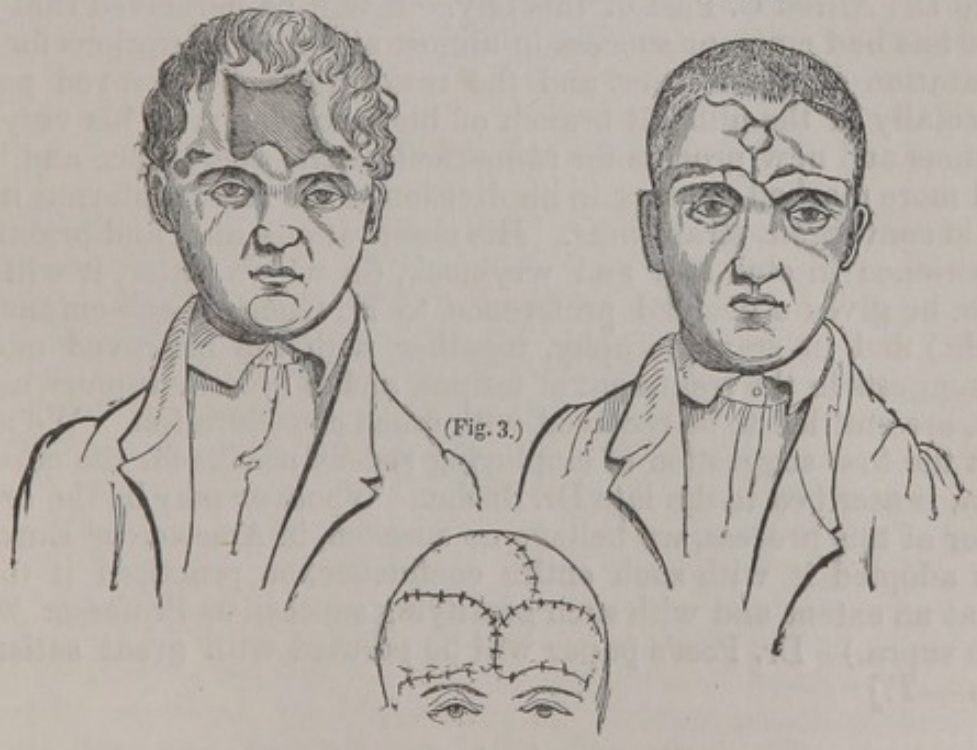
The fifth step was an attempt to approximate the lateral flaps, so as to cover the opening. This, however, could only be partially effected. They could be made to meet only to the extent of an inch from their lower edges, even after considerable stretching. The parts thus approximated were secured by two sutures. A large V-like gap still existed on the upper part of the forehead.

The next step consisted in an attempt to fill this by a flap from the top of the scalp. For this purpose a free incision was carried from near the upper and right angle of the ulcer, in a curved direction, towards the crown of the head. The flap thus made was dissected up and then partially rotated, so as to bring its lower and

right angle downward on the centre of the forehead. In this way the remaining deficiency of integument was effectually supplied. The approximated edges were now brought into exact coaptation along the whole of the lines of incision by numerous points of suture. No part of the wound was left gaping. The sutures were strengthened by strips of adhesive plaster, and the forehead was covered with a compress and bandage.

The patient suffered comparatively little subsequent to the operation. During the greater part of the first week he was kept on a restricted diet. The dressings on the forehead were kept wet with cold water. This had no effect in detaching the adhesive straps, and was exceedingly grateful to the patient. The first dressings were removed on the sixth day. About three fourths of the lines of incision had united by the first intention. A few of the sutures were removed, and the wound was dressed as before. At the second dressing, on the ninth or tenth day, cicatrization had progressed somewhat further. The lower angle of the upper flap had not adhered, and it had receded somewhat, so as to leave a small gap about the size of a shilling in the middle of the forehead. All the remaining sutures and ligatures were now removed, and replaced by simple adhesive straps.

(Fig. 1.) (Fig. 3.)



(Fig. 3.)

Subsequent to this period, although the central gap increased slightly in size, the integuments around it became attenuated and cicatrized firmly to the parts beneath, so as to leave very little depression. The patient left the hospital about five weeks after the operation; at which period the wound had entirely cicatrized, with the exception of a papillary opening which communicated with a small point of carious bone that had escaped notice during the op-

eration, and that had not yet exfoliated. This opening was at the upper and right angle of the original cavity, and was seated on the hairy scalp, so that as the hair grows it will become entirely hidden, provided it is not soon allowed to cicatrize by the exfoliation of the point of bone beneath it.

Figure first, in the accompanying plate, is a representation of the patient's features just before the operation. Figure second illustrates the lines of suture subsequent to the operation; and Figure third is a representation of the face at the date of the patient's dismissal.

OPERATIONS IN BLEPHAROPLASTY, RHINOPLASTY, RHINO-CHEILOPLASTY, STAPHYLORAPHY, STRABISMUS, TALIPES, TORTICOLLIS, AND ERECTILE TUMORS; BY ALFRED C. POST, M. D., ONE OF THE SURGEONS OF THE NEW YORK HOSPITAL.

[In illustration of what has been done in anaplastic and sub-cutaneous operations by our own countrymen, it is a source of much gratification to be enabled to incorporate with this work the following very highly interesting summary, for which we are indebted to Dr. Alfred C. Post of this city. It will be perceived that Dr. Post has had eminent success in almost all of his operations for the reparation of deformities, and the restoration of destroyed parts, especially in the difficult branch of blepharoplasty, in his very ingenious and new process for *rhino-cheiloplastic* operations, and in a still more marked manner in his division of the rectus-internus muscle in convergent strabismus. His observations, also, and practical experience in club-foot and wry-neck, (in which latter, it will be seen, he gives a decided preference to M. Guérin's sub-cutaneous mode,) and in staphyloraphy, together with the improved modes he suggests in the treatment of talipes, and of erectile tumors, nævi, &c., are entitled to be received with much consideration. We note that the first suggestion of employing *red-hot needles* for the cure of *nævi*, is ascribed to the late Dr. Bushe. Whoever may be the originator of this process, we believe no surgeon, in America or Europe, has adopted it with such entire confidence, or practised it to so great an extent and with such gratifying success, as Professor *Mott*, (see supra.) Dr. Post's paper will be perused with great satisfaction.—*T.*]

Blepharoplastic Operations.

My first blepharoplastic operation was performed on the fifth June, 1841, in the presence of Doctors J. Kearny Rodgers, Blakeman, Trudeau, and Buel. The patient was a boy seven years of age, whose face had been badly burned three years before the operation. The left lower lid was completely everted, and its margin much elongated and drawn down upon the cheek, where it was

fixed by a firm and unyielding cicatrix. The following account of the operation is extracted from the New York Medical Gazette for Jan. 19, 1842:—

I first made an incision immediately below the everted lid, by which I detached it from the cheek. I then cut out a V-shaped piece from the lid, and brought the edges of the incision together with a suture, by which means the tarsal edge of the lower lid was shortened and brought into apposition with the corresponding margin of the upper lid, leaving, however, a considerable chasm between the lower lid and the cheek. I then dissected a vertical flap from the integument covering the anterior edge of the masseter muscle, about two inches in length and five eighths of an inch in breadth, leaving it attached at its upper extremity by a neck three eighths of an inch in breadth. The flap was then brought around so as to fill up the chasm between the lower lid and the cheek, and was secured in its place by ten sutures. The sides of the wound, from which the flap was taken, were brought together and secured by three sutures, fortified by adhesive straps. The only situation in which the sides of the wound were not brought into contact, was at the angle below the twist in the neck of the flap. A piece of lint, dipped in iced water, was applied over the wound, and directed to be moistened as often as it became dry or warm.

The sutures were removed on the fifth, sixth, and seventh days. Union by the first intention took place throughout the whole wound, except at three points, viz.: the angle below the twist in the neck of the flap, the junction of the extremity of the flap with the side of the nose, and the inferior angle of the part of the wound from which the flap was taken.

The following report was made on the 20th June, fifteen days after the operation:—The wound has healed throughout its whole extent. The eversion appears to be entirely cured. The patient has the full power of opening and closing the lids. The twist at the neck of the flap is almost entirely effaced; but the outer canthus is crowded somewhat towards the nose, so as to make the affected eye appear a little smaller than the sound one.

My second blepharoplastic operation was performed on the 25th May, 1842, in presence of Doctors Hoffmann, Hitchcock, Hobart, Buck, Hubbard, Blakeman, and Westmacott. The patient was a little girl two and a half years of age, whose face had been sadly disfigured by a burn, when she was six months of age. The middle portion of the right lower lid was drawn down, everted, and fixed to the cheek by a firm wrinkled cicatrix, which adhered also to the nose and drew its tip to the right side. The patient was unable to close the lids; and the eye, from its exposed situation, was subject to inflammation from slight exciting causes. The operation which I performed was almost precisely the same as in the former case. After the operation the child was fretful and feverish, and cried a great deal. Three days after the operation, suppuration took place between the extremity of the flap and the nose. On the following day, I dressed the wound and removed all the su-

tures. Adhesion had taken place between the edges of the wound from which the flap had been taken, and along the lower edge of the flap where it was attached to the cheek. The adhesion between the upper edge of the flap and the eye-lid, and between the edges of the divided lid, was very slight. I brought all the edges of the wound together as accurately as possible with adhesive plaster. The next day the adhesions between the edges of the divided lid, and between the lid and the flap, had given way, and the inner extremity of the flap had separated about three eighths of an inch from the nose. On the 5th of July, about forty days after the operation, the process of cicatrization was completed. There was a notch at the margin of the lid where the edges of the wound had been brought together, and a slight degree of eversion remained at the same *point;* but the lids could be closed, and the whole appearance of the eye was greatly improved. A slight additional operation would have removed the notch at the edge of the lid, and I recommended to the parents to bring the child to me again for the purpose, but they did not return.

About a year ago, I performed a third blepharoplastic operation for the restoration of the upper lid in a case of extreme deformity, resulting from a burn. The patient's health was bad, and I could not obtain perfectly sound integument for the formation of the flap. The greater part of the flap sloughed, and the wound was left to heal by granulation. She left the city before the wound had healed, and I have not been able to ascertain the ultimate result.

Rhinoplastic Operations.

On the 8th November, 1843, I performed, at the New York Hospital, a rhinoplastic operation according to the Indian method, as modified by Dieffenbach. The patient was a girl twenty-two years of age, whose nose had been partially destroyed by ulceration, supposed to be syphilitic, three years before the operation. The point of her nose was drawn up by a cicatrix, so that the nostrils were very conspicuous in a front view of the face. The dorsum of the nose above the point was much depressed, a large portion of the cartilaginous septum of the nose having been destroyed. In the depressed portion of the dorsum was a hole with cicatrized edges, sufficiently large to admit the extremity of the little finger. The deformity was of so disgusting a character that the patient had been in the habit of covering the nose with a plaster. The ulceration had been healed a little more than a year before the operation, and during that period she had enjoyed good health.

The operation was as follows:—A transverse incision was made about three fifths of an inch above the point of the nose, and extending through the whole thickness of the organ, from cheek to cheek. By this means the point of the nose was liberated, so that it could be brought down to its proper situation. The depressed and perforated portion of the dorsum and sides of the nose was then excised by two oblique incisions, extending from the upper

part of the dorsum of the nose to the two extremities of the transverse incision. These incisions, with the restoration of the point of the nose to its proper position, left a triangular chasm more than an inch in length in a vertical direction, and about an inch and a half in a transverse direction. To fill this chasm, a triangular flap was dissected from the forehead, encroaching upon the hairy scalp, which had been previously shaved. The base of the flap was situated superiorly, and the extent of the flap was considerably greater than that of the chasm which it was designed to fill. The flap was left attached to the root of the nose by a neck of integument about three quarters of an inch in breadth, and the incision on the left side of this neck was continued down to the corresponding side of the wound upon the nose. The bleeding, which was pretty copious, was arrested by the application of iced water. When it had ceased, the flap was brought down, being twisted towards the left side, and its edges were secured by twisted sutures to the sides and base of the triangular space included between the incisions on the nose. Fourteen sutures were employed to keep the flap in its place, and three to adjust the edges of the wound upon the forehead, from which the neck of the flap was taken. No attempt was made to bring together the edges of the broad part of the wound on the forehead, which was simply covered with dry lint. A piece of lint, spread with simple cerate, was applied over the whole *wound*. The flap maintained a natural appearance from the time of its transposition. After the lapse of forty-eight hours, the threads were cut and removed, but the needles were left in place. Four needles were removed on the 12th November, six on the 13th, six on the 14th, and one on the 15th. Union of the flap took place by the first intention, except on the left side, where there was some suppuration. The lower part of the wound on the forehead also united by the first intention.

On the 29th November, the union of the flap on all sides having become firm, I divided the neck of the flap and untwisted it; and, having cut it to a proper shape, I secured it to the adjacent parts by five twisted sutures. On the 2d December, ulceration had taken place around the needles and I removed them all: the wound had united throughout nearly its whole extent. The broad wound on the forehead became filled with granulations, by the contraction of which its edges were gradually approximated, and cicatrization was completed about the 15th January, 1844. A merely linear cicatrix extended from the root of the nose nearly to the upper part of the forehead, where the broadest part of the cicatrix which encroached upon the hairy scalp could almost be covered with a dime. The lower part of the flap, which now formed part of the nose, had become covered with hair of a much finer growth than that which proceeded from the portion of the scalp from which the flap had been taken. The sensibility of the flap, which at first was nearly extinct, had gradually increased, but was much less at the centre than towards the edges. The point of the nose was drawn a little upward, and above it was a deep transverse depression in the

transplanted skin. The portion of the flap which constituted the dorsum of the nose was broad and flat, and a ridge existed on each side at the junction of the lower extremity of the flap with the remains of the original alæ of the *nose*.

To remedy these defects, and to improve the form of the nose, on the 18th January I performed the following operation:—I excised an elliptical portion from each ala of the nose, extending from the dorsum to the cheek, and including the elevated cicatrices. I then made a transverse incision dividing the remains of the dorsum between the two lateral incisions, by means of which the point of the nose was liberated, so that it could be brought down again to its proper position. But as the point of the nose was disposed to rise again, I divided the columna with the remains of the septum, and excised a portion about a quarter of an inch in length with strong and sharp scissors. I then excised a longitudinal strip, about one third of an inch in breadth, from the whole length of the dorsum of the nose, and sloped the edges of the wound at the expense of the inner surface of the skin. After the flow of blood, which was quite copious, had been arrested by the use of iced water, the edges of the wound in the dorsum of the nose were brought together with five twisted sutures. The lower extremity of the flap was reunited with the remains of the alæ by one twisted suture and one interrupted suture on each side. As the edges of these incisions were curved, their approximation pushed forward their anterior extremities, and thus removed, in a great measure, the transverse depression which had previously existed. Finally, the edges of the divided columna were brought together by two interrupted sutures, and thus, by shortening the columna, the point of the nose was secured in its proper position. The operation was necessarily tedious and painful, but it resulted in a very marked improvement in the appearance of the nose, which had assumed the form of a very becoming feature. The wound was dressed as after the first operation.

Jan. 20th. Several of the needles have caused ulceration; I removed all the threads from the twisted sutures, and extracted three of the needles.

21st. Removed the remaining four needles and the two sutures connecting the lower extremity of the flap with the alæ of the nose.

22d. Removed the remaining two sutures, viz., those connecting the edges of the divided columna. The union of all the wounds appears to be nearly perfect.

The patient left the hospital about the 20th February. The nose had become considerably flattened since the last operation. The growth of fine hair still continued on the portion which had been detached from the scalp, requiring the occasional use of *tweezers*. On the whole, however, a great improvement in her appearance had resulted from the operation.

Rhino-Cheiloplastic Operations.

During the past summer, (1844,) I performed two operations for the restoration of the upper lip and of the columna of the nose. The cases were very similar to each other. The subject of the first operation was a young man twenty-two years of age, most hideously deformed by a double hare-lip complicated with double fissure of the bony and soft palate. The intermaxillary bone between the two fissures of the upper jaw, projected forward nearly as far as the tip of the nose, and terminated in two prominent teeth, which were about an inch in advance of the lower lip. This projecting portion of bone was covered in front by the portion of integument which separated the two fissures of the lip, and which was attached above to the tip of the nose. The fissures of the lip extended nearly to the angles of the mouth.

The operation was performed in the following manner:—The portion of integument between the fissures of the lip was first detached from the intermaxillary bone, but left attached to the tip of the nose. The intermaxillary bone was then excised with bone forceps by two incisions—one horizontal, on a level with the floor of the nose, and the other vertical, on a level with the teeth of the lower jaw. The edges of the hare-lip fissure were then excised with sharp scissors, and two horizontal incisions, each nearly an inch in length, were made through the cheeks, extending backward from the alæ nasi. By this means, I was enabled to obtain two flaps from the cheeks, which I drew together in the median line and united by three interrupted sutures, which were fortified by strips of adhesive plaster. The portion of integument which hung down from the tip of the nose was then pared down to a proper shape and size, and turned backward and upward so as to be applied to the lower part of the septum of the nose, from which the intermaxillary bone had been excised. It was attached to the septum of the nose by two sutures.

I saw the patient two months after the operation: the lip had united firmly, but the vermilion border was a little higher on one side than on the other. The middle flap had also united to the septum nasi and had formed a very respectable columna, which, however, was rather too wide, and which I proposed to reduce by the excision of a narrow strip; but the patient did not return to me for the purpose. The result of the operation was extremely gratifying to the patient and his friends. The deformity had been of a most hideous character, and it had previously been examined by several surgeons, who had regarded it as beyond the reach of surgery. Some of the steps of the operation were such as have not generally been made known to the profession, and, as far as my knowledge extends, had not previously been adopted by any surgeons in this country. I allude particularly to the horizontal incisions through the cheeks, and to the mode of constructing the columna nasi. For the plan of operating which I adopted, I am chiefly in-

debted to the valuable work of M. Serre of Montpellier, "sur l'Art de restaurer les Difformités de la Face," &c.

The subject of my second operation was a boy about ten years of age. The deformity bore a striking resemblance to that which existed in the case described above, and the steps of the operation were so nearly the same, that I do not consider it to be necessary to describe them in detail. When I last saw the patient, which was a fortnight after the operation, the lip had united perfectly, and its appearance was symmetrical, except that it was swollen on one side, in consequence of ulceration caused by a projecting tooth. The union of the columna was not yet perfect.

Staphyloraphy.

I performed the operation of staphyloraphy on the 21st August, 1843, at the surgical clinique of the Castleton Medical College. The patient was a young man twenty years of age, affected with a congenital fissure of the velum palati and uvula. The tongue was depressed by an assistant with a bent spatula; I held the edges of the fissure with a double hook, and excised them with a scalpel. I then introduced three sutures with needles which were fixed to a handle, drawing out the ends with forceps; I found it difficult to draw out the threads, in consequence of the needles being too little curved, so that their points were necessarily thrown too far back. The patient fainted during the operation, which was somewhat protracted from the difficulty of passing the threads. The quantity of blood lost was very small, scarcely exceeding an ounce. In tightening the ligatures, I found difficulty in keeping the first knot from slipping until it was secured by a second. I accomplished it by having it held by an assistant between the blades of a forceps. After the knots were tied, so much tension existed in the velum that I feared that the threads would cut through the edges of the wound. I succeeded completely in relieving this tension, by making an incision on each side parallel to the wound, and extending through half the thickness of the velum, according to the plan suggested by M. Dieffenbach.

The first day after the operation, the patient was allowed to swallow nothing but a teaspoonful of milk every hour, and to hold ice in his mouth. He was directed afterwards to take a pint of beef tea daily for a week, to be swallowed very slowly, and in small quantities at a time. He was also directed to confine himself to liquids for another week, but to take them more freely.

Three days after the operation I examined the throat, and found the edges of the wound in perfect apposition, and very little appearance of inflammation. The patient complained very little of soreness of the throat. On the evening of the same day I left Castleton. I visited Castleton again during the following spring: the patient was absent, but I ascertained from several medical gentlemen who had seen him, that the operation had been entirely successful.

In the performance of the operation just described I experienced considerable difficulty, in consequence of not being provided with needles of a suitable form to pass the threads readily through the velum. I have since procured needles much better adapted to this purpose, but I have not yet had an opportunity of making use of them. I have no doubt that the operation would have failed if I had not relieved the tension of the velum by incisions; I think, also, that the success of the operation was promoted by allowing the patient small quantities of liquids, instead of proscribing all food and drinks, as some operators have done. The effect of entire abstinence from drinks, is to occasion an accumulation of viscid saliva and mucus about the fauces, and thus to give rise to frequent attempts at deglutition, which are much more likely to disturb the healing process than swallowing bland liquids.

Strabismus.

My first operation for strabismus was performed on the 28th October, 1840. I have divided the rectus internus muscle SIXTY-ONE times, and the rectus externus SIX times. Of the SIXTY-SEVEN operations, two were for converging luscitas, being performed on the right and left rectus internus muscle of the same patient, and they were entirely ineffectual. Of the FIFTY-NINE operations for strabismus convergens, FIFTY-TWO were successful in restoring the affected eye nearly or quite to its normal position; in some of these, however, the eye remained a little convergent, or became slightly divergent, but not to such a degree as materially to injure the appearance of the patient. Of the seven unsuccessful cases, there were four in which the eye became divergent to such a degree as to constitute a serious deformity. In the remaining three, the operation failed in consequence of the obstinacy or resistance of the patient. One of the patients was a boy, who struggled so violently that I could not satisfy myself that the muscle was completely divided. The two other patients were men, in both of whom the two eyes were affected, and in each case the failure of the operation was the result of the refusal of the patient to submit to the operation upon the second eye.

Of the six operations for the cure of strabismus divergens, by the division of the rectus externus muscle, four were successful in restoring or greatly improving the position of the eye. In both of the unsuccessful cases, the divergence was the result of the previous division of the rectus internus muscle.

It has been supposed by many persons that the successful result of the operation for strabismus was not permanent, and that there was a great liability to a return of the distortion. This opinion has not been verified by my experience. As far as I have had an opportunity of observing the subsequent progress of the cases upon which I have operated, there has been but one instance in which there has been a return of the distortion after it has been apparently cured. In this case, the strabismus was originally brought on by

an attack of ophthalmic inflammation, and after having continued a number of years, was perfectly cured by the division of the rectus internus muscle. About a year after the operation the patient had a severe attack of ophthalmic inflammation, in consequence of which the strabismus returned.

Club-Foot.

I have had considerable experience in the treatment of club-foot. In a few instances I have tried the effect of simple mechanical treatment without the division of tendons, and I am fully persuaded that many cases may be cured by the persevering use of this method; nevertheless, I am firmly convinced that the reduction of the foot to its proper position is greatly facilitated by the division of such tendons as are contracted, and that the division of the tendons not only renders the cure more rapid, but saves the patient a vast amount of suffering. I have divided a large number of tendons, and I have never known any serious consequences to result from the operation. The instrument which I employ for the reduction of the foot in children, is Scarpa's shoe, as modified by Little and Buck, with the addition of a soft laced boot, which is immediately applied to the foot, and the heel of which is fastened to the heel of the shoe, while the remaining portion of it is free. The laced boot is a modification introduced by myself, and it appears to me to have the decided advantages, that it fixes the foot more securely to the apparatus, and that it diminishes the danger of excoriation. For the reduction of the foot in adults, I prefer Strohmeyer's foot-board as modified by Dr. Detmold.

Wry-Neck.

I have treated a confirmed case of this distortion very successfully by the *sub-cutaneous* division of the sternal origin of the sterno-cleido-mastoideus, followed by the use of Winslow's bandage, Joerg's apparatus, and Dieffenbach's cravat. I am inclined to prefer the sub-cutaneous to the open division of the sterno-cleido-mastoid muscle.

Erectile Tumors.

I introduced cauterizing needles into one of these tumors as early as the 2d March, 1836. In this case considerable arterial hemorrhage followed the operation. I think that it was owing to the needles having been too sharp. I would suggest the propriety of having blunt points to the needles, so that they may burn their way through the tumor rather than cut it. [The actual cautery, heated to a *red* rather than a *white* heat, has been recently (as will be seen farther on) recommended in all cases where this invaluable remedial agent is required in surgical operations of any kind. Though Dr. Post has not mentioned why *he* also gives it a preference in

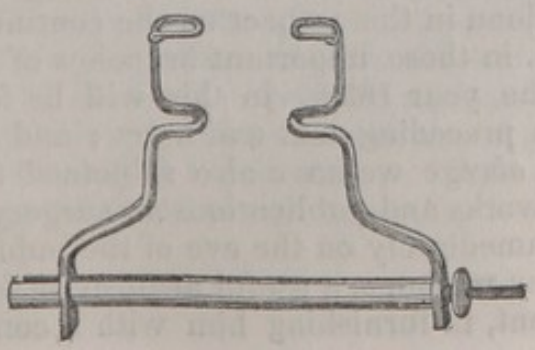
erectile tumors, it may be well to remark that it appears to be founded on correct pathological principles; inasmuch as the needle, heated only to a moderate degree of heat, makes, by burning its way, a much better eschar in its passage, and is therefore more effectual in arresting hemorrhage and procuring a healthy slough, than by the white heat, which must make it act in some measure as a cutting instrument.—*T.*]

If my recollection does not deceive me, I received the first information of this method of treatment from Dr. Theodore L. Mason, who received it from the late Dr. Bushe. I have treated erectile tumors successfully by a variety of different methods, and it does not appear to me that any one method is properly applicable to all the cases which occur. When the tumor is prominent, and its situation is such as to admit of the remedy, I think that the plan of transfixing the base of the tumor with two needles at right angles, and then applying a ligature, is calculated to effect the most safe and speedy cure. In some situations, excision is the preferable method. During the last summer I saw a case in an infant four months old, in whom more than half of the vermilion border of the lower lip was involved, and the tumor was growing rapidly. I excised it by an operation similar to that which is performed for the extirpation of cancer of the lip in the adult, and stretched the remnant of the lip across to the angle of the mouth, where I secured it by two interrupted sutures. A very moderate amount of hemorrhage occurred, and the lip united with but little deformity. [Under *erectile* tumors we presume that Dr. Post means to include, with transatlantic surgeons, the different forms of *nævi*.—*T.*]

IMPROVED EYE-SPECULUM, BY GEORGE TIEMANN, SURGICAL INSTRUMENT MAKER, NEW YORK.

[Designed particularly for operations for Strabismus, &c.]

This instrument, invented by George Tiemann, of New York, appears to us to possess a decided preference over the common spring speculum, as described by Prof. Pancoast in his work on surgery, as well as over some of the more complicated but not less objectionable specula used by others. The instrument of Dr. Pancoast will not, when applied to the eye-lids, open them at equal distances, for the outward points of the hooks will stand farther apart than those of the inner side.



The above eye-speculum, by means of the spiral spring within the silver cylinder, opens the two hooks in a direction perfectly parallel to each other, and the regulating screw secures them at any distance the operator chooses to set them. This will much alleviate the pain of the patient; for the continued pressure of the spring speculum upon the muscles of the eye-lids (there being no check to the spring of the instrument) is considered by some, and no doubt often is, far more painful than the operation itself.

The profession for many years owe much to Mr. Tiemann for the very perfect workmanship, not only of all the ordinary instruments employed in surgery, midwifery, &c., but also for the very great improvements he has made in some of them, and for those more remarkable instruments of his own invention (as his *tonsil-scissor-forceps*, &c., all of which will be given in their proper place) which have justly given to this very scientific and intelligent artist an enviable reputation.—*T.*]

GENERAL REVIEW

OF THE

PROGRESS OF SUB-CUTANEOUS SECTIONS AND ANAPLASTIC SURGERY,

SINCE THE LAST EDITION OF M. VELPEAU'S WORK ON OPERATIVE SURGERY IN 1839.

As it would have been impossible, from the length of time that this first volume of the American edition of M. Velpeau's work has been in the press, to have incorporated in systematic order the various improvements, and new applications of sub-cutaneous and anaplastic surgery which are constantly being made both in Europe and in America, especially in the former country, we have, in addition to the annotations which are found in various portions of the text, and as a sequel to the more distinguished contributions of our own countrymen, as contained in what immediately precedes this part of our concluding appendix, thought it advisable to endeavor to give, in this place, a brief and consecutive historic summary of what has been done in this respect on the continent of Europe and in Great Britain, in those important branches of new and modern surgery, since the year 1839. In this will be found supplied all omissions in the preceding text and notes; and this summary, together with the *abrégé* we have also subjoined from the more recent European works and publications on surgery which have only come to hand immediately on the eve of the publication of our volume, will form, as we hope, a useful acquisition for the practitioner as well as student, in furnishing him with a complete account of

every thing of any value that has been done up to the present moment, or that seems worthy of record, both as a guide to what may now be safely undertaken, and as embracing matter which may act as a laudable incentive for further experiments and discoveries.

THE SUB-CUTANEOUS SECTION.

It is not to be denied (as is made manifest by M. Velpeau and others in the text of this work—vid. supra, and especially the discussion in the Academy of Medicine at Paris) that the sub-cutaneous section of the integuments had been long since practised by many surgeons both of England and on the continent of Europe. But it is nevertheless true, that its practical application was never brought to such perfection, or proved to be a matter of such high importance and value, as it has been in all the varied processes of tenotomy and myotomy proposed and practised by M. Jules Guérin. His boldness, tact, and success, and the extent and diversity of cases of deformities on which he has employed it, have justly given him an undisputed as well as the most exalted rank in those invaluable departments of new and modern surgery. It is due to M. Guérin, in order the more effectually to authenticate and enregister his claims, to quote in this place an extract from a paper in his Gazette Médicale, 1841, which bears the title of "*Remarques Historiques et Critiques pour servir à l'Histoire de la Méthode Sous-cutanée, par le Dr. J. Guérin*," and which was intended as part of an introduction to the work he was then about to publish, entitled "*Essais sur la Méthode Sous-cutanée*," and which has since been published. In this preface he generalizes his method by laying down the following principle: "that all wounds practised under the skin, whatever may be their seat and the nature of the divided tissues, partake of the character of sub-cutaneous wounds of tendons; that is to say, that they neither inflame nor suppurate, and that they cicatrize (*s'organisent*) immediately." The peculiar character of the consecutive action (*du travail consécutif*) in these wounds, is not a diminution of inflammation, but one of an altogether different nature, to wit, immediate organization, (*organisation immédiate.*) The indirect character is the absence of all febrile reaction, local or general, even when the sections are carried to the number of ten or twelve, or even to more than *forty* on the same individual, as is seen in the remarkable and unique case in which M. Guérin operated at Paris, and which we have mentioned *supra* in our notes on tenotomy and myotomy, embodied with the text, and of which a more exact account will be found in the subsequent pages of this appendix.

STRABISMUS.

The absolute necessity of more exact experiments and investigations in relation to the motive agents and functions of the eye, is strikingly illustrated by a remark of Mr. W. Hey, jun., in the Transactions of the Provincial Medical and Surgical Association, Lond., vol. xii., 1844, p. 170. In an interesting retrospective address on surgery in that work, Mr. Hey says: "Before we attempt the cure of these affections (strabismus, &c.) by an operation, we ought to decide, in the first place, whether the disease depends on an abnormal condition of the muscles, or on some defect in the organ of vision; and, in the next place, we ought to ascertain which, if any, of the muscles are in fault; for it appears that in myopia one surgeon divides the *obliquus superior*, another the *obliquus inferior*, a third, *two of the recti*, and a fourth, *all four of them*."

Mr. Bransby Cooper, in some physiological observations on the eye, (*London Medico-Chirurgical Review*, January, 1839,) draws certain conclusions from experiments he made on rabbits, which, however, as has been justly remarked, from the difference of anatomical structure in their eyes from those of the human species, must be taken with certain allowances, (see some remarks of Dr. Franz, infra.) Mr. Cooper is led to believe that the oblique muscles of the eye, when they act together, retain the globe in a central position in the cavity of the orbit, and moderate the *retraction* of the *four straight* muscles; and that when they act one after the other, without their power being diminished by the action of the straight, they turn *the eye on its axis*, drawing the globe forward, and at the same time much enlarging [thereby] the field of vision. This is clearly inferred from the great loss of mobility in the eye after the section of one of the oblique muscles. In dividing the *two obliques* of one eye, he found, in rabbits, that the *globe was permanently retracted into the orbit*, and depressed upon the floor of this cavity, the pupil being also *contracted*, without, however, any lateral deviation. By the section of one only of these muscles, the eye was not left exclusively to the action of the other, which was necessarily subject to the influence of the straight muscles.

In Dr. David Hosack's theory on the action of the muscles of the eye, broached by this eminent American practitioner so early as 1794, (see text of this work, supra,) and to the ingenious and unquestionably sound principles of which theory we have thought it our duty to give full credit in our text, though he declares the general fact, he does not pretend to point out precisely, in detail, in what manner the various muscles co-operate or combine in producing a diminution or elongation of the longer axis of the globe. M. Velpeau, it will be seen in his treatise on strabismus, (embodied in the text, supra,) advances some plausible explanations of the manner in which changes are thus produced in the globe, (consequently in its adaptation to distances—in other words, to all the modifications of vision,) by throwing out the idea that the recti and the oblique

act, as Dr. Hosack had intimated, in an antagonist manner to each other, and thus each order having their fulcra in an opposite position, their compound actions are so combined by the will as to draw the ball backward, or outward and forward; i. e., to diminish or elongate its longest diameter.

Mr. E. W. Duffin, of London, one of the earliest surgeons to introduce the operation of strabism into England, and to illustrate its pathology, speaks of the acti of the muscles as follows, without, however, apparently referring to the indispensable connection of these moveme with the adaptation of the eye to correct vision, (*Lond. Lancet*, 1 0, p. 925:) "Much diversity of opinion certainly prevails in d to the functions of the oblique muscles of the eye; but if we dissect them with very great care to their insertions, we *must admit*, whatever else we may call in question, that the direction of their fibres, as well as their ultimate attachments, warrant the conclusion that the function of the superior oblique is to roll the eye inward and downward, and that of the inferior to rotate the organ in the opposite direction. *When both muscles* contract at the same time, *the effect will be to bring the eye forward and render it a little more prominent;* thence proceeds one of the common results, *increased fulness of the eye*, when the adductor [i. e., rectus internus] is divided." It is proper to say that Sir Charles Bell, on the contrary, believed that the superior oblique assisted in rotating the globe *upward* and inward. This Mr. Duffin cannot comprehend. This latter surgeon continues: "that the only muscles requisite to enable the eye-ball to move diagonally *upward and inward*, i. e. towards the nasal process of the frontal bone, are the *superior rectus* and the adductor; although it is possible that the superior oblique, by rolling the globe downward and inward, may contribute slightly, in some individuals, in causing the pupil to approximate the inner canthus, but certainly not in directing it upward," (*Ib.*) Mr. Duffin proved by his operations in several cases, and in one more especially remarkable case of excessive squinting of the right eye *upward* and *inward*, that the division of the superior and inner rectus alone effected a perfect restoration of the ball. (*Ib.* pp. 926, 927.)

These ideas, we think, seem consistent with the principles of the composition of forces which must result from the position of the recti; i. e., the diagonal line, (equidistant from any two proximate recti,) upon which this action must be directed. The prominence of the eye, also, when one or more of the recti are cut, appears to show that their appropriate (not conjoint with the oblique) action is to retract the globe into the orbit, and that of the oblique to protrude or elongate it.

In respect to *the causes of permanent strabismus*, besides those of some congenital or accidental lesion of the nervous centres, Mr. Liston and Mr. Ancram, (*Lond. Lanc.*, 1839–40, pp. 609, 610,) in a summary on seventy-six cases already operated upon by Mr. Liston at that date, mention the wearing of a *shade* so that the light has been admitted only at the inner angle—the eye being constantly directed

to this point. This was the cause in ten patients out of seventy-six. *Violent exertion*, as in whooping-cough, occasioned the disease in five; the *action* of the muscles of the eye in looking suddenly at some object, caused it in seven; falls caused four cases. The relative proportion of cases of congenital strabismus is small; more cases are caused by spasmodic contraction of the internal rectus, than by paralysis of the external straight muscle. Mr. Liston, it appears, (loc. cit., supra,) *divided the external rectus* for divergent strabismus previous to July 14, 1840. Most of the causes of the disease have operated effectually before three years; after that their power decreases. Both sexes and both eyes these surgeons *then*, at least, thought were equally liable to the disease. Mr. Liston cured, and in a perfect manner, one case of *contracted internal rectus of sixty years standing*. The objection to operating very early is that some temporary internal derangement [as we have said in a note in the body of the text, supra,—*T.*] may be the cause, and require only pathological means. At that time, also, [for it is proper to recur to these early steps of this part of *new surgery* to serve as guides to the future,—*T.*,] Mr. Liston recommended (in convergent strabismus) to dissect *perfectly clean* the internal part of the ball of the eye, "for (says Mr. Ancram, speaking for Mr. Liston) the *slightest* fibre of the internal muscle that remains undivided *will prevent eventual success*." Though perhaps this advice, from the now too frequently observed occurrence of the deformity of exophthalmia, flaring of the lids, &c., (see text, supra,) after this unsparing dissection, can no longer be admitted in practice, we must, with the spirit of impartiality which should guide us, give Mr. Liston the credit of having, as early as this period, (July, 1840,) been so impressed with the necessity of an unrestricted liberation of the fibro-cellular connections of these parts, that he frequently, in convergent strabismus, where the patient after the operation continued to have the power of turning the eye inward and *downward*, divided also, wholly or in part, the *inferior rectus*, the *contraction* of the inner border of which Mr. Ancram, with reason, considered as the probable cause of this partial degree of the disease remaining after the division of the internal rectus. In every case of this kind thus treated, the result was perfect success. For the dissection of the ball, these surgeons gave a preference to the scissors and forceps, as we thus avoid wounding the sclerotica, evacuating the humors of the eye, and consequently destroying vision. Mr. Liston's *first* operations for strabismus, says Mr. Ancram, took place in the *early part of May*, (1840.) In seventy-four cases he failed in BUT ONE [!] so avers Mr. Ancram. This certainly is a far greater proportion of cures than strabotomists are favored with at this present advanced epoch of this branch of surgery, (1844,) and no doubt Mr. Ancram soon afterwards found that his statement of cures must be taken with many exceptions.

Our author, M. Velpeau, as will be seen in the text of the body of the work, enters largely into the importance of a partial division

of the inner border of both the upper and lower rectus, in certain cases of convergent strabismus.

It is proper here to say, so far as Mr. Ancram (Mr. Liston's adjunct) is the exponent of Mr. L.'s opinions, that as early as May 6, 1840, Mr. Liston had noted the difficulty mentioned above, of the continuance of the eye to converge to a certain degree after the operation, and had at first imputed it to a contraction of the *two oblique muscles*, (*Ib.*, *Lond. Lanc.*, pp. 306, 307.)

It is just also to Mr. Lucas, of London, to mention that he at that early period (August, 1840) doubted so much the propriety of interfering with either the *superior or inferior rectus*, and feared so much an external strabismus from their division, that he felicitates himself, at that time, on never having touched the tenotome to either of those muscles, or any of their fibres, maugre the unvarying success which Mr. Ancram assures us Mr. Liston obtained by these sections.

Mr. Lucas, however, claims in most unqualified terms, the honor of having performed the *first operation for strabismus in England*, as reported by him in the London Lancet, (vid. *London Lancet*, 1839–40, p. 709.)

Mr. E. W. Duffin, of London, however, who at this time appears to have quite surpassed all his cotemporaries in the first year (1840) that the operation for strabismus was domiciliated in England from the continent, had already, on September 1, 1840, (though the first surgical operation for this deformity ever performed in England was only a few months before,) performed the operation, he avers, no less than one hundred and fifteen times; in which operations, however, he *frankly* confesses he met with frequent total failures, and expresses, therefore, the utmost surprise at the very marvellous successes alleged by others. Mr. Duffin, too, at that time possessed probably of as much if not more experience than any other English surgeon, distinctly foresaw, even then, one of the most formidable difficulties to be avoided, "a staring, vacant, projecting eye, of apparently disproportionate size, or a disagreeable leer;" the former now well known as that repulsive deformity of *exophthalmia*, and flaring of the lids, which too frequently results from the unrestricted division of the muscles and aponeuroses. Mr. Duffin then also recognised that one of the principal causes of partial continuance of the deformity (as above mentioned) arose from some remaining undivided "band of fibrous adhesion," that had escaped the scissors—and possibly, also, from the rude practice which it appears some then had (and of which he highly disapproves) of pushing the inner divided end of the muscle back into the posterior and lateral part of the *socket of the eye with the handle of the scalpel!*

Mr. Duffin, however, does not seem disposed to impute the partial continuance of the strabismus after the operation, as Mr. Liston thinks, to the inner border of the inferior rectus, "*but* to a few upper tendinous fibres, or a band of adventitious cellular attachment," still remaining unseparated, the division of which he found to answer every purpose. "These fibrous bands or digitations,"

Mr. Duffin says, "though so indistinct and lax in the dead eye, are very energetic in life, and are found sometimes seated very far back, even beyond the greatest diameter of the eye-ball." He therefore never cut, he says, the fibres of the *inferior rectus*, and never thought of dividing the *superior oblique*. He doubted [then at least] if the division of the oblique muscles had ever yet been made by any one, or ever would be found necessary, (vid. *London Lancet*, 1839–40, pp. 894, 895, 896.)

A very useful suggestion, as it appears to us, in respect to exophthalmia of the ball from too free dissection, is that which Mr. Duffin makes, that if one eye only squints, and is less than the other, this freedom of dissection may bring out the smaller or diseased globe more upon a level with the healthy one, and thus cause their inequality of size to pass unobserved. The opposite course, i. e., a cautious and circumscribed dissection, should, he properly remarks, be pursued where the faulty eye is largest. Mr. Duffin, at that *early* epoch of strabismus, (Sept. 10, 1840,) had, as we have said, a correct appreciation of many of the more disagreeable consequences (as exophthalmia, sinking of the inner canthus, polypus in the angle, double vision, &c.) which result from defective modes of operating. To avoid the sinking of the inner canthus, he enjoins upon the operator to be particularly careful in preserving the semilunar fold of the conjunctiva, (*Lond. Lancet*, 1839–40, p. 926.)

Mr. Duffin has known *sloughing of the eye-ball*, and *total loss of vision*, from too extreme and clean a dissection of the sclerotica, (*Ib.*, p. 927.)

Dr. *Hocken* (in the *London Lancet*, March 27, 1840–41, p. 8) mentions permanent strabismus as not unfrequently complicated with sympathetic amaurosis. Where strabismus occurs (if ever) with hysterical amaurosis, it is, he thinks, spasmodic and temporary.

Inasmuch as the diseased eye, when the sound one is covered, generally has its motions correct, Dr. Jno. Walker, of Manchester, (Eng.,) who has written much on this organ, thinks it plain that the independent movements of an eye in strabismus are perfect, *that it is the associated action that is defective*, and that the organ is only inactive when it ought to move conjointly with its fellow, (*Lond. Lancet*, 1840–41, p. 673.) In most cases of strabismus he considers "that it is merely this absence of agreement in the direction of the two eyes, which constitutes the defect in question," (*Ib.*)

Dr. Walker seems of opinion that the greater frequency of convergent strabismus is owing to the *preponderating power* of both *oblique* muscles in their tendency to bring the eye towards the inner canthus. In further illustration of his theory, he mentions that peculiar semi-rotary movement of the globe from within outward observed by Dr. Jacob in some cases of paralysis of the orbital nerves, and which Dr. J. imputes to the action of the *trochlearis* muscle, (see *Dublin Medical Press.*) Dr. Walker says he has seen it exist where the whole of the muscles of the eye-ball apparently were paralyzed, every movement but this rotary one being totally suspended, including paralysis of the levator palpebræ, as well as of

the iris; he explains it on his theory of the independent and associated muscular actions of the eye. Thus, by the class of *associated movements* "the two eyes are directed forward, inward, upward, and downward; and there is another class in which the movements are *dissociated*, and the eyes directed laterally. As these are distinct and independent movements, so they are accomplished by two distinct classes of muscles, and these muscles have distinct and independent nerves. Those movements in which the eyes are directed FORWARD, inward, upward, and downward, are, *I conceive*, effected by the muscles supplied by the third pair of nerves, [i. e., the motor oculi, which supplies the rectus superior, inferior, and internus, the inferior oblique, and the lenticular ganglion, the source of the ciliary nerves;] whilst those movements in which the eyes are directed laterally, (one eye being turned outward and the other inward,) are effected by the muscles supplied by the sixth and fourth pairs of nerves, viz., the external rectus and the trochlearis," (*Lond. Lancet*, 1840–41, pp. 676, 677, 678.) It is curious to note these remarks, in connection with the *Hosackian* theory of vision. (vid. sup.) It is seen that Dr. Walker alludes to a *forward* motion of the eye (i. e., we presume, an *elongating* one of the longest axis of the globe) as among the effects of the action of *three* of the recti and of the inferior oblique; more exact study and observations upon the myology and the *myotenotomy* of the eye, will doubtless lead to more correct views of the true physiology of vision, and of the remarkable functions of this almost purely mechanico-mathematical organ of the human body.

Dr. Franz, of London, persists in his opinion, in which, however, but few participate, that the division of one or both the oblique muscles, as well as of the internal or external rectus, sometimes becomes necessary to complete the cure of strabismus; especially the division of the superior oblique, which, he thinks, (being the longest of all the six muscles of the eye, and therefore subject to greatest contraction,) with more or less paralysis of the external rectus, may, after the division of the internal rectus, help to retain the eye in its convergent position. He thinks both oblique muscles assist in the inversion [i. e., convergence] of the eye. He avers that in *six* cases of convergent strabismus, he has not been enabled to complete the cure but by the division of the superior oblique.

In proof of these opinions he made, he says, in conjunction with Dr. A. Ure and Mr. F. Fowke, certain experiments on animals, from whence he deduces the following inferences in respect to the functions of the muscles of the eye:—

"That in man the ordinary movements of the eyes inward, upward, outward, and downward, or in a direction between any two of these, or in circles intersecting these different directions, are performed by the *straight muscles only*, and *independently of the obliques;* but that while the straight muscles are moving the eyes in one of these directions, or after they have moved them towards a certain object, the obliques assist the straight in keeping the axis of vision steadfastly fixed upon the object, which either moves while the person is at rest, or which is at rest while the person is moving, or

while both the object and the person are in motion, or while the person perhaps, at the same time, turns his head towards one side or the other; secondly, that the *obliques* act the principal part in accomplishing those minute alterations in the inclination of the axis of vision between their parallelisms and their greatest convergence, which are necessary for their decussation in a given point. If, while the head is kept in a vertical position, this point is situated on a level with the eyes, the convergence of the visual axis is effected by the four obliques; if situated above, by the two inferior only; and if beneath, by the two superior only. And thirdly, that by means of the obliques the refraction in the eye is made dependent on the convergence, or the convergence on the refraction." He does not give so great a *rotatory* power to the action of the obliques, each acting alone, (viz., forty-five to fifty degrees,) as do Professor Volkman and Dr. Hueck, (vid. *Neue Beitrage zur Physiologie des Gesichtssinnes*, Leipzig, 1836; and *Müller's Archiv.*, 1840, Nov. 4, p. 475; also, *Ueber die Achsendrehung des Auges*, Dorpat, 1838.)

Dr. Franz adds, (which is adverse to the Hosackian theory of vision,) "I am not inclined to think that the *adjustment of the eye to distance* is accomplished by a *mechanical action of the recti*, although it is not impossible that the obliques may exert some indirect influence by effecting the convergence of the visual axis; this adjustment appears to me to exist in a *delicate motion* of the *lens* in *the antero-posterior* axis of the eye, *and to be dependent* on the *ciliary nerves and body*." This is reverting to the ancient German opinion of that adjustment being effected by a prodigious muscular power in the lens itself, (see our notice of the Hosackian theory in the text of this work, supra. For the views of Dr. Franz more in extenso than we have given, see the *Lond. Med. Gazette*, 1840–41, pp. 611 et seq.; also ib. vol. xxvi. p. 689.)

Dr. D. Ross-Lietch, of Tynemouth, Eng., (vide *London and Edinburgh Monthly Journal of Med. Science*, March, 1841,) states at the date of his publication, that out of 276 cases operated upon, more than *two-thirds* were the result of *measles*, *small-pox*, or *scarlet fever*. The eye having been distorted during the cerebral excitement connected with these diseases, or, having been turned towards the inner canthus to avoid the light during the ophthalmia accompanying these eruptive fevers, had so remained, until the internal rectus muscle became structurally shortened. The remaining cases were ascribable to paralysis of the opposing muscle, injuries on the head, irritation, nebulæ, worms, the hair of some portion of the head-dress having been allowed to hang near or over the eyes, and rarely to an "amaurotic or cataractous condition of the eye."

Dr. L. is decided in his opposition to the additional division of the inner fibres of the superior and inferior rectus in convergent strabismus, as flaring of the ball and divergence may ensue. Also he is against the section of the superior oblique, for he has seen the deviation upward and inward, in which the superior oblique is supposed to be particularly concerned, cured without dividing that

muscle, and by the section of the inner rectus only. He thinks the division of either of the obliques useless in *permanent* squint.

He makes some useful remarks on the uncertainty of opinions as to the true functions of the superior oblique, and the impossibility of deriving any very sound deductions from the section of the muscles of the eyes of lower animals, as the *retractor* muscle in them presents so different an anatomical condition from that of the human species. In the monkey also, whose eye is nearest to man, there are serious impediments. Dr. L. proposes to obtain some light on the action of the obliques by dividing both in an amaurotic eye, where the motions of that eye harmonize with the sound one.

He considers that all the *forward* movements of the eye, upward, downward, and inward, are effected by the inner and the superior and inferior recti, which cannot otherwise act than in couples and consentaneously. All these actions are excited by one nerve alone, the *motor oculi*. The greater importance of the *abductor oculi* muscle is shown by its having an appropriate nerve. But their field of vision being extensive and opposite, it is necessary that two external recti (i. e. abductores) should never act together; for if they did confusion of vision and divergent strabismus would result.

To effect this harmony, he believes that when one eye is thus turned outward, the other is not brought into correspondence (that is, inwardly) by the inner rectus, but by the inferior oblique.

The primary action of the superior oblique he conceives to be to draw the eye *forward*, and that that of the inferior oblique, from the nature of its insertion, must be a compound action *forward* and inward. The ball, he says, rests on a *cushion* of fat upon which it is *revolved*, *not* dragged from side to side; and that the eye *is held back by the four recti*, [as in a sling, he might have added;] and that the internal rectus possesses advantages over the abductor in point of origin and insertion; so that if the eye were thrust forward so as to stretch the recti muscles, it would be dragged inward by the mere tension of the internal rectus, which is shorter and inserted nearer the cornea than the abductor. From all the above anatomical considerations, Dr. Lietch believes the action of the oblique muscles is much more concerned in turning the eyes *inward* than some imagine.

He does not, however, think that the superior oblique of either eye, when the opposite eye is directed to its greatest extent outward, can have power to roll the eye deep into the inner canthus. Its position forbids this opinion. But the inferior oblique seems capable of doing this, by its direction backward, and its broad expanded insertion, enabling it to *wheel* the *eye* around deep into the inner canthus, while the ball is being held *suspended* to the recti muscles. The action of the obliques, according to Dr. Lietch, has been much mistaken, from not recollecting that the eye may be considered as fixed, to a certain extent, and that it moves as on a pivot, not as a body dragged from side to side. We cannot help

remarking how much in accordance these rational views appear to be with many of those of Dr. Hosack's theory.

The manner in which the obliques are supplied with nerves, justifies the supposition that their action is independent of the muscular action supplied by the third nerve alone.

The superior oblique has its independent nerve, the inferior is supplied from the third and the fifth. This combination of the motor nerve with one so essential to vision as the fifth, strikingly distinguishes, as Mr. Lietch thinks, the inferior oblique from the internal rectus, and seems to show that the former muscle has a higher action than those actions supplied by a mere motor nerve, and that its functions are linked by a closer sympathy to those of vision.

For these reasons he believes the oblique muscles are intended to turn the eye inward, under circumstances in which the action of the recti under the influence of the third pair is inadmissible.

We are disposed under the head of Strabismus to go the more extensively into a record of the various opinions entertained concerning the true physiology and pathology of the muscular motions of the eye, inasmuch as the subject has not been much dilated upon in M. Velpeau's late treatise, (see text, supra,) and still rests in much obscurity. What is found in this place may incite to further and more accurate dissections and experiments, so as to affix definitively to each muscle its appropriate and specific functions, as well as those which it may have conjointly with or in antagonism to the others; this result, so much to be desired, having, as is perceived, a most important and direct bearing upon what muscle or muscles should or should not be divided.

Dr. Lietch thinks care should be taken in double convergent strabismus to divide the inner recti, not in their middle or muscular part, but in their *tendinous* portion, and near to its insertion in the sclerotic coat, and then the retraction will not be so great. In the other case divergent strabismus will be produced, (see Dr. Lietch's very valuable paper in the periodical above referred to.)

As early as Nov. 2, 1841, such had been the extent to which strabismotomy had been generalized in England from the continent, that among others we find Mr. F. B. Dixon, of Norwich, (Eng..) under that date had already operated on one hundred cases. Out of forty-one cases of *convergent* strabismus operated upon, *thirty-one* had both the pupils central. In *five* the pupil of the eye treated was perfectly central, but with slight obliquity of the other eye. In *three* the disease returned. In two the inward squint became a *leer*, that is, diverged. Mr. Dixon preferred dividing the muscle on a curved director with a *very sharp bistoury*, as he thinks the divided end of the tendon is then *less contused*, and can thus, he thinks, make a better insertion upon its new location on the sclerotica. This remark deserves consideration even at this time. He also thinks the *obliques*, or one of them, may have some agency in preventing the centralization of the eye, (*Lond. Med. Gazette*, 1841–2, p. 309, 310.)

The greater part of the cases of strabismus, it is familiarly known, are *convergent*. Out of near five hundred cases of strabismus, examined by E. W. Duffin, M. D., (see his *Practical Remarks on Strabismus*, Lond., 1840,) he met with only twenty-three examples of divergent squint. Mr. Guthrie met with one case in thirty. Mr. Ch. Phillips ten in one hundred, (vide his work, *Du Strabisme*, Paris, 8vo.) M. Melchior found six in sixty-one, (*De Strabismo Dissertatio pro Licentia, &c.* by N. G. Melchior, Thauniæ, 1839.) In Mr. Liston's one hundred and twenty-five cases, there were only *two*. In some hundreds Mr. Lucas found *one* only, (*Practical Treatise on the Cure of Strabismus*, by P. Bennett Lucas, Lond., 1840.)

The *left eye*, it appears, is rather more prone to squint than the other.

In many cases the sound, habitually well-directed eye (where the other alone is affected with convergent strabismus) squints, while it is covered, and while the previously squinting eye is properly directed. This, according to Melchior, was first pointed out by Fischer, (*Theorie des Schielens veranlasst durch Buffon's Schrift*, Ingoldstadt, 1781, p. 70,) and again by Purkinje, (*Beobachtungen zur Physiologie der Sinne*, Berlin, 1825–32, B. pp. 166.)

In double convergent strabismus one eye will always, Mr. Lucas says, be a little more turned in than the other.

Dr. Alison, (on single and correct vision, &c., *Trans. Roy. Soc. of Edinb.*, vol. xiii., Edinburgh, 1836,) in numerous experiments in relation to *double vision*, has found, if the vision of both eyes was tolerably good, that when the attention was fairly fixed on the sensations of both eyes, single objects held directly before the face were seen double.

A reviewer of the above works in the British and Foreign Medical Review, (1841, p. 477,) considers that the sound eye sees best because the light falls then on the most sensitive part of the retina, and that therefore the vision in the squint eye is better in proportion as the *cast* is less.

Whatever difference of opinion may exist, whether defective vision may occasion strabismus, or is always the result of it, it is certain, as we have ourselves repeatedly observed, that in two sound eyes, one will become squint in proportion as it loses from some organic defect (slight opacity of the cornea, conjunctival inflammation, &c.) its healthy vision, and the sound eye becomes habituated to the performance of its functions. The remark of Melchior on blind eyes not squinting is no argument against the fact we have stated, and which fact, on reflection, must be familiar to most practitioners. Nevertheless, it is no doubt true that in idiopathic strabismus, if we may use the term, the defect of vision is imputable to that disease, as Mr. Duffin justly remarks.

In regard to the *cause* of strabismus, *Rossi* (*Memorie delle Scienze de Torino*) found in post-mortem examinations of strabismics, that the axis of the orbit was in an abnormal position, obliquely inclining upward or downward, outward or inward, and *in one case only* did he find an abnormal insertion of the muscles, (*Brit. &*

For. Med. Rev., ib. p. 479.) But Mr. Middlemore says (*Treatise on the Diseases of the Eye*, vol. ii., p. 561) that in a child with divergent strabismus, he found, after death, the *external rectus* certainly "*much larger than it ought to have been*, much larger relatively to the size of the other muscles of the same eye, and comparatively with those of the opposite organ."

Dr. Cavarra (see *Journal Hebdomadaire*, tome i., p. 309, Paris, 1836) says, he has found in his *dissections nothing unnatural in the muscles of a squinting eye*, or in their *attachments*.

M. Bouvier, in a verbal communication to the Paris Acad. of Medicine, said that in the dissection of a divergent strabismic, aged 82, affected from infancy, he found the *external rectus* in a state of *complete relaxation*, but of the same length as the other straight muscles, and *unaltered in texture*, which fact confirms the now more rational pathology of strabismus, (and which the return of the squint eye to a sound direction, when the sound one is closed, proves,) that it is not owing, like club-foot, to permanent contraction of the muscles, but to the *physiological defect* of harmony in the *muscular contractions*, which, however, the operation may and does repair.

Mr. Guthrie contends that, as far as his observations in the operation go, the *muscle divided does not appear to be in the least diseased*, whereas Mr. Lucas speaks of the *hypertrophy*, and highly *vascular* state and *deeper color* of the internal rectus.

Dr. Von Ammon, however, says (*Die Behandlung des Schielens durch den Muskelschnitt, &c.*, Leipzig, 1840, pp. 15, 16) he has found the inner part of the conjunctiva contracted and dry, and of a peculiar blanched appearance, owing, he thinks, to its thickening. He has found also, after dividing the conjunctiva, several bands of membrane going from the sclerotica to the inner wall of the orbit. Where the inversion was very great, he has found the insertion of the muscle *farther back* than usual, and the same in divergent strabismus. In a *majority of the cases, however, the insertion was normal.* The muscle itself sometimes seemed thick and gorged with blood, and less easy of division than a sound muscle, and in such cases it was rather round than flat. Sometimes it appeared as if it was very tendinous, and then either very thin and shrunk, or tough and pretty thick, having lost its muscularity, and the division of it giving a creaking sound. *Very often*, however, *every thing normal*, in its color, consistence, and length.

Mr. C. R. Hall (see *Lond. Med. Gaz.*, 1841) found, in some cases of double convergent strabismus, that the internal rectus of the less inverted eye was much larger and stronger than that of the more inverted eye.

In *luscitas*, however, or permanently fixed distortion of the eye, Mr. Duffin found great organic changes, the inverting membranes of the muscles in two cases being almost cartilaginous, and so contracted and unyielding that the patients were wholly unable to move the pupil out of the inner canthus previously to operation.

Wherever the patient has been able to turn the affected eye (in convergent strabismus) external to the axis of the orbit, and especially if he had the power of keeping it in this position for a short time, both eyes being open, Mr. Lucas has *never* found any alteration in the structure of the muscle upon dividing it. In some such cases, however, it was more developed than natural, but in others it appeared of its natural size, and he has occasionally even found it pale and very thin. In the opposite state of things he has invariably found "the muscle altered in its structure, or most unnaturally developed." In a case operated upon (for convergent strabismus) Mr. L. found the internal rectus consisting of *three times the natural quantity of muscular and tendinous substance.* The muscle was not altered in its structure. It was observed by Mr. Liston as early as 1841, or earlier, that when in convergent strabismus a slight squint remained after the operation, he could remove it by dividing the inner fibres of the superior and inferior recti. It was also at that time thought, that the superior oblique was occasionally implicated in this difficulty. This division, however, it was even then thought, favored protrusion of the ball.

In an autopsy of a case of strabismus, which died of pulmonary disease after the external rectus had been divided, just at the union of the tendon and muscle, by Mr. Babington, Mr. P. S. Hewitt, curator of St. George's Hospital, found (see *Lond. Med. Gaz.*, Jan. 22, 1841) the muscle itself had retracted *three quarters of an inch* from its natural attachment, but still remained connected with the globe by a strong band of cellular tissue, which band was about three lines wide and six in length, and inserted about two lines behind the original insertion of the muscle. This is supposed to have been the natural cellular tissue connecting the muscle and globe, and *stretched by the retraction of the muscle.*

Mr. Lucas attributes the return of the squint at some period after the operation, to new adhesions of the muscle to the tunica sclerotica, anterior to the transverse axis of the ball. This could be prevented by excising a portion of the muscle, especially if it is unusually developed.

From what our author (Prof. Velpeau, vid. supra) judiciously says of the dangerous fallacies into which we should be seduced by taking for granted, at the early period of the history of strabismus, the reported proportions of cures until time sufficient has elapsed to test them, we deem it of so much the greater importance to record the more candid admissions of those whose statements, even at that time, had not so much the appearance of exaggeration as those of others. We therefore, in addition to what we have given above, present a summary of these results in this place up to the time of the respective publications.

Dr. Ure, in one hundred cases since June, 1840, found the obliquity removed in seventy-five, diminished in sixteen, not affected in nine, (see *Brit. & For. Med. Rev.*, 1841, p. 490.)

Dr. Baumgarten, of Dresden, (vide *Ammon's Monatsschrift*, vol. iii., p. 485,) in fifty-two cases on one or the other eye, had thirty-

three perfectly cured, seventeen considerably improved, and two rendered worse, i. e., affected afterwards with divergent strabismus. In twelve of the *successful* cases the operation had to be *once* repeated, and in one case *three times* repeated.

Dr. Ammon, taking his own cases with those of Drs. Zeis, Baumgarten, and Warnatz of Dresden, in all seventy-two, saw forty-five quite successful, thirteen less so, and fourteen unsuccessful. The operation was performed twenty times on the internal rectus of the right eye, forty-three on that of the left eye, six times on the external straight muscle of the right eye, and three on that of the left.

Franke, of Leipsic, operated on twenty-eight cases, of which twenty-three were convergent strabismus, and five divergent. In three there was perfect restoration in both eyes, in about *eleven*, partial success, (ib. *Brit. & For. Med. Rev.*, 1841, pp. 490, 491.)

The power of the eye to adapt itself to near and distinct vision, Sir Everard Home also ascribes to some modification in the figure of the crystalline lens, but produced by bundles of muscular fibres, of $\frac{2}{1}\frac{5}{0}\frac{5}{0}$ths of an inch in length, which go all round from the capsule of the vitreous humor, pass forward over the edge of the lens, and are attached firmly to its capsule, and there terminate, (see his Croonian Lecture, *Philos. Trans.*, part i., 1822, p. 77.) Dr. Von Ammon inclines also to the opinion of the lens being the seat of this function. So also Mr. Tyrrell, of London, (late deceased.)

M. Pravaz, correspondent of the Paris Academy of Medicine, in some "*Remarks on the Action of the Muscles of the Eye, and the Cure of Myopy, consecutive upon the Action of those Muscles*," (*Archives Générales de Méd.*, 3^{e} série, tome xi., May, 1841, p. 86 et seq.,) states that he published in 1825, in the Archives Générales, (t. viii., p. 59,) a memoir on some anomalies of vision, where the question of the *accommodation of the eye to the variations of distance of illuminated* (*éclairés*) *objects, was treated in an incidental manner.* The explanation, continues M. Pravaz, which I have given of this phenomenon, has received additional confirmation (*une autorité nouvelle*) from the experiments lately made for the cure of myopy. *No one, in fact, doubts to-day that the changes of the ocular focus are produced by the action of the muscles;* but each one of the surgeons who have arrived at similar results by different processes, having endeavored to deduce a particular theory from it on the conditions of distinct vision, I shall proceed to demonstrate the error of those different interpretations, and to show how that which I have proposed can alone satisfactorily account for the circumstances apparently contradictory which observation has noted.

Thus M. Phillips, from finding myopy, which sometimes accompanies strabismus, relieved by the division of the obliquus superior, naturally therefore supposed that this muscle was the agent of the elongation of the antero-posterior diameter of the eye—that elongation being necessary for vision at short distances. M. Bonnet, having cured many cases of myopy by cutting the obliquus inferior, assigned the same function to that. Hence comes the opinion

which Demours formerly entertained, (see article *Presbytie* in the *Dictionnaire des Sciences Medicales*,) that the oblique muscles *laterally compress the ocular globe, while the four straight muscles flatten it from before backward*, so that there are antagonist effects (*opposition d'effets*) between the actions of those two systems of contractile organs. M. Pravaz considers this theory of the action of the oblique muscles entirely illusory. He believes the superior (or great) oblique is especially designed (*disposé*) to carry the ocular globe *forward* at the same time that it impresses upon it a slight movement of *rotation;* the lower (or small) oblique also causes a feeble traction of the eye from *behind forward*, but its principal effect is to cause the ball (*ce sphéroide*) to move around (*autour*) its antero-posterior axis. In these combinations M. Pravaz sees nothing to produce lateral depression, (i. e. compression.) That the oblique muscles do not *alone elongate* the ball, is proved by the fact (he says) that myopy is relieved equally well by the section of the recti where the obliques are not touched.

M. Guérin says myopy has been imputed to one or perhaps all of these three causes:—1. An increased convexity (*courbure*) of the cornea; 2. An active or passive depression of the crystalline, in the direction of its transverse diameter, (*suivant son limb transversal;*) and, 3. A greater distance (*un plus grand éloignement*) between this disc [the crystalline lens] and the retina. M. Guérin considers that the experiments of Young disprove the first cause, as they also, in his opinion, overthrow the experiments of Home and Ramsden. M. Guérin also rejects the two other causes, since he is of opinion that in vision at short distances the *eye is flattened from behind forward by the action of the straight muscles.* M. Pravaz, however, thinks this is at war with all the laws of optics. M. Pravaz doubts the accuracy of Young's experiments, and seems to think he has overlooked the possibility that the *movements of the crystalline lens*, or *its change of form*, may assist in the variation of the ocular focus.

M. Pravaz contends that he was the *first* to show that the *united action* (*synergie*) *of the straight and oblique muscles, combined with the elasticity of the envelopes of the eye, perfectly explain all the phenomena of the appropriation of the refracting surfaces of this organ to the variations of distance;* which, he says, reconciles the two methods for the cure of myopy.

The simultaneous action of the recti muscles from their oblique direction to the back of the orbit, exercises, he thinks, two forces, viz., one *lateral compression*, and the other to draw the globe from before backward. The latter being the most powerful would preponderate, and would alone produce its effect, if it was not eventually balanced by a contrary force. This antagonist force is that of the oblique muscles, which thus indirectly serve for the elongation of the ocular globe, and consequently for the vision of near objects—the only function we can assign to them *à priori.*

The section then of the two opposite muscles which laterally compress the eye, ought to give to this organ the power of ap-

proximating itself to a spherical form by the *elasticity* alone of its fibrous envelope; for there is no doubt, he says, that this elasticity is put into action whenever one of the ocular diameters is elongated. It is, in fact, an elementary geometric principle of two isoperimetar (*isopérimètres*) curved (*courbés*) surfaces, that that which approaches nearest to a sphere includes the greatest quantity of solid contents; but the humors of the eye being incompressible, it is absolutely necessary that the sclerotica should dilate itself to contain them, when its form becomes more or less elliptical, (*ellipsoide.*) The elasticity which it possesses to aid in this expansion may be altered in time, like that of all similar tissues; and hence the section of the straight or oblique muscles does not instantly cure myopy, and hence also, where the elasticity of the sclerotica is much diminished, it would not come to the relief of the isolated recti, or oblique muscles.

M. Pravaz does not think it by any means demonstrated that the *contraction of the recti sensibly depresses the globe of the eye from before backward, to accommodate it to the vision of distant objects.* If, in fact, this compression was too energetic, it would injure the optic nerve against the bottom of the orbit and impair its functions. Another proof that the recti have not that compressing power is, he says, the winking (*clignotement*) to which we are obliged to have recourse, when we wish to perceive distant objects more distinctly. The orbicular muscle of the eyelids then acts as antagonist of the oblique muscles, and the *ocular globe, placed between two contrary powers which second the elasticity of its fibrous envelope, returns then to the spheroidal form*, or, perhaps, is even slightly depressed in the direction of its antero-posterior diameter. The double *eyelid*, or membrane clignotante, in birds that fly high, like the eagle, which sees small objects at an immense distance, favors this opinion.

From all which, M. Pravaz concludes that he has, besides other principles above enumerated, incontestably established that the oblique muscles, acting separately, are incapable of modifying the form of the eye to the sight of near objects; but, in combination with the recti, they concur in the elongation of the ocular spheroid, and *their action is indispensable* in order to effect this change.

He however admits that the operation of M. Guérin for myopy would seem more conformable to the results of anatomical symmetry, if there were an antagonism between the recti and oblique muscles; but the section of both orders is essential to destroy the *constriction exerted laterally on the globe of the eye by the simultaneous action of the recti and oblique muscles.*

M. Pravaz thinks the obliquus superior acts as a sort of check (*amarre*) destined rather for retaining the globe of the eye in a position nearly stationary, than as an organ for extended movement. The comparative shortness of its muscular fibres, its reflection at an acute angle on a pulley, where it cannot glide without friction, tend to confirm this opinion.

He therefore gives the decided preference to M. Bonnet's sec-

tion of the *obliquus inferior* rather than both for the cure of myopy.

[The remarks of M. Pravaz, though in many respects ingenious, are not altogether satisfactory, as they present contradictions that seem irreconcilable. The action of the orbicular muscle, however, appears to have been judiciously brought into this question and well explained. All these inquiries will stimulate the student to further investigations in a subject so essential to the advance of surgery in ocular myotomy, as is the true explanation of the action of the muscles of the globe and its appendages.—*T.*]

In illustration of the *rotation of the eye upon its axis*, Professor Hueck of Dorpat, to whom we have already alluded, (*supra*,) furnishes, in a paper on this subject, (*Die Achsendrehung des Auges*, Dorpat, 1838; vid. also analysis of the same by M. Szokalski, D. M. P., in the *Archiv. Gén. de Méd.*, 3e sér. Paris, Août, 1841, p. 439 et seq.,) a minute description of the anatomy of the oblique muscles.

The *superior oblique*, evidently perfected with great care, begins with short and tendinous fibres at the optic foramen, within the levator palpebræ, and on the upper part of the internal wall of the orbit; it advances towards its inner angle, enlarges in the middle of its length, takes then a spindle shape, gives birth to a round tendon, and forms a cord which passes through the ring attached to the frontal bone in the inner angle of the orbit. This ring is constituted of a cartilaginous layer in form of a groove, whose two extremities are attached to the bone by means of ligaments. It is slightly moveable from before backward, and its diameter corresponds exactly to the thickness of the tendon, without, however, interfering with the freedom of its play; on the contrary, it facilitates it, owing to the particular form of the cartilage, which resembles a portion of a pully. After having passed through the ring, the tendon is reverted outward and backward, so that it forms with its primitive direction an angle of fifty-four degrees, and runs horizontally towards the globe of the eye. In proportion as it approaches it, it becomes wider and thinner, passes under the tendon of the superior rectus, on the most elevated point of the globe, then passes farther outward and backward, and attaches itself to the sclerotica about three millimetres behind its transverse diameter. The external fibres descend a little lower than the internal; the insertion, therefore, is in an oblique direction, and of the width of six millimetres. The middle of this insertion corresponds to the outer border of the superior rectus, and is situated at about seven millimetres behind the sclerotic insertion of this muscle.

In setting out from the point where the fibres of this oblique muscle are changed into tendinous fibres, (which is nearly at about seven millimetres behind the ring,) a mucous bursa embraces the tendon and accompanies it through the ring in the course of its passage, to about six millimetres in its direction towards the eye, and ceases at ten millimetres from its insertion. Owing to this bursa, the play of the tendon in the ring is very easy, and may

be made upon a space of about twelve millimetres. The length of the tendon from the ring to the point of its insertion upon the sclerotica is twenty-three millimetres, five of which cover the globe.

From the anterior edge of this cord is detached a *fine aponeurosis*, which extends to the insertion of the rectus superior. Another similar aponeurosis arises on its posterior border, and is inserted upon the ocular globe behind and within, near the optic nerve, and is five millimetres in breadth. The anterior aponeurosis is tense (*tendue*) when the eye is directed outward and downward, and the posterior aponeurosis when it is directed inward and upward.

The *inferior oblique* muscle is the only one of the muscles of the eye which arises in the anterior part of the orbit. It is the shortest of all. Its insertion is made upon the floor of the orbit, by a very short tendon between the intra-orbitar canal and the lachrymal bone. This point is situated at nearly twenty millimetres lower than the ring of the superior oblique, and nearly eight millimetres behind the vertical plane which passes by the rings on the two sides. The inferior oblique passes almost in a parallel direction backward and outward with the reverted tendon of the superior oblique, then passes under the inferior rectus muscle, crosses it exactly at the point of the greatest lower convexity of the globe of the eye, runs then in contact with the globe of the eye, is then transformed into a tendon of eight to ten millimetres in breadth, which glides under the external rectus, and is inserted obliquely upon the sclerotic coat, and in such manner that its anterior fibres terminate towards the middle of the posterior fibres above the upper border of the tendon of the external rectus. This insertion is situated two millimetres farther behind than that of the superior oblique, at nearly five millimetres from the greatest transverse diameter of the eye, and at eleven millimetres from its place of crossing the inferior rectus muscle. There also is perceived a delicate aponeurosis, which adds nearly four millimetres to the breadth of the tendon on each side. The entire length of the muscle is thirty-three millimetres, twenty-two of which lie between the point of its origin and that of its place of crossing.

Albinus, Soemmering, and others, thought that the superior oblique moved the globe of the eye at its upper part inward, and at its lower part outward, and that it directed the pupil downward into the outer angle of the eye; and that the inferior oblique executes the opposite movement, directing the pupil upward towards the outer part of the eyebrow, while turning the eye from without inward and downward, (*de dehors en dedans par en bas.*) When the two obliques act together, they thought they carried the globe *forward* and *inward* toward the nose. Rosenmüller, Weber, Cloquet, &c., consider that the oblique [the superior] has the faculty of moving the eye so that the pupil is directed downward and inward, while the inferior oblique directs it upward and inward. Müller, Haller, and Chroeder Van der Kolk think that when these muscles act together they draw the *eye into the orbit.* Lawth denies both

this and the movement of rotation, but believes with Briggs, Taylor, and Lemoine, that when the *oblique muscles* of the eye act *simultaneously* they *compress* this organ, *elongating* its *antero-posterior* dimension, and consequently augmenting the shortness of vision, (*la portée de la vue.*) This last opinion has been triumphantly refuted, it is thought, by Winslow, and more lately by M. Hueck.

The oblique muscles do not appear to be capable of directing the axis of the eye either to this or that side, the recti muscles being quite adequate for this function. *There appears to be nothing in common between the direction of the axis of vision and the action of the oblique muscles*, for these last place the pupil differently according to different circumstances. If, for example, the superior oblique contracts at the moment when the axis of the eye is directed upward, the pupil will be carried downward and inward; if the axis is directed exactly inward, the pupil will be carried still nearer to the nose; if the eye is directed outward, the pupil will be carried still farther outward and inward towards the outer part of the superciliary ridge. The same may be said of the inferior oblique.

This direction depends only on the activity of the recti muscles; whichever way one of them acts, the others fix the globe in that direction by their simultaneous action; the straight muscles, when acting simultaneously, drawing the eye slightly toward the optic foramen. The action of the oblique can in nowise *supply*, *exclude*, or *second* that of the straight muscles. The simultaneous action of the last would be represented by a line which would pass through the centre of the eye and that of the optic foramen, while the line of the former (or oblique) would pass through the centre of the eye and a point intermediate between the ring of the superior oblique and the place of insertion of the inferior oblique, these two different directions making an angle of a hundred and three degrees. When, therefore, the straight and oblique muscles act simultaneously, the eye is carried, in conformity to the laws of the *parallelogram of forces*, towards the inner wall of the orbit.

The recti muscles, then, fixing the eye in a certain direction, either of the oblique contracting at the same time would, according to M. Hueck, execute a movement of *rotation around the antero-posterior axis of this organ.* M. Szokalski, who furnishes the analysis of M. Hueck's paper to the *Archives Générales*, and who himself had about the same period read a paper before the *Société Médicale* of Gand, embracing nearly the same views, says, however, that he differs from M. Hueck in this last opinion, as he thinks he (Mons. S.) has proved in his dissertation that in the human eye the axis of rotation differs essentially from the axis of vision.

The action of rotation, M. Szokalski says, may be shown on the dead body by drawing upon the straight muscles and one of the oblique. The particular design of the muscular apparatus for rotation is not only to give greater mobility to the eye, but more especially to fix the immobility of the image which the objects form on the retina, thus preventing what would render vision nugatory, the necessity of the eye following all the movements of

the head. This arrangement, then, affords a motive power antagonist to the movement of the body, like that in quadrants, (cadrans,) which fix them in spite of the motion of the sea. The inferior and superior rectus correct the movements of the head from below upward, and from above downward; the lateral recti rectify the movements to the right and left; but this antagonism would be imperfect without other means to fix the eye in the vacillating movements of the head. For this purpose nature supplies the *oblique muscles*, and which can turn the eye in a direction opposite to that of the head. Another important function they have is that of determining (*appréciation*) the position of the object we look at relatively to the position of our own body.

We acquire in the course of time, and experience from our earliest infancy, an exact appreciation or consciousness of the habitual tension of the different muscles in different positions; thus, of those employed in keeping the body erect, which we are fully aware of though the eyes be shut. This thus produces a consentaneous or corresponding and harmonious action in those of the eye. The same with the horizontal position. By the sense of the vertical position particularly, we acquire a comparative knowledge of the dimensions of bodies. The opposed action of the superior and inferior recti muscles, being upward or downward, makes us thus conscious to a degree of the corresponding vertical dimensions of bodies, the lateral recti being then in a state of repose. The lateral dimensions, on the contrary, correspond with the action of the lateral recti, the upper and lower recti being then at rest. But it is by the perfect harmony (*liaison*) between the vertical dimension of the retina and the axis of the body, that we alone ascertain the dimensions of objects. This harmony is preserved by means of the repose of the oblique muscles. Each dimension from above downward is rigorously vertical, and each dimension from one side to the other is horizontal.

From various experiments in looking at objects in vertical and horizontal lines, to test the truth of the foregoing conclusions, M. Hueck calculated that when a vertical rectus muscle shortens or contracts 0.03 millimetres, or $\frac{1}{1200}$ of its length, the mind may be conscious of this difference. The same experiments were made with the horizontal line. The lateral recti are more sensitive than the superior and inferior (*i. e.* the vertical) recti to every movement of retraction, to the degree even of 0.005 millimetres, or $\frac{1}{6000}$ of the length of the muscle.

Muscular Cicatrix after the operation of Strabismotomy, according to M. Bouvier's dissection.

As every thing that can throw light on the organic changes in strabismus and its cure is highly important, we give the following of M. Bouvier from the *Bulletin de l'Académie de Paris:*

"M. Bouvier's patient died of consumption about three months after the cure of a divergent strabismus in the right eye. The

rectus externus, which had been perfectly divided a few lines from its insertion in the sclerotica, now adhered anew to this membrane by a fine *cellulo-fibrous* production, fixed at about a centimetre behind its normal place of attachment, and quite analogous to the bands of new formation which reunite the muscles to the eye, according to the experiments of Amussat and L. Boyer upon horses. The attachment of this aponeurosis to the eye describes a curve with an anterior concavity. The middle part has become adherent to the sheath of the *inferior oblique* near the ocular termination of this muscle. Its superior extremity is less prolonged forward than the inferior, from which last arises a filament apparently tendinous, which extends nearly as far as the old attachment of the muscle. This seemed to be owing, not to the inferior edge having escaped the section, but to the preservation of the ocular fascia to a greater extent below than above, for a divided line of separation divides the fleshy body in its entire height from the new aponeurosis, and the muscular fibres are all equally retracted, which could not have taken place if some had remained intact. The anterior end of the muscle has become atrophied; no distinct trace of it remains, although it was very apparent after the operation. The division of the conjunctiva had left no visible cicatrix." (*London Lancet*, 1841–2, p. 476.)

Statistical Table of Results of the Operation for Convergent Strabismus in one hundred cases, after the interval of a year. By Mr. C. Radclyffe Hall, of Manchester, Eng.

In a hundred cases of convergent strabismus, after the lapse of from ten to fourteen months from the period of the operation, (see *Lond. Med. Gazette*, also *Lond. Lancet*, 1841–42, pp. 575 to 582, pp. 624 to 629, pp. 735 to 743,) he found the following results:

In 3 divergent squint.
28 inversion not completely removed.
7 the eye operated upon is straight, but the other slightly inverted.
62 both eyes are perfectly straight.
61 an appearance of fulness of the eye.
39 no such appearance.
23 both eyes were operated upon. In two instances only of these does one eye appear more prominent than the other.
62 power of vision materially improved.
38 the vision, which had been much impaired, is but little improved.
79 double vision followed the operation.
65 this disappeared within a month.
11 " three months.
2 " six "
1 " fourteen " nearly.

In every instance, the power of inversion (*i. e.* convergence) is greatest when the other eye is closed. In no case is the adducting power quite to the natural extent, though in a majority it is.

Among the CAUSES of strabismus, Mr. Hall, besides those from *intestinal irritation*, and others familiarly known or already adverted to in this work, enumerates those diseases in which the *extremities of the fifth nerve* are rendered morbidly sensitive to the influence of light, as in *strumous ophthalmia*, *irritable ulcer* on the cornea, &c.; also he mentions imperfect cataract.

In *strumous ophthalmia*, he says, the retina, as well as the conjunctiva, is morbidly sensitive to light, and hence the upward and inward direction of the eye is from the irritation both of the fifth nerve, (common sensation,) and of the retina, or special sensation. And in hydrocephalus, not only is there muscular palsy, but blindness, complete or otherwise, at the stage when strabismus occurs.

Mr. Hall, in the course of this paper, enters very elaborately into a philosophical explanation of *double vision*, associate movements of the eye-balls, identical parts of the retina, direction of objects, &c., from all of which it appears that he differs entirely from Müller, and deems vision to consist, in its normal state, in an habitual consentaneous movement of the balls, and the effort of the mind in combining into a whole distinct parts of an image respectively seen by either eye, &c., that the mind [as is seen above in the memoir of M. Hueck] judges of the situation of an object by the *muscular action* necessary to see it most distinctly, &c.

Mr. D. Henry Walne (see *Lond. Med. Gaz.*, Sept. 18, 1840, and *Lond. Lancet*, 1841–42, p. 783, &c.) states that he has never found it necessary, in convergent strabismus, to divide other than the internal rectus, and that in one case inward and upward, complicated with congenital pterygium, this latter production was divided, and then the muscle reached and divided through this incision into the conjunctiva.

Mr. Walne, after twelve months full experience, has never had a single failure, [!]

Dr. Hocken, in an article on the *separate and combined actions of the orbicularis palpebrarum*, (vid. *Dublin Journal of Medical Science*, vol. xxi. 1842. pp. 57 et seq.,) says the closure of the lid is a voluntary act, preceded by relaxation of the levator palpebræ, and attended by a corresponding contraction of the inferior oblique muscle of the orbit; hence, as we close the lid, so in proportion is the eyeball *rotated* upward and *inward, and finally upward* and outward. In *staphyloma*, he says, this motion and position can be detected under the lids by the fingers. That obliquely rotated position, too, he says exists in sleep, as can be seen when the lids are suddenly opened on waking. The advantage of this position, he thinks, is to secure during sleep the complete exclusion of light, and thus greatly to aid that imperfectly translucent curtain, the lid. This position he seems to think is assumed by the ball through the action of the inferior oblique, every time we close the lid, however

rapidly, (as we often see.) That action may be performed, as in some persons, almost every few seconds, from a bad habit. If so, it would appear, by Dr. Hocken's theory, that these reiterated partial occlusions of the ball upward and outward, in other words, *winking*, (a habit very common in seafaring persons, captains of vessels, &c., from the necessarily intense straining and fixed attention of the eye, which, by day as well as by night, they are often compelled to resort to,) must thus, by the abstraction of the exhausting stimulus of incessant light, give the organ power to execute its functions of vision with greater energy.

When the levator palpebræ is voluntarily contracted, the orbicularis undergoes relaxation and the lid is raised, while the oblique (i. e. the inferior) is also relaxed, and the eyeball assumes its straight position.

The involuntary closure of the orbicularis during sleep, he thinks, is maintained by the impression on the *trifacial* nerve, inducing a reflex action through the seventh pair. A continuous sphincter-like action is produced.

A few fibres of the orbicularis palpebrarum muscle, spread on the front of the tarsal cartilages, which, being capable of an independent action, that is, a slight wink on the approach of bodies, make this, especially where the eyelashes are touched, an excellent and sure *diagnostic mark*, he says, to detect *feigned blindness*.

Dr. Hocken considers that the orbicularis is employed conjointly with the two orbital oblique, and with the four recti muscles, "among other changes effected, to *adapt the organs of vision for near and distant sight*, and for the scrutiny of large and also very minute objects. When the eyes are adapted for *near-sight*, being ELONGATED by the *conjoint action of the oblique*, besides other changes, the eyelids are partially closed, and *this also is one of the actions employed when near-sighted persons endeavor to discern distant objects.* With the recti conjointly it [*i. e.* the orbicularis] is employed, when the globe is *retracted and flattened by their operation*, and otherwise fitted for use on distant bodies; hence, when the sight is strained to discern something ill-defined, the *brows are contracted*, and the *lids partially closed.* These actions are combined, moreover, with another muscle, the *corrugator supercilii*, by which the brows are contracted, being drawn downward and inward towards the middle line."

The orbicularis and inferior oblique also perform a joint function in diffusing moisture upon and *wiping* the globe of the eye; also in weeping, to bring the edges of the tarsi together, to form that triangular canal, by which the tears are conveyed to the puncta lachrymalia, and thence through the lachrymal sac to the nose; and in this operation the orbicularis co-operates with the *tensor tarsi*, which stretches over and compresses the sac.

Dr. Hocken says any one may himself be convinced and conscious of the combined action of the orbicularis with the inferior rectus, and that of the levator palpebræ with the superior rectus.

Thus, "if we depress our eyes by the contraction of the inferior recti, or, if we observe this action in others, we can, in the first place, feel, and in the second, see, that in proportion as the eyeball is rotated downward, so is the lid proportionately lowered by the contraction of the orbicularis palpebrarum, and that, in like manner, as the eyeball is rotated upward by the contraction of the rectus superior, so is the lid elevated by the levator palpebræ."

The orbicularis differs, says Dr. Hocken, from Hunter's definition of the ordinary character of sphincters, (*i. e.*, *muscles* with *occasional* relaxation,) in this, that relaxation is "the ordinary. and contraction the occasional condition of this muscle; besides, its closure is not involuntary, and when closed, little if any active power of contraction is exerted to maintain the eyelids in apposition, although the excito-motory function presides over this aperture, as it does over the other orifices of the body." He considers that the two halves of the orbicularis, as of other sphincters, are natural antagonists, though acting together in antagonism to other muscles. Thus the muscular fibres of the rectum antagonize the sphincter ani, so the orbicularis palpebrarum and the levator palpebræ.

Dr. Hocken considers that his opinions are confirmed by the observations of Hunter. Hunter had said that, although many *circular* muscles may not have the mixed contraction of sphincters, as the orbicularis, (see Palmer's edition of Hunter's works, vol. iii., p. 147,) yet that that muscle has a disposition to contract peculiar to itself. Its relaxation is active, and may be called the relaxation of watchfulness; and when tired it contracts, which may be considered the contraction of sleep; or it may be considered as the elongator muscle to the levator palpebræ, with a disposition to remain relaxed while that muscle is contracted, but contracting when the levator is tired. That the natural contraction of the orbicularis muscle is involuntary, and the relaxation, both natural and occasional, is involuntary; but that it has likewise a voluntary contraction and relaxation, which can be made to exceed the involuntary, resembling what is inherent in all the sphincters.

Mr. Gabriel Stokes, previous to Dr. Hocken, had advanced the opinion, (*Dublin Medical Journal*, vol. xviii., Sept., 1840, p. 70,) that the closure of the eyelids is not a merely passive condition from relaxation of the levator palpebræ, as taught by Bichat, but that muscular agency is employed in its accomplishment. He illustrated this by a case of paralysis of the portio dura, occasioning lagopthalmas, in which, as is not uncommon, the upper eyelid assumes the position which its natural gravity would give it unaided by muscular effort. Sir Charles Bell had also remarked, in such cases, that during sleep the eyeball is turned up, while the affected eye remains open; in fact, the lower third of the eyeball is exposed in these cases by the dropping of the upper lid over the two upper thirds, and the "white of the eye" alone shows, from the more or less complete action of the inferior oblique.

Dr. P. Evers, in an article on the physiology of the muscles and

nerves of the orbit, (*Dublin Journal of Med. Science*, vol. xix., May, 1841, pp. 165 et seq.,) gives as an evidence of the natural disposition to a *consensual muscular movement*, the *voluntary power of contracting the pupil*, by *rotating the eye inward*, as in viewing a near object, though the quantity of light remains the same. In this combined movement there is a consensual action between the same muscles on both sides, as well as between the rotatory muscles inward, and the iris on the same side.

He is of opinion that, during health, the *orbicularis* and *levator* exert but *little influence* over the motions of the eye; but in paralysis of the portio dura, the eye is protruded between the widely parted lids, by the pressure of the levator palpebræ from within; and, in paralysis of the third nerve, the pressure of the closed lids from without, by the action of the orbicularis palpebrarum, causes the eye to recede within the orbit; the principal office of these muscles being to part and close the lids.

Dr. Evers also thus takes ground against the Hosackian theory, (though not naming it, or totally unacquainted with it, as may be said of most modern writers:) "The four *recti* muscles arise nearly from a common point in the bottom of the orbit, and proceed forward in a divergent manner to their respective insertions around the anterior part of the sclerotic tunic. When any one of them contracts, it directs the pupil towards its own side, and the simultaneous action of any two is equal to the direction of the pupil in the diagonal between them, while the *combined actions of the four cause the whole globe to retreat within the orbit.*"

In reference to the action of the *oblique muscles*, which has divided some of the greatest names of anatomy and surgery, viz., Soemmering, Cloquet, and Harrison, in opposition to Müller, Monro, and Sir Charles Bell, the three former assert that the superior oblique rolls the eye in such a manner as to direct the pupil downward and inward, and that the inferior oblique moves it in the opposite directions. The three opposing authorities maintain that the superior oblique turns the pupil downward and outward, and that the inferior oblique rotates it upward and inward.

Dr. Evers believes the first opinions, viz., those of Soemmering, &c., erroneous.

He (Dr. E.) maintains that both obliques act toward a point *internal* and *anterior* to the globe of the eye; that they pursue a very oblique course from their point of action to their insertion—the one above and the other below the ball of the eye; and lastly, that the eye has two axes, an antero-posterior and a transverse.

"The *superior oblique* (says this physician) having emerged from the bottom of the orbit, takes its second departure from its point of action at the internal canthus, to be inserted into the back of the sclerotic, external to the antero-posterior and behind the transverse axis of the eye. It is obvious, that from its posterior insertion, it must roll the eye in such a manner as to direct the pupil downwards; and from the same insertion being external to the antero-posterior axis, it will cause the pupil to look outward. Then

the uncombined action of this muscle undoubtedly has the effect of turning the pupil *downward and outward.*

"The *inferior oblique* takes its origin from the inferior and internal margin of the orbit, and runs upward, backward, and outward, to be inserted into the inferior surface of the sclerotic, behind the transverse and external to the antero-posterior axis of the globe. When it rolls the eye, in consequence of its posterior attachment, it will direct the pupil upward, and by virtue of its external attachment, it must cause the pupil to look inward. Its individual action, then, will direct the pupil *upward* and *inward.* And in consequence of both obliques arising from points anterior and internal to the globe of the eye, their *combined influence* will have the effect of drawing the whole organ *forward and inward.*"

Dr. Evers, in his experiments on the dead subject and on rabbits, (to which latter the great objection of difference of anatomical structure attaches,) found the *superior* oblique capable of rolling the eye to a much greater extent than the inferior.

He enforces the importance of a minute knowledge of the distribution of the nerves of the orbit. The *third*, or *motor oculi nerve*, after entering the orbit, divides into two unequal branches, the superior or smaller going to the levator palpebræ and superior rectus; the inferior or larger division again subdividing into three secondary branches, to be distributed to the inferior and internal recti and the inferior oblique. From the long slender branch going to the last-named muscle, the ciliary, lenticular, or ophthalmic ganglion derives its short root; whilst the long root of the ganglion is supplied by the nasal nerve, with a few exquisitely delicate filaments from the cavernous plexus of the sympathetic.

Thus have we a large nerve (says he) from an undisputed *motory* source, (the *crus cerebri*,) ministering to *five* of the seven muscles of the eye, and through the short root of the lenticular ganglion presiding over the movements of the *iris* also. We thus learn why the pupil contracts when rotating the eyes inward to view a near object, "since the inversion of both eyes arises from the action of the muscles supplied by the third pair; and when one eye is everted, the other being closed, the pupil of the former dilates, the intensity of light remaining the same; because this action is determined by another nerve, the *sixth*. If, however, (he continues,) both eyes move together in a lateral direction, the pupils undergo no change, because the contraction arising from the inversion of one eye is balanced by the dilatation produced by the eversion of the other, just in the same manner as if the eyes were exposed, the one to an intense, and the other to a subdued light; the pupil is alike in both, and of a medium size between those which the two different impressions of light would produce if separately applied. These considerations (he adds) enable us to understand why the eye, which is insensible to light from paralytic amaurosis, will have its pupil contracted by the admission of light to the sound retina."

In direct contradiction, however, to the opinion of Dr. Hocken,

(supra,) Dr. Evers says: "During sleep the pupils are contracted, and are directed *upward* and *inward*;" this is the case also in extreme exhaustion, ebriety, &c., imputed by Sir C. Bell to the *rolling* [i. e., *rotating*] influence of the oblique muscles; but this is denied by Dr. Evers, because (says he) the inferior obliques and the recti, which direct the pupils upward and inward, are under the influence of the same nerve, while the action of the superior oblique is to turn the pupil downward and outward. The branches of the third nerve, distributed to four of the six acting muscles, direct the pupil in sleep upward and inward, while its contraction is explained, he thinks, by the short motor root of the ophthalmic ganglion.

He thinks the contraction of the pupil, from use of opium, is owing to its action on the origin of the third pair, and the dilatation of the pupil from belladonna from its action on the origins of the fourth and sixth nerves.

The *fourth nerve*, which is also called trochlearis patheticus, and by Sir Charles Bell the respiratory nerve of the orbit, arising by two or three roots from the valve of Vieussens behind the testes, enters the orbit through the sphenoidal fissure, and having received a twig from the frontal branch of the ophthalmic, and a filament from the sympathetic, it is distributed to the upper surface of the superior oblique muscle.

Sir Charles Bell looks upon this nerve as presiding over the instinctive and insensible rolling motions of the eye. He allies it to the *respiratory*, and asserts that during sneezing and other involuntary respiratory efforts, it directs the front of the eye upward, under cover of the upper lid. Yet, contradictory as it may seem, he agrees also with Dr. Evers, in supposing the superior oblique muscle has the effect of directing the cornea downward and outward.

The *sixth* or *abducens nerve*, arising outside of the corpus pyramidale, and before entering the orbit below the other nerves, receives two or three of the nervi molles from the superior cervical ganglion of the sympathetic. In the orbit it is distributed in a divergent manner to the external rectus.

The consentaneous action belonging to the muscles supplied by the third nerve, is denied to those which are supplied by the fourth and sixth nerves, each of those last muscles having a distinct nerve, and for a wise purpose. Thus, "when one eye is directed downward and outward by the action of the superior oblique, the other is not turned in the same direction as it would be if the fourth nerve of both sides had been associated, but it is turned downward and inward. This (says Dr. Evers) is the normal state of both eyes in viewing a lateral object below the level of both eyes. If the superior oblique, instead of the fourth, had received a branch from the third nerve, the action of both obliques of the same side would be the same. This (says he) is the reason of the superior oblique receiving a distinct nerve. It would not answer to have the inferior oblique supplied by the fourth, and the superior oblique supplied by the third pair; as they should have been, in order to

accord with the actions assigned to these muscles by Harrison, Cloquet, Soemmering, &c.

"A similar line of reasoning applies, and with equal force, to the sixth nerve. When the axes of both eyes converge, as in beholding a proximal object, the external rectus of each side acts simultaneously to the extent of restoring parallelism, but there their consensual action ends. Both eyes can never be made to diverge synchronously—it would be quite impossible. Had the external rectus been supplied by the third, instead of the sixth nerve, then independent action was at an end; and one eye could not have been directed inward and the other outward at the same time. In this last movement, it is true, the two internal recti oppose each other, but it is only reasonable to suppose that a weak muscle, supplied by a small branch of a nerve, should be overcome by a stronger opponent, under the command of an entire nerve."

Without vouching for the exactitude of the opinions of the various authors we have quoted on the anatomy, physiology, and pathology of the eye, we see great plausibility and reason in many of them, and think that they deserve to be spread before the practitioner as well as the student, to incite, we hope, to farther investigations in a domain where, after all that has been written, so much remains to be explored. We cannot be too indefatigable in our researches upon this branch of study, when it has so important and direct a bearing, not only upon the operation for strabismus, but on those of blepharoplasty, and in fact every thing that concerns the improvement or preservation of a faculty so essential to our happiness as that of vision.

M. Lucien A. H. Boyer (in his late valuable memoir to the Paris Academy on the operation for strabismus, 1842) particularly urges the necessity of abandoning the *vertical incision* into the conjunctiva and aponeurosis, as contributing so essentially to the abnormal protrusion of the ball, depression at the caruncula lachrymalis, &c., which are often worse deformities than the primitive one. He recommends NOT to divide the portion of conjunctiva which extends from the internal commissure of the eyelids to the cornea, but, by cutting in such a way as *to leave a band, to keep the caruncula lachrymalis in its place.* The directly transverse or horizontal incision, from the cornea to the caruncle, and parallel to the fibres of the muscle, he proscribes—1. Because it is difficult; 2d. Because it is followed by an annoying hemorrhage; 3d. Because by this incision we cannot divide upward or downward on the sub-conjunctival aponeurosis, should the simple division of the internal rectus not be sufficient; 4. Because it divides the semi-lunar fold of the conjunctiva, the cicatrix of which leaves a repulsive band and impedes abduction of the ball.

M. Boyer prefers cutting a little *above the muscle.* Seizing there a *vertical* fold of conjunctiva, he divides it *horizontally* with the blunt scissors from the cornea toward the internal wall of the orbit, *taking care not to let the internal terminus of the incision approach too near to the caruncula.* Seizing then with a pair of forceps the cel-

lulo-fibrous membrane, and snipping out a bit with the scissors, the sclerotic is thus disclosed, and is very apparent from its *dirty white* color contrasting with the surrounding tints. Dividing the tendon raised on the double blunt hook then completes the operation. He considers the two incisions a great advantage for seeking, through either, the cellular bands without the necessity of denuding the eye of the conjunctiva. The cicatrices, also, by this mode are hidden under the eyelids, and the flabby granulations and consecutive divergence rendered less rare. M. Boyer considers that his method has some of the advantages of M. Guérin's, but that it is rather a modification of Strohmeyer's and Dieffenbach's.

The Organic Changes of Structure consequent upon the Operation for Strabismus.

In further elucidation of the interesting observations upon this subject in the text of our author, we think it right to add here the post-mortem examination which M. Lucien Boyer made at the Royal Academy of Paris, December 20, 1842, of a little girl aged 12, upon whose right eye he had operated twenty-three months before for convergent strabismus. The operation was completely successful, and restored her sight, though it had been so impaired as to make her almost blind. She died of tubercular diathesis. The *internal rectus* of the *right* eye, it was found, had contracted a new tendinous and solid attachment to the sclerotic. This was situated at the distance of nine millimetres from the cornea, while the tendon of the internal rectus of the left eye was only *seven* millimetres from it. Moreover, in this latter the muscular fibres were lost gradually in the substance of the tendon, and could still be distinguished at *three* millimetres from its insertion into the sclerotic, while again, in the former or right eye, they disappeared *abruptly at eleven* millimetres from its point of adhesion. It is evident, then, that a new tendinous structure had formed after the operation. and that it had become organized and attached to the sclerotic behind the old or former attachment, of which last no traces were any longer visible. This patient had been quite able, after the operation, to turn the eye toward the inner angle of the orbit. (See, also, experiments of M. Lucien Boyer on the same subject in lower animals, before the Paris Academy, January, 1841.)

Results in the first Two Hundred Cases operated upon by M. Boinet.

This instructive table, alluded to in M. Velpeau's treatise on strabismus, (see text, supra,) gives the following classification :—

Causes.

These are important to know, in order to establish the most correct principles for the treatment.

In the 200 cases there were—

102 Cerebral affections and convulsions during infancy.
49 Alleged false lights, (*faux jours*,) from the improper position of the cradle, through neglect of the nurse. Among these, are included brilliant objects above the head of the infant. M. Boinet, however, is not disposed to receive these alleged sources, but supposes it more probable that all these cases, without the knowledge of their parents or nurses, have had convulsions, under which head, therefore, he ranges them.
16 From birth.
11 Imitation and vicious habits, (that is, in the direction of the eyes.) These two last orders of cases he also imputes to and ranks under convulsions. He doubts very much the alleged cause, from *children mocking and imitating those who squint.*
13 Inflammation, the result of ophthalmias.
1 Apoplexy.
5 Unknown. These he also attributes to convulsions, as their probable source.
3 From wounds.

Of the total amount, therefore, he assigns 183 cases to *convulsions*, or cerebral affections, which he thinks are the sources of strabismus in *nine cases out of ten.*

The result then is—

183 Strabismus from convulsions.
1 Apoplexy.
13 Inflammation of the eyes.
3 Wounds, contusions, &c.

Age.

The most aged was a woman of 68 years; and the youngest were between 7 and 8.

Between 7 and 15 years, 52 cases, { 23 men, 29 women.
Between 15 and 25 years, 107 cases, { 39 men, 68 women.
Between 25 and 40 years, 19 cases, { 7 men, 12 women.
Between 40 and 68 years, 12 cases, { 3 men, 9 women.

Sex.

Strabismus is more common in females than in males. We have in the above 119 females and 81 males. This difference, he supposes, may in part arise from infants of the female sex being of a more feeble and delicate constitution, and, therefore, more liable to cerebral affections and convulsions.

Seat.

In the 200 cases, 121 had the right eye affected,
94 had the left eye.

In this enumeration are counted 15 who had both eyes affected, and both operated upon, making 215 operations in the 200 cases.

In these 15 cases, where both eyes were operated upon, the strabismus in each eye was nearly the same. But there were 157 cases in which it existed in both eyes, but in different degrees. Of these last, 142 were operated upon in one eye only. There were 42 only that squinted in one eye only.

Direction.

Of the 200 cases—

190 were of convergent strabismus—of which 21 deviated inward and upward, 174 inward, 5 inward and downward.
21 divergent—4 outward and upward, 16 outward, 1 outward and downward.
4 strabismus upward.

In the above are counted separately the 15 cases of double strabismus.

Vision.

Of the 200—

187 saw well with one eye only, the strabismic eye being the most feeble.
13 only appeared to see equally well with both eyes.

In 158 cases the *pupils* were found unequal; in 42 they were of the same size.

Results of the Operation.

In the 200 patients, there were performed 232 operations:—

183	on one eye only - - - -	183 operations.
15	on two - - - - - -	30 "
13	for a return of the disease - -	13 "
2	three times on the same eye - -	6 "

Out of this whole number of operations, a *complete restoration* of the eye was effected in 203—incomplete in 29; in some of which last, the continuance of the disease was owing to the unwillingness of the patient to submit to a free liberation of the restraining bridles: and of these 29 unsuccessful cases, it is to be remarked, that 14 had divergent strabismus.

But it is to be noted, that of the 200 patients, 21 did not return —of which 21, two had both eyes operated upon, and 19 one only.

The 179 patients who were regularly attended upon throughout, furnished 209 operations. Of these—

164	were operated upon on	one eye - -	164	operations.
13	"	both eyes - -	26	"
2	"	three times - -	6	"
13	"	a return of disease	13	"
	Total - - - - -		209	operations.

Of these 209 operations, 134 resulted *successfully*, and 65 unsuccessfully.

Of the 134 successful results, 125 were *completely cured*—of which 125, there were 104 operated upon on one eye, 9 on two, 10 a second time for a return, and the two above three times.

Of the total 179 cases above, 54 were failures, but many of them were much benefited.

Of the 54 unsuccessful cases above, there were—

42 in which the disease returned after several days or weeks.
11 divergent cases, but much improved, excepting two.
9 convergent, which became divergent.
7 convergent, imperfectly relieved.

In the total result we have—

In 179 patients operated upon,	125	cured,
	54	uncured.
In 209 operations,	134	successful,
	75	unsuccessful.

But in the 75 unsuccessful operations, there was a marked benefit obtained in 41 of those operations.

In many patients there was *diplopy* after the operation ; but this double vision disappeared in the course of time.

M. Boinet gives, also, a table of 27 cases operated upon at Angers by Dr. Chedanne, of that town, and himself. Of these, there were 21 patients on whom 27 operations were performed, with complete success.—(See M. Boinet's *Treatise*, in the *Jour. des Connaissances Medico-Chirurg.*, for January, February, March, and May, 1842.)

Strabismus at Bristol, (*Eng.*,) 1842.

Mr. J. B. Estlin, surgeon to the Eye Dispensary, Bristol, gives in the Provincial Medical Journal for July, 1842, the results of one hundred cases operated upon by him for strabismus. He condemns in unmeasured terms the sharp hooks to the sclerotica, and the

specula to the lids. His method is chiefly that of Mr. Lucas, and he uses only a pair of small round-pointed forceps for seizing the fold of conjunctiva, Lucas' blunt hook, and a strong pair of scissors, straight or angular, for the incisions. For holding open the lids he finds the fingers of an assistant, and sometimes even the aid of a female servant, quite sufficient. He binds up the eye immediately after the operation, but removes the bandage in a few hours, and keeps the patient in bed for that time, applying warm water freely to the part, and enjoining low living and rest for a day or two.

Of the hundred patients above, thirty-nine were males, and sixty-one females, (confirming M. Boinet's table above of the greater frequency of the disease in females,) and the ages varied between five and a half and sixty-two years. Of these, ninety-two had convergent, and only eight divergent strabismus. In thirty-nine the left eye was operated upon, in thirty-two the right, and in twenty-nine both. In five the operation was required a second time upon the same eye, and in one patient, a youth aged fifteen years, it was required twice in both eyes.

Results.—Perfect and satisfactory, sixty-five; improved some, twenty to twenty-five; leaving, Mr. Estlin thinks, not more than five failures in the hundred. Yet he prefers the *vertical incision*, so much condemned by M. Lucien Boyer. We must remark here also, that the proportion of cures in Mr. Estlin's cases, in order to be in accordance with the general and established results of the present time, will, we are constrained to think, have to be very considerably diminished in amount.

The *sub-conjunctival section* has now been proposed by Dr. Bernard, of Paris, in the operation for cataract. He fixed the eye-ball by the double hooks used in the operation for squinting, and inserted the couching needle under the conjunctiva, at the distance of four millimetres behind the usual place of entrance, then passed its point forward and penetrated the sclerotica as usual. Dr. Bernard thinks this mode has the great advantage of preventing the admission of air, and therefore much of that intense pain and inflammation which follow by the old method, (see *Gazette Médicale de Paris*, July 30, 1842.)

Myotomy of the Levator Palpebræ.

This was ingeniously proposed and successfully performed by Mr. Liston, as long ago as previous to May 6, 1840, (see Mr. Ancram in *London Lancet*, 1839–40, p. 306,) to effect a permanent closure of the lids in a case in which the patient had lost the ball by inflammation, and did not wish to wear a false eye. It was effected by a small transverse incision immediately beneath the supra-orbitar ridge, which with a little dissection soon exposed the belly of the muscle backward, which being seized and divided with the scissors, caused the lid immediately to fall over the ball.

Prof. Dieffenbach has cured slighter degrees of strabismus by

snipping off a piece of the conjunctiva with the subjacent cellular tissue, near the insertion of the rectus muscle on the side from which the eye diverges. The piece snipped off must be larger when the eye is turned outward than when turned inward, because the latter is occasioned by the greater power of the internal rectus; but when the eye is turned outward there is generally paralysis, or at least a weak state of the rectus internus, (*Wochenschrift für die ges Heilkunde*, 1841.)

[We should very much doubt if even in the slightest cases such an operation could be relied upon, especially when we see with what obstinacy (as in convergent strabismus) the eye will persist in maintaining its morbid deviation, even after the division of the rectus internus, and the most extensive dissections of its subconjunctival, cellular, and aponeurotic connections with the sclerotica and other muscles.—*T.*]

Hook to steady the Eye in the Operation for Strabismus.

Whoever may have been the surgeon that first suggested the improved sharp double hook, with the teeth turned more or less acutely back on themselves, so as to avoid penetrating too deep into the sclerotica, (to which contrivance Prof. Velpeau gives a decided preference,) it is very certain that as early as Aug. 7, 1840, (see *London Lancet*, 1839–40, pp. 785–6,) Mr. Jas. J. Adams, of London, strongly recommends a hook of this description, and communicates to the public a figure and description of one, in which, as he describes it, "the sharp extremity of the stem is bent upon itself at such an angle as to require its introduction into the sclerotica, not by a sudden thrust at a right angle with its stem, but by a gentle motion in a line with the direction of the handle of the instrument, so as to enter the sclerotica obliquely, thus rendering all pressure on the globe unnecessary, as the motion is to direct the eye outward, and not press it backward." The form and position of the hook prevent its being "thrust through the sclerotica." Mr. Liston, however, had already contrived before this a modification of the sharp hook, to which some gave the preference over that of Mr. Adams, (ib. p. 786.)

"*A blunt hook with a cutting edge on its concavity,*" *to raise and at the same time divide the muscle in strabismus*, was, it appears, also first proposed and used successfully in Great Britain, by Mr. Ross Lietch, (see *London Lancet*, 1839–40, p. 786.)

Escape of the Vitreous Humor from a wound in the Sclerotica.

Mr. Jas. J. Adams, of London, (see *London Lancet*, 1839–40, p. 858,) has seen this dangerous accident result from an attempt to divide the internal rectus, in the operation for strabismus, by means of a knife without the use of the director or hook.

Speculum in Strabismus.

As long since as Aug. 31, 1840, (*Lond. Lancet*, 1839–40, p. 908,) we find Mr. Chas. Clay, of Manchester, complaining of the severe pain of the sharp hook into the conjunctiva and sclerotica, and the painful pressure thereof to the ball, as well as that to the lids from wire specula. He proposed to do away with all, and to substitute his *silver-spoon* speculum, notched out at the point, then to pinch up the conjunctiva with a forceps, make a *bold incision* half an inch long, raise the muscle with a probe, and divide with a knife. We should suppose the *spoon speculum*, as we have called it, too heavy and cumbrous on the cornea to obviate the objection complained of. As to the *bold incision* into the conjunctiva, that is shown to be now an obsolete error, and highly objectionable in the present advanced state of *strabotomy*, (vid. supra.)

A *probe-pointed curved hook*, with a concave cutting *edge*, for dividing the rectus in strabismus, and also the addition of the sharp hook to the sclerotica, were proposed in England by Mr. Jno. G. French, of St. James' Infirmary, as early as July 27, 1840, being very soon after the operation for strabismus was introduced from the continent into England, (vid. *Lond. Lanc.*, 1839–40, p. 710.)

We cannot, perhaps, better conclude these supplemental observations on strabismus, than by stating that the committee of the Academy of Sciences of Paris, in their recent annual distribution of the Monthyon prize, (this year, 1844,) have awarded the largest prize (6000 francs) to be divided into equal portions between *MM. Strohmeyer* and *Dieffenbach;* the one for having originated, and the other for having first performed the operation of myotomy for the cure of squinting. The commissioners declare the operation to be "justly admitted into the domain of surgery, as one of the recognised achievements of the art." Signed by MM. Roux, Breschet, De Blainville, Pariset, Velpeau, Andral, &c.

TORTICOLLIS.

Proposed Division of the Splenius Capitis.

Sign. Sani, surgeon of Rome, prefers, for greater safety in torticollis, to divide the sterno-mastoid by a transverse incision of proper width through the skin, and from before backward, (see *Annali Medico-Chirurgici;* also *Gazette des Hôpitaux de Paris*, and *Lond. Lancet*, 1841–2, pp. 289, 290.) This is in accordance, as we have stated, (supra,) with Dr. Mott's recommendation, who, though he has so frequently seen the section brilliantly made from within, out, and sub-cutaneously, by M. Jules Guérin, with his proverbial adroitness, does not himself feel authorized to adopt this process, and would especially caution young surgeons against undertaking it. Even the mode proposed of late, of obtaining greater security

by introducing a grooved blunt director under and along the posterior surface of the muscle, might, Dr. Mott thinks, still compromise the important vessels and nerves in that immediate neighborhood, rupture the internal jugular, &c. The knife, of course, must therefore be tenfold more hazardous. Mr. Nottingham, of Liverpool, Eng.,) thinks the state of the muscles at the posterior aspect in wry neck has been neglected, and says he has seen one case where the division of the splenius capitis, as well as of the sterno-mastoid, might, he thinks, have been beneficial, (*London Lancet*, id. ib.)

DORSAL MYOTOMY, (*MYOTOMIE RACHIDIENNE,*) FOR LATERAL CURVATURES OF THE SPINE.

It cannot be other than a matter of justice and impartiality on our part to M. Guérin, the author of this new branch of sub-cutaneous surgery, to give the substance of his letter to the Paris Academy of Sciences, June 24, 1839, on the results which he declares he obtained in the first twelve operations of this description. This letter, entitled *Traitement des Déviations Latérales du Rachis, par la Section sous-cutanée des Muscles du Dos, et de la Colonne Vertébrale*, (see *Archives Gén. de Méd.*, tom. v., nouv. sér., Paris, Août, 1839, pp. 501 et seq.,) says, that the muscles which he had up to that time divided in the above cases, were the trapezius, the rhomboideus, the levator anguli scapulæ, the sacro-lumbalis, the longissimus dorsi, and the semi-spinalis colli, semi-spinalis dorsi, and multifidus spinæ.

According to M. Guérin, as he then wrote, and still asserts, the greatest number of articular deformities are the result of convulsive muscular retraction, dependent upon an affection of the brain, (*affection du cerveau,*) of the spinal marrow, or of the nerves themselves, which are distributed to the muscles. By this doctrine, established in one of the early treatises of the author, on the deformities of the osseous system, and demonstrated, according to him, in its general application (*dans sa généralité*) to deformities of the neck, hips, hands, feet, and other articulations of the skeleton, he was conducted to the following results for the diagnosis and the treatment of these deformities, to wit:—1. That the different kinds of deformity that each one of these varieties is capable of assuming, are the product of the retraction variously (*diversement*) distributed to such or such muscles. 2. That the active treatment of each one of them should consist in the section of the tendons or muscles, to whose retractions these particular varieties of deformity are ascribable, (*sub-ordonnées.*)

To realize this double result, it is necessary, on the one hand, to determine precisely (*rigoureusement*) what, in each deformity, and in each of the elements that make it up, are the muscles whose energetic contraction (*racourcissement actif*) produces these deformities; and, on the other hand, it is necessary to effect, by the sec-

tion of these same muscles, the removal of the abnormal forms of the skeleton, and to confirm by this decisive experiment the justness of the theory and the validity of the practice. Now, says M. Guérin, this double result I had already obtained in regard to old cases of torticollis, (*torticolis ancien*,) and the different varieties of congenital pes equinus. I have extended the same doctrine to the anatomical determination of the different varieties of *lateral deviation* of the spine, and to their surgical treatment. The following were then the only details (*seuls détails*) (see the abrégé account in the *Archiv. Gén.*, loc. cit.) that the author gave on the applications he had at that time made of this method of treatment, on subjects of both sexes and of different ages. "The youngest was *thirteen years*, the oldest *twenty-two*. All the deviations were of the second and third degree, with torsion of the column and corresponding (*proportionnées*) gibbosities. In some a single section of the retracted muscles sufficed; in others, I had to perform it twice or thrice; in all I obtained, immediately after the operation, a marked degree of straightening (*redressement*) of the column; and in one young man, aged twenty-one years, who had been for eighteen months under mechanical treatment, I obtained, by the section of the longissimus dorsi, and of the corresponding semi-spinalis colli, semi-spinalis dorsi, and multifidus spinæ, an immediate removal of the entire distortion, (*un redressement immédiat de toute la déviation.*) In the other cases, I have been enabled to put in practice (*j'ai pu poursuivre*) with constant success, the treatment by mechanical apparatus. In not one of the *twelve* operations which I have performed have I had the slightest accident: no hemorrhage, but little pain, no fever, and, *in all the cases except one*, immediate reunion of the wounds without suppuration. I will add, that though the operation is a delicate one, it is performed almost with the same facility as at the neck or foot, and by processes that are similar." At a subsequent sitting of the Academy of Sciences, (viz. Sep. 23, 1839,) M. Guérin addressed a memoir to that body upon the *Etiology of Lateral Deviations of the Spine by Muscular Contraction*, (*rétraction*,) from an extract from which, communicated by the author to the editors of the *Archives Générales de Médecine*, of Paris, for Nov., 1839, tom. v., nouv. sér., pp. 379–84, we make the following summary.

The memoir is devoted to the development of the principle which he had already laid down in his previous communication, (supra,) that the greatest proportion of these deformities are the result of muscular *retraction*. In reply to a question, he asks if there are cases of deviations of the spine, accompanied with material alterations in the nervous centres, and evidently caused by these alterations? he answers in the affirmative. He points out in his memoir a series of cases of fœtal monstrosities, and others in which there existed alterations of the brain and spinal marrow, or of one of those two centres only, from their total destruction to partial circumscribed lesion of one portion of them, lesions coincident with a series of articular deformities of the osseous system, corresponding

in number and intensity to the extent and intensity of those lesions. Among these deformities were found the deviation of the vertebral column, corresponding also in its extent, direction, and degree, to the nervous alteration which had been its point of departure, [i. e. source:] it was found bent (*repliée*) in different directions, drawn (*attirée*) and bridled on its two sides by the long muscles of the back, which became the cord of the curvatures it took. All these deformities were also rendered permanent by an excessive shortening and tension of the intermediate muscles.

In a series of analogous observations to the above, M. Guérin says he has not only verified, during life and after death, the exact relationship between the nervous affection which existed anterior to birth and the deformities, but also the same affections producing the same deformities at every period of childhood up to the age of fifteen years.

M. Guérin then asks, Does there exist, in the absence of alterations of the nervous centres, any certain and evident means of recognising, that a deviation of the spine is the product of an energetic (active) muscular retraction, put into action by a nervous affection?

These means, he replies, are of two orders, constituting two orders of characters of deviations by active muscular retraction. The first consist in the series of effects caused by the disease in its various reactions, (*ses reflets multiples,*) other than the deformity [itself,] and existing outside of the seat of this last; the second consist, on the contrary, in an ensemble of direct characters, belonging to the deformity, and which impart a peculiar physiognomy to it, by the aid of which it may be easily distinguished from the other kinds of deviations.

Among the characters of the first category, he adduces the general traces of ancient nervous diseases, an appearance of convulsion in the face, an inequality in the two halves of the face, the traction (*tiraillement*) of the features, (*traits,*) inequality of the eyes and of their visual faculty, strabismus, the unequal prominence (*la saillie différente*) of the bones of the cranium, some traces of paralysis in one half of the body, or in the limbs only; on the other hand, simultaneous retractions of other muscles, for example, of the muscles of the neck, arms, hands, legs, and feet, whence arise corresponding deformities.

Among the characters of the second category, he would mention the identity of the forms peculiar to a deviation, accompanied with a material alteration of the nervous centres, with those of a deformity of the same origin, but which is destitute of direct traces of the disease. In the two cases they have the same seat, the same direction, the same number of curvatures, the same projections, (*reliefs,*) the same depressions, &c.; but this identity of forms may be traced (*ramenée*) to elementary characters, which emanate from the character itself (*de l'essence même*) of the active muscular retraction, and its immediate relations with the parts of the column which it displaces. Such are the shortening of the muscle, or

muscles actively retracted, which are rigorously adapted to the space comprised between their points of insertion, and are exhibited under the appearance of bridles or tense cords, projecting under the skin, extremely hard, and of fibrous consistence. These effects of *active* retraction, cannot be confounded with those of *passive* retraction, because the muscles, passively shortened, preserve their primitive consistence, are soft, little resistant, and tend rather to pass into a fatty condition, (*l'état graisseux.*) Moreover, there exists a perfect accord between the seat and direction of the forms of the deviation, and the seat and direction of the action of the muscles which determine them. This relation, common to all the deformities of the osseous system of the same nature, is rigorously maintained in all the varieties of the deviations of the spine, and becomes the basis of the anatomical history of those varieties. As a last order of characters, he mentions the different modes of distribution of the active retraction in the muscles of the back, of which one, or many, or all may be retracted, or one particular bundle (*faisceau*) only; whence arise the manifestations, the different prominences (*reliefs*) of this retraction, which is so much the more intelligible, as the contrasts resulting from its characters, and those of the normal muscular state, are the more striking, (*sensibles.*)

He has (he says) endeavored to determine what are the different modes of active muscular retraction in relation to the deviations of the spine, and in what limits it ought to be circumscribed as a cause or active element of those deformities.

Muscular retractions are not only produced by the deep-seated diseases of the brain, or spinal marrow, or structural (*matérielles*) alterations of the nerves distributed to the retracted muscles; but they manifest themselves, also, in a great number of diseases that act intermediately through the nervous system, and which cause, incidentally or consecutively, the retraction of certain muscles in consequence of temporary general convulsions; or these deformities are seen in simple contractions of muscles directly attacked and entirely isolated, [i. e., separate,] as is frequently observed in diseases of infancy, to wit, eruptions, those of dentition, fevers of every kind, and slightest morbid accidents, from which causes one or more muscles may become and remain contracted. The origin may be also purely local and external; thus, wounds, falls, blows, and *contusions of the muscles of the spine*, induce their retraction, as is more especially seen in the *muscles of the calf*. In this case the nervous alteration cannot be directly established, but it is legitimately induced from the lesion of the mobility of the muscle.

M. Guérin then inquired whether we have any means of distinguishing the deviations produced by active muscular retraction, from those imputable to other causes.

The latter deviations he had established long ago: such are the passive muscular deviations, osseous deviations from unequal development of the two halves of the skeleton, and deviations from scrofula and rickets. They all exhibit and may be known by gen-

eral and local characters; the general characters from the general action of causes that manifest themselves almost always elsewhere than in the seat of the deformity. The local are the appearances peculiar to each deviation, produced by the intimate relation of the cause of the deviation with the point of the column on which it acts, and with its particular mode of action on this column, (*tige.*) He gives in his memoir the principal characters of each deviation, and refers to his Treatise addressed to the *concours* of the Academy, for the general and particular applications of these principles to a general law he had then given, that "the essential causes of the deformities of the osseous system, possess such a specific action (*spécificité d'action*) in regard to the deformities to which they give birth, that each one of those causes is interpreted externally by characters which are appropriate to it, and by the aid of which we may, in general, diagnose the cause by the deformity, and determine the deformity by the cause."

Active muscular retraction not only has the greatest share among the essential causes of deviations, but exercises even a partial action in the production of each one of those [deviations] which it does not exclusively produce. All the causes of deviations displace the column in whole or in part from its vertical [position.] When this mechanic effect (the compulsory intermediate one of every morbid cause) exists, an instinctive effort of the muscles of the trunk at the same instant, tends to keep or bring back the column to its vertical [direction.] This effect, having relation to the verticality of the spine, is the point of departure and the cause of the combined (*multiples*) and alternate curvatures which accompany and characterize every deviation [of the spine,] of whatever nature it may be. Therefore, the muscles are the agents of these deviations, (*courbures,*) by their struggle to overcome the causes which tend to disturb the equilibrium of the trunk, and thus form antagonist curvatures, (*courbures de balancement,*) and retract afterwards to maintain those curvatures fixed, and in number, extent, and degree necessary to the re-establishment and support of the equilibrium. This retraction, though different in its object, is essentially the same in its essence and results; in every instance (*de part et d'autre*) it is an *active shortening of the muscles* and curvatures of the column. To diagnose this retraction from that purely spasmodic or morbid, I name it *active secondary muscular retraction*, (*rétraction musculaire active secondaire.*) It is important as not only taking an active part in all deviations, of whatever nature they may be, but as presenting indications (though restricted) for the application of surgical treatment, (*Archives Gén. de Méd.*, 3e et nouvelle série, tome v., Nov., 1839, p. 379 to 384; *Séances de l'Acad. Royale des Sc., Séance du 23 Septembre*, 1839; see also, *Compte-rendus Hebdomadaires des Séances de l'Acad. des Sc.*, 1839, 2e semestre, page 383.)

In the beginning of the year 1840, M. Guérin stated to the Royal Academy of Paris that he had then, in nearly *fifty cases*, divided, more or less completely, most of the muscles of the back and spine; viz., the trapezius, the rhomboideus, levator anguli scapulæ, sacro-

lumbalis, and longissimus dorsi. In each the wound of the muscle was from three to four inches long, and in the case of the sacro-lumbalis and longissimus dorsi, one and a half to two and a half in depth; in the case of the trapezius and rhomboideus, the bistoury traversed from four to five inches under the skin.

In no case, scarcely, was there local inflammation or feverishness, and by the third day the patients were enabled to rise up and walk about without support.

M. Guérin had then also divided the sterno and the cleido-mastoid muscles (separately, simultaneously, or consecutively) for *wry-neck*, *twenty-five* times, in every case under the skin, the wound healing without trouble. Occasionally, however, the operation was attended with some effusion of blood.

He had then, also, divided the tendo-Achillis for *club-foot* over two hundred times—in all successfully.

"I have now (says M. Guérin) performed the sub-cutaneous section of different tendons and muscles in upwards of FIVE HUNDRED CASES, and in not one instance has any troublesome inflammation of the wound supervened. The great object, therefore, (he continues,) of the surgeon should be, to prevent the entrance of the external air into the wound. From all these circumstances, I infer that sub-cutaneous wounds do quickly heal in consequence of the exclusion of the external air; and that it is from this fluid (the air) neither physically obstructing the circulation, nor chemically modifying the properties of the blood, nor altering in any degree its vital constitution, as well as from its not exerting any hurtful influence on the nerves and other parts which are protected from it, that the lacerated or divided tissues coalesce and unite by the first intention, without any of the usual inflammatory symptoms," (*London Medico-Chirurg. Review*, July, 1840.)

At the sitting of the Academy of Sciences of Paris, Feb. 2, 1840, M. Bouvier read a memoir in which he boldly censured those who cut the muscles as the cause of the deviations of the vertebral column. Such persons, he thinks, have mistaken the effect for the cause. In most deviations after birth, he thinks the disease commences in the *osseous*, and especially the *fibro-cartilaginous system*. The column inclines, and the attachments of the muscles being thus brought in nearer approximation on the side of the concavity, it is clear these last must become shorter. Cut the muscles and you don't remedy the incurvation. Hence, in cutting the muscles of the back in the *dead body*, you in no manner redress the dorsal spine, while the straightening is easily effected by dividing the *fibro-cartilages*. Nevertheless, some deviations in the fœtus seem to originate in a lesion of the nervous system; but they have special characters. and cannot be confounded with those caused by the bones and cartilages.

M. Gerdy, one of the Academy, could not admit this doctrine, and thought deviations of the bones were most frequently preceded and accompanied by some lesion of the *nervous system*, or *at least manifest disturbance in its phenomena;* to wit, convulsive movements of

the face and limbs, attacks of epilepsy, deafness, temporary blindness, cephalic or rachitic pains, &c. Add to this, that *individuals whose body or limbs are deviated* have, in general, precocious intelligence, and the greatest development of genius, (*esprit.*) Do not such facts lead us to the belief that there often exists a chronic affection of the nervous system, which excites the muscles to a permanent contraction? [These ideas were broached by M. Gerdy in the first edition of his Treatise on Bandages, so long ago as in 1826. They appear to us, however, to be only the reiteration of a well-known fact, and which, perhaps, is susceptible of another explanation than that of M. Gerdy. The remarkable mental precocity in such cases, and in no instance is it seen in more striking contrast than in some cases of total paralysis of the whole trunk and limbs, need not, as we think, exact a pre-existing chronic organic lesion of the brain or spinal marrow. For this greater intellectual activity, often brilliant to a degree that is surprising, may be owing to the distribution of nervous power being now, as it were, suspended, or vastly abridged and diminished to the more or less unexercised muscles, and therefore concentrated, for the same reason, upon the intellectual functions proper—in the same way as the activity of the circulation and of the cerebral functions, when in a normal condition, are augmented often in intensity of energy, by rendering them, as it were, more compact, or abridging the physical or organic domain in which their functions are performed, and thereby husbanding the expenditure of vital force, as is well known in the greater health and vigor often enjoyed by those who have undergone amputation of a leg, or the removal of a large tumor, &c.—*T.*] (See *Archiv. Gén. de Méd.*, 3e sér., tom. x., Mars, 1841, pp. 357, 358.)

Prof. Robert Hunter, of Glasgow, (now, we believe, of London,) says, in a communication to the London Medical Gazette, March 6, 1841, that he had already, at that time, performed the operation of sub-cutaneous section of the dorsal muscles for lateral curvatures of the spine in *twenty-five cases;* and that, "although in five of the cases the latissimus dorsi, the serratus posticus inferior, the longissimus dorsi, and sacro-lumbalis, were divided, and the sub-cutaneous incision extended from the spinous process of one of the lumbar vertebræ across to the outer margin of the sacro-lumbalis, dividing the above-mentioned muscles, yet the pain was so trifling that the majority of patients hardly murmured. The flow of blood never exceeded a few drops. The skin over the track of this long and deep incision never changed its natural temperature or color; in no case did suppuration follow; constitutional disturbance of any kind never once supervened, and in three or four days after the incision, the puncture had cicatrized, the swelling from the effused blood had generally disappeared, and frequently by that time not a vestige of the operation could be discovered." He adds, (and what is a valuable testimony to the alleged marked success in these sections by M. Jules Guérin, and especially of that most remarkable operation already alluded to in this work, and of which Dr. Mott was also an eye-witness:) "During the time I sojourned in Paris

last summer, M. Jules Guérin operated upon a patient affected with anchylosis of nearly all the body, arising from contraction of the muscles. He cut across *forty-four muscles*, and *spread out the limbs*, and although the successive incisions occupied more than sixty minutes, yet the system of the patient received so small a shock that the pulse was not sensibly affected, and the patient slept soon after the operation, and neither irritability nor febrile excitement followed."

Prof. Hunter believes he was the *first* in *Great Britain* to perform the sub-cutaneous section of the dorsal muscles for lateral curvature of the spine, but candidly acknowledges that in no instance has he found the operation, *of itself*, produce a cure; but that it manifestly facilitated that result by the application of mechanical and physiological means. All his cases were of long standing, from seven to twenty years, had been variously treated, and were accompanied with considerable torsion and gibbosity, as well as lateral curvature. In some instances the operation effected no change whatever.

Professor Hunter's Process.

He performs the section of the dorsal muscles at four different places upon the back:

1st. He weakens the deepest seated layer of muscles—that formed by the multifidus spinæ—by dividing the thickest part of that muscle, as it lies comparatively superficially upon the dorsum of the sacrum, opposite the posterior superior spinous process of the ilium.

2dly and 3dly. He removes the tension of the middle layer of spinal muscles—that formed by the longissimus dorsi and sacro-lumbalis—by cutting these muscles across, sometimes in the lumbar region and sometimes in the costal region, according to the circumstances of the case; but more frequently in the lumbar region, near the origin of these muscles.

4thly. In order to destroy the tension of the flat and more superficial muscles, he divides these muscles, by a longitudinal incision, close to the spinous processes of the vertebræ, at the place where the tension of these muscles appears to be the greatest. In one instance he cut through, with considerable effect, the *latissimus dorsi* at the side of the chest, and consequently, at some distance from the spine. The muscle crossed the contracted and concave side of the trunk, and appeared to be accessory in huddling in the ribs of that side. When the patient attempted to elongate that side, a cord, as thick as the little finger, was seen stretching from the crest of the ilium to the scapula; as soon as this rigid cord of muscle was cut through, the ribs became less huddled together, and the side could be elongated to a much greater degree, and the spine materially affected.

"In cutting the dorsal muscles," continues Professor Hunter, "I have chiefly, though not exclusively, followed the *method* of Guérin.

Guérin employs always two instruments; I have frequently employed only one. Guérin uniformly cuts the muscles, by commencing at the cutaneous surface of the muscle, and proceeding deep-seatedly; I have repeatedly, and with greater safety, cut in the opposite direction, that is, by carrying the instrument more deep-seatedly than the muscle, and cutting towards the skin. As Guérin, however, is a *great authority* upon this subject, his mode of operating is worthy of being mentioned. He makes the subcutaneous incision with a narrow, sharp-pointed bistoury, almost two inches and a half in length. He then withdraws that instrument, and introduces into the track thus made a sickle-shaped instrument of the same length and breadth as the former, the cutting edge of which is on the convex margin. Having carried this instrument across the muscles to be cut, he turns the convex cutting edge to the muscles, and their division is effected, not by one cut, but by a number of successive touches, the patient at the same time calling his dorsal muscles into action, by throwing his head forcibly backward, to impart a greater degree of resistance to the muscles, and to enable the incision to be effected partly by the pressure of the contracting muscles upon the edge of the knife."

Prof. Hunter claims to have been the *first person in Glasgow* who performed also the subcutaneous section of the muscles for the cure of *club-foot;* in allusion to which he says: "I have seen that operation performed by M. Guérin for valgus, varus, and equinus, and with *astonishing success.*"

The value of the subcutaneous section of muscles and tendons, in the cure of deviations of the vertebral column, formed the twenty-first question proposed in the programme of the *Scientific Congress of France*, and was responded to in the session of that body in the year 1842, at Strasbourg, by *M. Kuhn*, [associate of M. Guérin in the Hôpital des Enfans, Paris,] who maintained that the causes of the deviations of the spine are numerous, and that *muscular retraction* occasions *about the half* of them, to which last alone the subcutaneous section is applicable. The treatment consists, first, in a preparatory elongation, which overcomes the muscles secondarily contracted, after which we proceed to the section of the fibres, (*faisceaux*,) which are the seat of the primitive retraction. He cites a table of *one hundred and sixty patients* treated by *M. Jules Guérin*, and upon whom this distinguished surgeon had performed *three hundred and sixty* sections. The *greatest part* of these cases obtained a more or less complete restoration of the spine, either immediately, or as the result of consecutive mechanical treatment. A *small number* experienced no relief. There were never any serious accidents, and in two cases only was there suppuration, *which arose from introduction* of air into the wound. (Vid. *Journ. des Conn. Medico-Chirurg.*, Nov., 1842.)

In the sitting of the Academy of Medicine of Paris, Feb. 28, 1843, (vid. *Journal des Connaissances Medico-Chirurg.*, Paris, Avril, 1843,) *M. Malgaigne*, in a letter to the Academy, remarks that, from the safety (*de l'innocuité*) of subcutaneous wounds, we are

too precipitate in inferring danger from those which are left exposed to the air. M. Malgaigne says he has injected air into wounds opening into the articulations, and even the thoracic cavity, in *rabbits*, also into wounds of complicated fractures made in these animals, and has found the union, in all these cases, not less perfect and immediate. We know, he says, from this what value is to be allowed to the theory which explains, by means of the intervention of some *bubbles of air*, the suppuration which takes place in operations performed by very skilful surgeons, "even by M. Guérin himself." M. Malgaigne thinks this theory has the inconvenience of fixing the attention of the surgeon exclusively on an imaginary danger, and concealing from him the true causes of inflammation and suppuration.

In the subsequent sitting of March 7, M. Guérin took occasion to reply to this letter, by remarking that M. Malgaigne had exaggerated the consequences of the theory of J. Guérin, on cicatrization in subcutaneous wounds. "I have never pretended," says M. Guérin, "that air, in momentary contact with a traumatic surface, inflames it, and necessarily causes it to suppurate. Suppuration is, on the contrary, an exception, and it is in these conditions that M. Malgaigne has placed himself in his experiments. But when the wound is in *permanent contact with atmospheric air* the suppuration is the rule, and the cicatrization an exception so rare that there exists no example of it."—(*Journ. des Connaiss.*, loc. cit.)

It is necessary, in order that this work may be *au courant* with the latest movements and investigations which are being made in all the departments embraced in operative surgery, to remark in this place, without in any way committing ourselves to any party or theory, that the treatment of curvature of the spine by dorsal myotomy, as practised for some years past by M. Jules Guérin, has recently given rise, we are pained to see, to a very angry and recriminative discussion in the Paris Academy of Medicine. This discussion, it appears, was based on the absolute denial, on the part of M. Malgaigne, that M. Guérin had effected, in these operations, the number of cures that he had alleged. The consequence was, that a committee of the Academy, as is customary in cases somewhat similar, was appointed, to examine the results of his treatment. It is proper, however, to record here the brief summary we have in the Proceedings of the Academy, (as we find them reported in the *London Lancet*, May, 1844, pp. 221–2,) of the initiatory part taken by M. Malgaigne in this matter.

M. Malgaigne read a memoir on dorsal myotomy, as practised by M. Guérin in twenty-four cases, between the years 1839 and 1843. The whole number thus treated, in this period, at the Hôpital des Enfans, was, he says, fifty-seven, of whom it is stated, (he asserts,) by M. Guérin, that twenty-four were completely cured, twenty-eight much improved, four remaining without amelioration, and one ending fatally. M. Malgaigne avers that he has been able to obtain information respecting twenty-four of these patients, either by personal inquiry and examination or from authentic

data. He adds that twenty of these patients had undergone section of the dorsal muscles from one to nine times. They had remained at the hospital from two to eleven months, the treatment, however, having been continued at their own residences. M. Malgaigne states that he has not seen one complete cure, and that even the instances of amelioration are problematical. From his examination of the patients, he even doubts whether the retracted muscles were really divided, and whether the operation is not one which addresses itself hazardously to overcome imaginary evils. The greatest difficulty (says M. Malgaigne) in orthopædia is, not to raise the vertebral column, but to give it the solidity which it wants by reinforcing its weakened ligaments and muscles. He condemns all apparatus for extension, and all dorsal myotomy, as increasing this weakness. It is a bad plan, he says, to divide a muscle in order to strengthen it.

Professor Syme, of Edinburgh, has stated that the *only cases of curvature* to which the operation of myotomy is applicable, are those which accompany wry neck, and are produced by a permanent contraction of the sterno-cleido-mastoideus muscle. (See Mr. W. Hey, jun.'s Address in the Transactions of the Provincial Medical and Surgical Association, London, vol. xii., 1844, p. 169; also *Lond. and Edinb. Journ. of Med. Science*, April, 1843.)

A case of unusual interest is related by Mr. Cocks, of Dundee, (*Lond. Med. Gaz.*, March 10, 1843,) in which the affection of the dorsal muscles was of a decidedly spasmodic character; being contracted to such degree as to produce an anterior curvature of the lower half of the spine, and constituting a tense band on each side of it. The section of these bands gave *instant relief*, and was followed by a *permanent cure.*

If lateral curvatures of the spine, as in torticollis, &c., have, of late years, received almost immediate and substantial relief from myotenotomy, there are those who are for *going back* again to improved modes of mechanical treatment.

In a recent essay on diseases of the spine, by Mr. R. A. Stafford, (London, 1844,) he claims the merit of having done much to save cases of *lateral* curvature from the experiments of charlatanry, and that he has effected this object by what he considers a *new* and improved treatment of those affections, viz., by *gravitation*, *lateral exercise*, &c. Mr. Stafford considers that one of the causes the most efficient and aggravating in the production of these curvatures, and which has been too much overlooked, is the position of the centre of gravity being, by the previous loss of function, and therefore inaction, of the contracted as well as elongated muscles, thrown thereby upon the edges of the vertebræ. *Muscular action*, therefore, he deems to be only the *initial* cause of the disease, meaning thereby that the irregular and unequal action of the antagonist muscles, whatever may be the source of it, is only the first step to the deviations which afterwards, by the cessation of muscular function, and the shifting of the centre of gravity as above mentioned, become permanently established.

In aggravated cases of long standing, he relies but little on any kind of treatment. In cases in which there is a prospect of success, the general health must be first attended to, and then we must restore, says Mr. Stafford, "the muscles and ligaments of the spine to their proper functions, which can only be done by bringing them into use." (p. 65.)

In weakness *alone* of the *spine* itself, great benefit is derived from the recumbent posture, which, however, must be alternated with as much daily exercise as the patient can bear. The habitual vicious use of one limb, or set of muscles, must be corrected by greater use of their antagonists.

After the *lateral distortion* of the spine, however, is confirmed, then, Mr. Stafford says, he has derived the greatest benefit from *lateral exercise*, i. e., exercise of the muscles on the side of the spine upon which the curvature is situated.

The machine he proposes is a semi-circular wooden frame, similar to the rocker of a hobby-horse, upon which, by means of ropes attached to pulleys in the wall and to each end of the rocker, the patient rocks himself laterally, from side to side, giving thus vigorous exercise both upon the dorsal and lumbar curve. But this will not suffice when the spine is thrown greatly from its centre of gravity, and when the contracted and elongated muscles have thereby both lost, in a great measure, their power of action. Then he uses a machine which he claims to have invented, which has the effect to *elongate the spine* itself, by raising the body from the ground by its attachments alone, and by counter-weights appended to the hips. This he calls the *spine-elongator*, (pp. 77–81,) and its action better prepares the muscles for the later resumption of lateral exercise. Objections might naturally suggest themselves to Mr. Stafford's system of cure, from the apparent impossibility, by such means as he proposes, of restoring a spine which has undergone, by lateral deviations, considerable organic alteration in its osseous structure. But the cures he relates of remarkable distortions, if not over-colored, would seem to give positive certainty to the superiority of his method, which we have deemed it right briefly to notice, inasmuch as the tenotome certainly should in all cases be avoided, if mechanical means can replace it. (Vid. also *British and Foreign Med. Review*, 1844, p. 225 et seq.)

In the midst of the doubts, denials, and insinuations, which have, within a year or two past, been promulgated at Paris, by M. Malgaigne and others, in relation to the alleged successes of M. Guérin in subcutaneous sections in general, and especially in dorsal, or, as M. Guérin names it, *rachidian myotomy*, (*myotomie rachidienne*,) in the cure of lateral curvatures of the spine, it is well not to lose sight of the immense and universally acknowledged successes of this surgeon, at the earliest periods of torticollis, talipes, strabotomy, dorsal myotomy, (his own appropriate discovery,) and when he stood so distinguished, and above all others, that all seemed ready to acknowledge that he had no competitor, and all vied with each other who should laud him the most. This must not be forgotten when

the tide of opposition, not to say persecution, seems to set against him. Thus, in the year 1837, a commission, as M. Guérin says, (*Gaz. Méd. de Paris*, Mai 4, 1844, tome xii., pp. 294, 295,) composed of seven of the most eminent members of the Paris Royal Academy of Sciences, after *sixty-three* sittings of contradictory discussions and experiments, adjudged to M. Guérin the *great prize* of surgery for his *researches on deformities*. The following are the concluding words of that Report: "After so many researches made successively on the skeleton, the dead and the living body; after so great a number of observations, rigorously and severely interpreted; after this crowd of new facts and new views on the different parts of the subject; finally, after such numerous, beautiful, and fruitful (*féconds*) results introduced into science and art, nobody will be surprised that the prize has been adjudged to this remarkable work." (*Rapport sur le Concours pour le Grand Prix de Chirurgie*, p. 22.)

In respect to the direct assault of M. Malgaigne, (which we have already referred to above,) made in a memoir to the Academy of Sciences, April 15, 1844, and in a letter, at the subsequent sitting, M. Guérin, in a few remarks in reply, made at the sitting of the Academy, April 29, 1844, charges M. Malgaigne with gross misrepresentation, touching the failures of M. Guérin in rachidian myotomy. Instead of twenty-four cases of cures, and which M. Malgaigne states that he had examined and found to be failures, M. Guérin says that his table of the cases treated by him, at the Hôpital des Enfans, comprised *one hundred and fifty-five* patients, (not fifty-seven, as M. Malgaigne says,) of which twenty-four were cured, thirty-eight relieved, four not relieved, one dead, and ninety-eight on whom the result was not ascertained.

At the present moment, when the great chief himself of subcutaneous surgery, M. Guérin, is the subject of such severe recriminations and investigations before the scientific bodies of Paris, every thing that emanates from him awakens, in this country, where he has so many ardent admirers, and where we look upon those bitter controversies with pain, but without any bias either way, a peculiar interest. In his very recent discourse at the Hôpital des Enfans, of which he is one of the surgeons, and which is entitled, "*Programme des Conferences sur la Chirurgie Sous-cutanée*," opened at that hospital, May 22, 1844, "*par le Docteur Jules Guérin*," (vid. his *Gaz. Méd. de Paris*, Mai 25, 1844, tome xii., p. 329 et seq.,) he remarks that, notwithstanding the serious accidents of erysipelas, phlegmonous inflammation, abscesses, &c., which have been frequently observed to follow subcutaneous wounds, which are nevertheless, in general, so often unattended with the least danger, and followed by immediate cicatrization, yet he *has never, in all his operations of sections of tendons*, had a single case of *suppurative inflammation* resulting from them, though, as he says, he has operated upon patients of "every age, in every condition of life, at the hospital, in the city, on the poor, the rich, or subjects that were plethoric, nervous, lymphatic, and scrofulous." (*Ib.*, pp. 329–30.) To explain

these anomalies, he repeats, therefore, the idea that he had already promulgated, that:

"1. The immediate cicatrization of tenotomic (*ténotomiques*) wounds is effected *without* the aid of *inflammation*, and by means of phenomena of a kind altogether peculiar, which I call *immediate organization.*

"2. That this immunity of tenotomic wounds, and this immediate organization of the divided parts under the skin, are due to the absence of the contact of air." (*Ib.* p. 330.) The same immunity, he says, is not confined to tendinous tissues, but applies to every tissue of the animal economy, divided under the skin with proper precautions. Thus to the *muscles*, *aponeuroses*, *cellular tissue*, *the arteries*, *veins*, *nerves*, and even the *bones*, which, as his experiments prove, all organize immediately, and without suppurative inflammation; while in the reverse circumstances of exposure to the air, they inflame and suppurate. So also extensive arterial or venous effusions under the skin are absorbed or transformed, and produce no trouble, nor the slightest reaction.

M. Guérin applied the same reasoning to *cavities containing liquids;* for, in fact, (he says,) all the tissues themselves may be considered as an *agglomeration of small cavities filled with liquids*, especially the cellular tissue, of which the others are but transformations or amplifications. This he proved also, by experiments, in opening subcutaneously articular cavities, the chest and abdomen, and collections of effused blood or serum. He has not said, as they have made him say, that suppurative inflammation may be produced from the *temporary* passage or presence of some *bubbles of air*, (*bulles d'air*,) but from the *permanent* communication of the wounds with the external air. Hence the striking and rapid cure, so well known, of luxations, fractures, and all lesions without laceration of the teguments, as contrasted with the opposite state of things. Hence the innocuity of old collections of liquid, abscesses, and effusions, until opened. Subcutaneous surgery, then, thus acquires hourly importance from the immense extent to which the above general principles of M. Guérin may be (and, as we have seen, have already been, vid. supra) applied, viz., not only to all the tissues, but to all the cavities, including, also, among the last, the *cranium* as well as the *orbit;* the last already illustrated, long since, by M. Guérin, in his *sub-conjunctival* section in strabismus. The modifications of contained liquid in the cavities must also be kept in view, i. e., whether arterial and venous, or serosity, lymph, synovia, or pus, in a word, all the *fluids* of the animal economy—bile, urine, chyle, fœces, &c., normal or abnormal. (*Ib.* p. 330–31.) The difference of tissues also must be considered. In the course of his inquiries, M. Guérin asks whether the process of subcutaneous *immediate organization* is similar to or the repetition of what passes during the *primitive nutritive organization in the fœtus.*

Apart from the chemical changes produced on the tissues and fluids by the elements of the atmosphere, (oxygen, hydrogen, nitro-

gen, carbonic acid, and ammonia,) M. Guérin attaches much importance to the *temperature and pressure* of the air.

M. Guérin remarks, with great justice, (instancing the brilliant operation for strabismus,) that the eagerness of ignorant empirics, without any scientific knowledge of the great principles of subcutaneous surgery, to share the honors of this triumph, have, by their failures and gross blunders, brought great discredit upon it.

M. Guérin proceeds now to class subcutaneous operations under two great divisions, viz., *sections* and *punctures*, the former bearing direct relation to the *non-inflammation* of tissues, the other to the *unalterability* of liquids. (*Ib.*, p. 332.)

1. *Subcutaneous Sections* include :

a. Skin ; the separation of the skin in adhesions and morbid cicatrices.

b. Tendons ; for deformities, for *old* luxations, and for recent luxations and fractures.

c. Aponeuroses ; as an orthopedic means, or to liberate engorgements or effusions from inflammation.

d. Muscles ; as an orthopedic means, or to favor recent luxations and fractures ; also for strangulated hernia, and the radical cure of reducible hernia ; the *section* of the *sphincter ani* in cases of fissure, [for years past practised with much success by Dr. Mott. —*T.*,] and for the *subcutaneous cauterization of muscles to effect artificial contraction.*

e. Ligaments ; as an orthopedic remedy, or to favor the reduction of certain recent luxations and fractures ; the *cauterization or stimulation* (*caléfaction*) *of ligaments, to shorten and strengthen them.*

f. Arteries ; the subcutaneous scarification or cauterization of certain fungous tumors ; the obliteration of arteries by section, scarification, or punctures, and the *subcutaneous ligature.*

g. Veins ; the subcutaneous section and scarification of veins, in varices, and the different varieties of this disease ; the ligature of veins.

h. Lymphatic vessels and ganglions ; sections of vessels as an abortive treatment in buboes ; sections and scarifications of ganglions that have been a long time swollen.

i. Nerves ; *subcutaneous section of nervous trunks or branches* in *neuralgia ;* the *subcutaneous scarification* of nervous filaments in acute pains under the skin ; [Hindoo acupuncture must have originated from this principle—*T. ;*] cauterization or stimulation under the skin, of certain nerves in certain affections, as arthralgias, or other similar morbid conditions.

j. Cartilages ; *subcutaneous symphyséotomie.*

k. Bones ; *subcutaneous removal of small exostoses,* subcutaneous fractures for a morbid callus, extraction of osseous sequestra, (*esquilles,*) and the exsection of *sharp fragments which, in recent fractures, threaten to protrude through the skin, scarifications of the swollen gorged extremities and surfaces of bones, cauterization or stimulation of the same surfaces, extirpation of osseous tumors.*

2. *Subcutaneous Punctures.*

a. In *commencing phlegmonous* tumors, to arrest their development, thus acting both on solids and liquids.

b. Puncture and evacuation of melicerous tumors, (*loupes,*) with scarification of the cyst.

c. Puncture and evacuation of cold abscesses.

d. Puncture and evacuation of abscesses by congestion.

e. Puncture and evacuation of bloody tumors and serous collections [already anticipated by M. Velpeau's recent operations on bloody cysts, see supra] which are formed in consequence of subcutaneous operations, or in consequence of severe contusions, and especially the cephalematomous, (*les céphalématomes.*)

f. Puncture and evacuation of *hydrarthose* tumors, [i. e., dropsical collections in the joints.]

g. Extraction of foreign bodies from the articulations.

h. Radical cure of hydroceles and hæmatoceles.

i. Puncture of the cranium in hydrocephalus, [already anticipated, years since, without any recognition probably of the principle.—*T.*]

j. Puncture and evacuation of hydro-rachidian tumors in newly-born infants.

k. The operation of empyema and *puncture* of the *pericardium.*

l. Puncture and evacuation of tumors of the liver, of ovaries, and other abdominal cysts.

m. Among numerous other operations which may come under the subcutaneous principle, *M. Guérin* mentions the *Cæsarean,* though the remark may, he says, excite surprise.

As the Academy of Medicine have, so to speak, virtually withdrawn their commission of inquiry into M. Malgaigne's charges, and as the subject of subcutaneous sections in general, as practised by M. Guérin, was, previously to the action of the Academy, and is now, undergoing a rigid investigation by a learned committee, appointed, at M. Guérin's request, by the board of commissioners of hospitals at Paris, it is ardently desired that the late animosities and controversies on this subject in that capital will subside, and that strict justice will be done to all the parties concerned.

Flexion of the three last Fingers from wounding the Median Nerve in the Right Arm, in Venesection.

Dr. Marshall Hall presented a case of this kind before the London Medical Society, Nov. 7, 1842, in a young woman aged twenty-five. He effected a perfect cure by "entirely removing the cicatrix made by the lancet and a portion of the adjacent skin." The cure remained permanent until a year after, when venesection having been again (very injudiciously if not rashly) performed in the same arm, and in a neighboring vein, (not, however, by Dr. Hall's advice,) the retraction returned. This second cicatrix was

removed with the same good effect; but the cure has not been permanent, and the contraction of the fingers has again returned, with a slight contraction also of the *biceps*. Dr. Hall exhibited this case as a striking illustration of his theory of reflex nervous action. By referring to Dr. Mott's case, and also to the remarks of M. Velpeau, in the text of this work, it will be seen that the excision of the cicatrix, and, therefore, of the portion of the nerve imprisoned in it, effected a perfect cure of the severe traumatic neuralgia which the state of the parts had caused. Dr. Hall proposed, in his case, to cut off the nervous communication with the spine, by dividing the internal and external cutaneous nerves at their lower part, and removing a small portion of each. The excision of the last cicatrix, perhaps, was not extensive enough, and the source of the contraction, probably, on both occasions of the venesection, was a strangulated portion of a filament of one of the cutaneous nerves.—*T.*]

M. Doubovitski's Case.

As this case is much spoken of in the discussion on tenotomy in the text, it may be well to state from *his own* memoir upon the subject, (entitled *Section Sous-cutanée des muscles pronateurs et des muscles fléchisseurs de la main et des doigts.* Par P. Doubovitski, Professeur de Pathologie Externe à l'Académie Impériale de St. Petersbourg. Vid. also, *Archiv. Gén. de Méd.*, 3e sér., Mai, 1841, tome xi., p. 100 et seq.; also, *Annales de la Chirurgie Française et Etrangère*, No. 2, Février, 1841,) that, for the retraction of several muscles of the fore-arm, produced by a badly applied dextrine bandage for fracture of the inferior extremity of the humerus, *twenty-nine* sections of tendons and muscles were performed upon him by M. Guérin, at Paris. The reunion, however, took place in seven only: 1, the four tendons of the flexor digitorum profundus, divided on a line with the phalanges; 2, in the two tendons of the flexor digitorum sublimis (*fléchisseur superficiel*) of the index and medius, divided on a line with the first phalanges; 3, and in the flexor longus pollicis. The action of these muscles, or extremities (*chefs*) of muscles, is destroyed. The deformity has almost entirely disappeared. In respect to the movements, those of extension and flexion in the elbow, of pronation, supination, and extension of the hand, have obtained a decided amelioration. In what relates to the fingers, they cannot be flexed against the thumb; for the action of the sublimis and profundus is nearly lost.

M. Doubovitski deduced from this sad experience upon himself, and from other experiments, that the retraction of the *flexor muscles of the hand*, of the palmaris longus, and that of the flexor carpi radialis, is easily cured. We may cut the tendons of these muscles with impunity in the fore-arm. The retraction of these muscles may exist without the retraction of the flexors of the fingers and pronators. The disease is then simple, and easily cured, and the section may even be repeated several times. The disease is more serious if there is, at the same time, retraction of the pronators,

and forced pronation. We may in this case cut the pronator radii teres, but should we divide the pronator quadratus? In cutting only one of these muscles the cure would not be complete. If to these retractions were joined those of the flexor digitorum sublimis, the result would be the flexion of the articulation of the first with the second phalanges; but it is rare, if not impossible, that it can take place without that of the *profundus* also.

The section of the sublimis, whether at the palm of the hand or on a line with the fingers, has not been followed with success. M. Doubovitski has seen many examples of it; he had it performed on himself, and the divided muscles have not reunited; and as to the profundus, it would appear to him difficult, if not impossible, to divide the tendons of this muscle without forever destroying their action. The contraction of the thumb, in consequence of the retraction of the flexor longus pollicis manus of this member, might, it would seem, be cured by the section of this muscle performed at the forearm; in his own person, however, the section did not have this result.

In fine, M. Doubovitski thinks that in the above deformities in the upper limb, viz., retraction of the pronator radii teres, of the flexor carpi ulnaris, the palmaris longus and flexor carpi radialis, the flexor longus pollicis manus, the sublimis and profundus, there may be a prospect of success, in dividing at the elbow the upper attachments of the pronator radii teres, and the palmaris longus and flexor carpi radialis; also, a part of the attachment of the sublimis, and of the flexor carpi ulnaris, at the epitrochlea. Moreover, it is necessary to make at the forearm, at different heights, the section of the tendons of the flexor carpi ulnaris, of the sublimis, of the flexor longus pollicis, and of the palmaris longus and flexor carpi radialis, (*des petit* et *grand palmaires;*) for the section of the attachments of these two last muscles, though complete, is not generally sufficient. Finally, it is necessary to sacrifice the tendons of the profundus, on a line with the second phalanges. *All the other sections would be injurious.*

"In acting thus," however, says M. Doubovitski, "the cure is not complete: the action of the profundus is lost forever; the movements of the wrist will be free, with the exception of supination; the flexion of the fingers will be free, except those of the third phalanges."

Contraction of the Fingers of both Hands, from Contraction of the Fascia Palmaris.

Mr. C. Hawkins, surgeon to St. George's Hospital, London, in one of his recent clinical lectures at that institution, (see *London Medical Gazette*, May 31, 1844, p. 273, et seq.,) exhibited the case of a coachman æt. thirty-nine, who was admitted into the hospital April 17, 1844, with contraction, in a greater or less degree, of all the fingers of both hands, but chiefly of the fore, ring, and little fingers of the right hand. The fascia in the palm of the hands was

very tense and hard, and also the portions of the fascia leading down to the metacarpal bones and the sides of the phalanges. There was no anchylosis of any of the joints, but a partial dislocation of the second phalangeal joint of the ring finger of the right hand, which arose from the pressure of the fingers, in their bent position, against any thing the man tried to grasp. The cutis in the contracted parts was much condensed and furrowed, and apparently thickened.

In this case (says Mr. Hawkins) the contraction is only in the palmar fascia, *though, on first examining* the hand, *you might easily suppose that the lines of hard substance which start up when you try to extend the fingers*, are the *flexor tendons.*

Mr. Hawkins says he has seen this affection in the higher classes, in whom the cause could not be, as Dupuytren avers it to be, viz., the holding or pressure of hard substances in the palm of the hand, and therefore occurring among laboring people. If the opinion of Dupuytren were correct, Mr. Hawkins asks why the contraction should be confined, as it almost invariably is, to the ring and little fingers; and why it should attack both hands, as in this case, which, however, is not a common circumstance, for the two hands are very differently employed in his labors. This man had some little contraction of the fore finger also, but it has nearly gone since he has been in the hospital, and it is unusual.

The remedy for this contraction (says Mr. Hawkins) is the division of the portions of fascia which are affected; and it would appear to be an effectual cure—if not, it can be repeated. In a case he performed the operation upon two or three years since, the contraction returned, but only in a slight degree, which gave no inconvenience. In the present case the existence of a gouty affection had as yet delayed the operation. He should, however, do it soon, but only in one hand first; and upon reflection, intends to operate as he had usually done, by *direct incisions through the skin and subjacent contracted portions of fascia*, as he would thereby not only obviate the danger generally to be apprehended from wounds of the plantar and palmar fasciæ, viz., that from confinement of matter, burrowing along the tendons of the muscles, but also the danger arising from making so many cuts as will be necessary in this case, viz., the division of the bands of fascia in the palm before its separation to the two fingers, and also the probable necessity of making an incision also opposite the joint of each finger with the metacarpal bone, and smaller cuts at the side of each finger, all of which, if made upon the sub-cutaneous principle, would be difficult, and also incur the risk of wounding the digital arteries and nerves, as well as expose afterwards to greater danger of suppuration, from the necessity of extension on a hand splint. If, therefore, the cuts were made under the skin, the confinement of the matter, should it have formed, would be much greater, and might do much harm. In the open incisions he proposes, there will be, it is true, several suppurating wounds, as a little lint must be put between their edges to prevent their union; but then, on the other hand, there will be

no confinement of matter, and consequently no probability that the suppuration will extend itself beyond the small cuts themselves, which extension is much more dangerous than the open wounds can be. It does not appear, says Mr. Hawkins, that Dupuytren met with any mischief when he performed the operation in this way, and he adds, "when I have done it myself, there was no inflammation of any importance produced." [Vid. our remarks in the text, supra, on the subject of contraction in the flexors of the hand as connected with intestinal derangement in children and adults. It is clear, from what Mr. Hawkins says, and what had also been long known, that these contractions, whether of the flexors or of the fasciæ, may certainly arise from some functional disturbance, or lesion in the ganglionic and spinal centres by which they are supplied; the further proof of which is seen in the cure being accomplished as we have mentioned supra, in the text, not only by electro-galvanic agents, but by general remedies directed to the constitution, and without the aid of mechanical or surgical means. It is doubtful, however, if after all, in cases like the above, the sub-cutaneous section is not to be preferred; and, in order to prevent the dangers spoken of, limiting the incisions to a few only in number—in other words, making several operations of the cure, and aiding it progressively by extension.—*T.*]

Section of the Flexor Longus Pollicis.

Instances of the abnormal contraction of this muscle are seen in what is called, in England, *Scrivener's spasm*. The division of the muscle has effected a perfect cure, (see Mr. Hey, jun., in *Trans. of the Provincial Med. and Surg. Association*, London, vol. xii., 1844, p. 170; also, *Medico-Chirurg. Review*, Lond., July, 1842.)

DIVISION OF MUSCLES, TENDONS, &c., OF THE LOWER EXTREMITY.—SUB-CUTANEOUS KELOTOMY.

Apparatus for excluding Air from Wounds.

In a letter from M. Jules Guérin to the editors of the Paris *Journal des Connaissances Médico-Chirurgicales*, (number for January, 1842,) he justly complains of the attempt on the part of M. Bouchut, in the number for November, 1841, to appropriate to himself, in an essay on *sub-cutaneous kelotomy*, (as the last-mentioned physician names it,) the merit of having first devised or proposed sub-cutaneous sections for strangulated hernia. M. Guérin (justly, as we believe) claims this honor to himself. Although, after the proofs that are adduced in the text, (vid. supra, our abrégé of the discussion on tenotomy in the Paris Academy,) we cannot agree with M. Guérin that neither the pathological principle nor the surgical operation of making as small a wound as possible to exclude contact with the air, had any thing to do, in the mind of Hunter, with the sub-cuta-

neous section, or with any hope or expectation on the part of that great surgeon, to prevent suppuration. We doubt not that to M. Guérin alone is due the entire honor of having, as we have repeatedly expressed, first philosophically, fully, and lucidly explained the principle of the sub-cutaneous section, and boldly and extensively carried out and demonstrated, with his tenotome, its vast practical application and utility.

M. Guérin, in the letter referred to, says: "It is nearly *three years* (see his memoir on *Plaies Sous-Cutanées des Articulations*, read to the Academy of Sciences of Paris, May 4, 1840) since I pointed out, in a very explicit manner, the liberation under the skin of strangulated hernias, (*le débridement sous la peau des hernies étranglées*,) as among the possible applications of my method; since that period I have frequently called the attention of the readers of the *Gazette Médicale* to this idea, and I finally myself put it in practice, with complete success, on the 12th of July last," [i. e., July 12, 1841,] (*Journ. des Conn., &c.*, loc. cit., pp. 25, 26.) This case was communicated to the Academy of Sciences Aug. 7, 1841, and was published in the Gazette Médicale Aug. 14, ensuing, and also in other journals. M. Guérin, without calling M. Bouchut by name, asserts that the kelotomy which he (M. B.) proposes to substitute in the place of M. Guérin's, is altogether too imperfect and too dangerous to be attempted on a human subject.

The idea, also, of M. Bouchut, of placing wounds in an apparatus deprived of air, (i. e., in vacuo,) is, M. Guérin says, another appropriation of property which legitimately belongs to him. So early as in the year 1839, in the memoir read by M. Guérin to the Academy of Sciences in July of that year, on *Plaies Sous-Cutanées*, M. G. thus expressed himself: "The second consequence which results from the comparison of the phenomena of immediate reunion with those of the immediate organization (*l'organisation immédiate*) of sub-cutaneous wounds, is that the essential condition of this reunion and of this organization is the same; which is to *carefully protect* (*soustraire exactement*) the surface of wounds from all contact with atmospheric air. I will not stop to point out the means of fulfilling this indication; it is sufficient for the moment to establish it as a *principal and certain* condition (*comme condition capitale et certaine*) of a result which has occupied the attention of surgeons for nearly two centuries."

The dressing or apparatus which M. Bouchut describes as his *own invention*, is, according to M. Guérin, precisely that which he (M. G.) had employed for a long time, and which he has since greatly improved. He has, also, fully explained their principles in his work entitled "*Essais sur la Méthode Sous-Cutanée*," published in the beginning of the year 1842, and in his *Mémoire sur les Plaies Sous-Cutanées*, read at the Academy of Sciences, July, 1839.

The division of the tendo-Achillis, in injuries to the knee or hip-joint, causing retraction of the heel, was successfully performed in January, 1841, by Mr. J. Nottingham of Liverpool, on a laborer who had fractured the thigh, and injured, at the same time, the articulation

of the knee, ending in a permanent retraction of the heel on that side. By the division of the Achillis, the foot was in a very short time restored to the ground and to its uses, (*Dublin Medical Press*, No. iii., Nov., 1841.)

A reversion of the os calcis backward, following partial amputation of the foot, was completely cured by M. *Hippolyte Larrey*, by a division of the tendo-Achillis, (*Séance de l'Acad. de Méd.*, Nov. 9, 1841; vid. *Archiv. Gén. de Méd.*, 3e sér., Dec., 1841, p. 515.)

Division of numerous Muscles of the Thigh for Contracted Hip.

Mr. R. W. Tamplin, of London, in a statistical report (in the *Lond. Lancet*, April 1, 1842, p. 181, &c.) on distortions treated at the "*Orthopedic Institution*" in that city, briefly adverts to his having, in two cases of *contracted hip* or flexion of the thigh upon the pelvis, with rotation inwardly, (one of which, we are left to infer, was a case of *morbus coccarius*,) divided the adductor longus and brevis, pectineus, sartorius, tensor vaginæ femoris, rectus femoris, and a portion of the adductor magnus, "which allowed (he says) complete abduction of the thigh, and enabled the *patient to flex and extend it at will*, the feet being brought nearer to the ground." The details of these cases require to be minutely given, especially that of the *hip-joint disease*, before we can clearly comprehend the condition of the parts, and the degree of relief obtained. Certainly, the case of *morbus coccarius*, if accurate, is altogether one of too unprecedented a nature in the present state of orthopedy, to have merited only so laconic a notice from the operator.

Division of the Tendon of the Triceps Femoris, of the Ligamentum Patellæ, and of the Triceps Cubiti, in ununited fractures of the Patella and Olecranon.

These sections have been performed by Dieffenbach, and the fragments of bone afterwards occasionally rubbed together from time to time, until union and restoration of the parts was in one or two instances effected: but in other cases the operations were unavailing, (see *Casper's Wochenschrift*, *Brit. & For. Med. Rev.*, and also *Lond. Lancet*, 1841–42, p. 767.)

Rupture of the Tendon of the Triceps Femoris.

This accident, by no means a common one, and the history, nature, and treatment of which are so correctly given by our author in the text, recently occurred to a male patient of M. Blandin, (*Journ. des Connais. Médico-Chirurg.*, Nov., 1842, pp. 203–204,) aged sixty-eight, from making a violent effort to escape a fall. M. Blandin, having used the dextrine dressing in the similar cases of fractured patella, applied it to this, but very prudently and judiciously not until eight days after the accident, and when all the

tumefaction had disappeared. First applying the dextrine bandage to the foot and leg, he forcibly raised the patella by means of tongued compresses, (*compresses languettes,*) while an aid pressing on the thigh brought the upper extremity of the ruptured tendon as nearly in contact as possible. The limb was held in complete extension by a long splint under the leg and thigh, and the whole limb placed on an inclined plane. In twenty-five to twenty-six days the dressings were removed. The sub-patellar cavity was filled up; but, as the new tendon did not seem sufficiently solid, a new dextrine dressing was applied for some further time. In fifty days the dressings were removed, and the patient marched perfectly well but for a slight stiffness in the knee. This case is related by M. Demarquay, (*interne,*) who mentions also another, aged about fifty, treated by Dr. Lebaudy. The patient, *rejecting all kinds of dressings or restraint whatever*, submitted to have his limb placed on an inclined plane. The cure was, nevertheless, perfect. We doubt very much the safety or utility of bandaging in these cases, least of all with the dextrine, (see text, supra.)

For Fractures of the Patella, &c., which may be adapted also to Rupture of the Rectus Femoris, or of the Ligamentum Patellæ,

M. Baudens (vid. Sitting of the Academy of Medicine of Paris, April 29, 1844, in *Gaz. Médicale*, tom. xii., May 4, 1844, p. 296) proposes a very ingenious *fracture-box*, open above, like that for fracture of the femur, but open also at its two extremities for the passage of the limb. It does not reach beyond the middle of the leg and thigh. The middle portions of two pieces of bandage are applied one above the other below the fragments of the patella, and their extremities fastened obliquely in the holes with which the sides of the box are perforated. The apparatus thus acts *only* on the fragments, without exercising any circular compression on the limb, and leaves perfectly free the popliteal space. The force may be graduated at pleasure.

Division of the Ham Strings.

Mr. Wm. Coulson, Surgeon of the Magdalen Hospital, London, (vid. *Lond. Lancet*, 1841–42, pp. 273, &c.,) says the semi-tendinosus and semi-membranosus appear to have been first divided in England, either by Dr. Little or by Mr. Liston, about the year 1838, (see *Lond. Lancet*, June 23, 1838; also Dr. Little's case in the *Cyclopædia of Surgery*, part iii., July, 1838,) but without curing the rigidity of the knee. The *tendon of the biceps*, he says, had not yet been divided [i. e., in England] when this account was published. About the year 1839, in a case of severe flexion of both knees from rheumatism, in a female, Mr. Phillips divided the biceps and the semi-tendinosus and semi-membranosus in the right knee, effecting a perfect restoration of the limb, (vid. *Lond. Med. Gazette*, July 20, 1839.)

On July 24, 1841, Mr. Coulson divided the above muscles and some thickened bands on the inner side of the popliteal space, in a girl of eleven years, who had an enlarged rigidly-flexed strumous joint. This, followed by a modification of M'Intyre's splint, with a screw-joint behind and a knee-cap in front, making gradual extension, effected a cure in five weeks, leaving the limb perfectly straight.

Mr. Henry Symes, of Bridgewater, (Eng.,) also successfully divided the above three muscles in both knee-joints, in a woman aged twenty-four, in whom these articulations had been for eighteen months flexed rigidly at an angle of forty-five degrees. The operations were performed Dec. 7, 1842, and on the 18th day, a suitable apparatus having been used, was removed, leaving the legs perfectly straight, (*Lond. Lanc.*, 1841–42, p. 860, 861.)

In 1841, April 16, Mr. Geo. May, surgeon to the Royal Berks. Hospital, Reading, (Eng.,) successively divided the three flexor muscles (above) of the knees in a woman aged twenty-nine, and succeeded perfectly in straightening the limbs. In another case, (a groom, aged sixteen,) for adduction of the right knee inward, interfering with the ability to place the sole of the foot on the ground, he divided, Nov. 17, 1840, the *biceps* tendon, and effected a perfect cure; and the biceps again successfully, Feb. 2, 1841, in a child aged two and a half, (*Lond. Lancet*, 1841–42, p. 596.)

Division of the Flexor Muscles of the Leg.

In a case related in the Paris *Journal de Médecine*, (see *Lond. Med. Gaz.*, 1841–2, pp. 810–811,) of a girl aged nineteen, who had the leg contracted at the knee-joint for eight years, and the muscles of the limb from its disuse thereby relaxed and atrophied, with swelling of the knee-joint and projection of the internal condyle of the femur, the cure was effected by division of the tendons of the biceps, semi-tendinosus, and semi-membranosus, and by gradual permanent extension for some months afterwards. Mention is made in this case of there having been some danger of wounding the popliteal artery, on account of a *cushion of fat* which surrounded the tendons.

[The ham-strings, within two or three years past, have been repeatedly divided, with entire success, by Dr. Mott, in adults as well as children, where there had existed for a long time permanent flexion of the knee without anchylosis.—*T.*]

Section of the Tendons of the Ham.

Mr. W. Rhind, as early as 1841, (vid. *Edinburgh Med. and Surg. Journ.* of that year,) in a case of a woman aged thirty, whose leg, in consequence of position and dressings for a contusion and ulcer at the knee, had the flexors of the leg so contracted as to oblige her to walk on the point of her great toe, divided successively the tendons of the biceps, semi-tendinosus, semi-membranosus, and sartorius, which, followed by an apparatus for gradual extension, effected a

perfect cure, and the normal position and movements of the limb, on the thirteenth day.

CLUB-FOOT.

Mr. M. H. Stapleton, one of the surgeons of the Jervis-street Hospital, Dublin, claims to have been the first surgeon in Great Britain who divided the tendo-Achillis, Oct. 16, 1838, by the method of Strohmeyer, in the case of a male child aged about two years, affected with varus equinus and a small bursa on the cuboid bone. In a month the child walked perfectly well, (vid. *Dublin Medical Journal*, vol. xv., pp. 405, 406.)

Dieffenbach inclines to the opinion that the sheath of some of the large tendons, and especially of the tendo-Achillis, is probably so relaxed naturally, (as Strempel's experiments on the dead subject would infer,) that the tenotome transfixes without dividing it, which he considers a providential circumstance, as it must prevent extensive diffusion of blood, aid in the restoration of continuity, and therefore favor the cure, (see *Ueber die Durschneidung der Schnen und Muskeln*, von J. F. Dieffenbach, Berlin, 1841, p. 12.)

The *frequency of club-foot* is estimated at tenfold greater than *hare-lip*, with which it sometimes coexists; and, according to Dieffenbach, it occurs more frequently in boys than in girls, though the latter are more severely affected. But boys have the disease in both limbs oftener than girls. In comparing varus with pes equinus, there are ten of the former to one of the latter.

Dieffenbach and Jorg estimate the proportion of *club-foot* everywhere at about *one in a thousand* births.

Division of the Tendo-Achillis in recent Compound Fractures and Dislocations of the Leg, Ankle, &c.

In a case of this kind of fracture of the leg, with considerable projection of the bones, which could not be reduced on account of the contraction of the muscles of the calf of the leg, M. Jobert effectually removed the difficulty by dividing the *tendo-Achillis*, being, as far as we are acquainted, the first case in which this operation has been performed for that purpose, (see *Bulletin de Thérapeutique*, Paris; also, *Provincial Med. Journal*, (Eng.,) Aug. 6, 1842.)

Mr. Wm. Hey, jun., (*Trans. of the Provincial Med. and Surg. Assoc.*, vol. xii., London, 1844, p. 171,) says that he has also derived great advantage from a similar proceeding in a recent case of compound *dislocation of the ankle*. The dislocation was easily reduced. but there was a strong tendency to displacement of the foot backward; I therefore (says Mr. Hey) divided the tendons of the tibialis posticus and flexor longus digitorum, which were exposed by the wound, after which there was no difficulty in retaining the limb in a proper position. [Here the divided ends of the tendons, though

freely exposed to the air, appear, notwithstanding, to have suffered as little of the greatly dreaded inflammation of those tissues under such circumstances, as if the operation had been sub-cutaneous. —*T.*]

Section of the Tendo-Achillis in Fractures of the Malleoli.

The difficulty in these fractures, whether of the external or internal malleolus, or both, is not to reduce the ends of the bones which usually protrude through the skin, but to keep them reduced; that is, to maintain the exact coaptation of the fractured surfaces. The consequence is, that profuse suppurations, tetanus, &c., thereby induced, often necessitate amputation. In a report upon this subject to the Paris Academy of Medicine, (1844,) M. Bérard suggests the propriety of division of the tendo-Achillis. He mentions that in a fracture of the leg, accompanied by dislocation of the foot, he had divided the tendo-Achillis and then placed the limb on a gutter-frame of iron wire, padded with cotton, which allowed the wounds to be dressed with the greatest care. This operation, he says, has been performed by him *three times;* and also about the same time, in 1842, by M. Laugier and by M. La Vacherie. In all the cases in which it had been performed, it had much facilitated the reduction. Some of the patients had died, but owing to the very serious nature of the lesions which complicated the fracture. In one case he had also divided the lateral peronei muscles.

M. Velpeau agreed with M. Bérard, that the section of the Achillis was calculated to render the reduction of the fracture easier, but thought that in many cases it was desirable that *exsection* of the *osseous extremities* should also be resorted to, as the fracture is often oblique, and then it was nearly impossible otherwise to reduce it. The muscular contractions, he remarked, which so often occur subsequently in this form of fracture, were much less to be feared when the length of the bones had been shortened.

M. Roux remarked, that the traumatic opening of articulations was not as dangerous as was thought, especially when only opened on one side. He therefore considered it a very good plan to extract a portion of the fractured bones, in extensive traumatic lesions of the articulations.

M. Gerdy mentioned a case of fracture of the malleoli, with protrusion of the tibia, and dislocation and protrusion of the astragalus, in which he extracted the latter bone and the patient recovered. He apprehended great disadvantages from the exsection of the osseous extremities at the tibio-tarsal articulation, as the foot required so much support on each side. The section of the tendo-Achillis he should advise only when there existed a state of muscular retraction which impeded reduction.

He took occasion to remark upon what he deemed a prevailing error, viz., that in fractures of the lower extremity of the fibula, the foot was turned outward. He had seldom seen this in the numerous cases he had treated at St. Louis; and even when it was, he

did not find it necessary to carry the foot inward, but had always readily effected a cure by maintaining the foot in a rectilinear position, by means of the ordinary eighteen-tailed bandage.

M. Roux agreed with M. Gerdy, that in the fracture of the fibula, very slight means of retention were all that was necessary, and that Dupuytren had evidently much exaggerated the importance of his apparatus, (see *London Lancet*, April, 1844, pp. 7, 8.)

Division of the Tendo-Achillis in certain Cases of Luxation of the Ankle-joint.

The propriety of an operation of this kind has recently been the subject of discussion at the Paris Academy of Medicine. In a late number of the *Dublin Press*, however, Dr. Halpin, as it appears, is entitled to the credit of having been, it would seem, the first to make this suggestion, (viz., in January in the year 1840,) which may, without doubt, prove of considerable value in some cases of luxation. Nor can we perceive why the same principle might not be applied, as it had been with eminent success (years before Dr. Halpin's suggestion) by Dieffenbach to the shoulder, (vid. sup.,) to all other irreducible, and especially to old luxations of the knee, wrist, &c., unless the danger of inflammation, and the severity of the suffering, should render it advisable, in some cases also of *recent* luxation of the more complicated articulations, to have recourse immediately to so prompt a means of great relief, easy reduction, and permanent cure, as this promises to be, and in fact is proved, as we have said, by Dieffenbach, to have been in certain cases, (see *Lond. Lancet*, June, 1844; also, Dr. Halpin, in the *Dublin Press*, 1844; and the same Journal, Jan., 1840.)

Division of the tendo-Achillis for fracture of the fibula, with dislocation of the foot outward, has recently been performed by M. Bérard, at Paris, (*Lond. Lanc.*, 1842–3, p. 557.)

Division of the Tendon of the Flexor Longus Digitorum Pedis.

In contraction of the second toe, by which it was recurvated upon itself, so that the nail rested on the ground, Mr. George May, of Reading, (Eng.,) effected a perfect cure by dividing the tendon of the above-named flexor, January 14, 1841, (*Lond. Lanc.*, 1841–42, p. 597.)

Subcutaneous Incision of Joints.

In M. Guérin's memoir on subcutaneous wounds, (1840,) the author proceeds to show, by experiments on men and animals, that the subcutaneous incision of joints is as exempt from danger as that of tendons, muscles, nerves, and small blood-vessels. This he proved on dogs, in opening the humero-cubital, the radio-carpal, the femoro-tibial, and the tibio-tarsal joints; the wounds, if carefully excluded from air, always healing rapidly.

But if the joints were *moved about, a synovial swelling usually appeared around the wound*, but when they were *kept quite quiet and extended*, even this trifling accident did not supervene. Admission of air invariably caused inflammation and suppuration.

Guarantied by these experiments, and by what is well known to happen *after some severe dislocations*, M. Guérin had then, in several cases, divided the ligaments and portions of the *capsules of the knees and ankle-joints*, and in none have unpleasant symptoms ensued.

The wound in the integuments should be, he says, as *small as possible, and far distant from that into the joint*. It should also be made when the limb is *extended*, and never when bent; and, lastly, the joint should be kept *perfectly motionless* for some days afterwards.

These two last injunctions are the more necessary, says M. Guérin, since he had discovered recently that, in all the movements of the joints, their *cavities become more or less enlarged*, and therefore that, as a vacuum is thus formed, there is a strong tendency *to the suction of air*, if any communication exists without upon the outer surface.

M. Guérin then gives the useful applications of such sections, in *serous, sanguineous, or purulent collections in the joints*, the subcutaneous division of *articular ligaments and capsules*, with the view of maintaining in a fixed condition certain congenital and also some old dislocations after they have been once reduced; also the exciting of adhesions, and favoring the *formation of new articular cavities*. [M. Guérin probably would therefore use the subcutaneous section, were it possible, in making an artificial joint, in anchylosis at the hip, &c. See Dr. Rodgers' case, supra, in text.—*T.*]

M. Guérin says he has in this way effected the *cure of a congenital luxation of the clavicle*, which had resisted every means, by making numerous sections of the *ligaments all around the displaced joints*. [Herein we manifestly have the germ of the subcutaneous principle, as now beautifully applied by M. Goyrand and others, to the destruction of bursal sacs, and especially the expulsion of foreign bodies in the synovial articular cavities. In conformity to M. Guérin's idea, (well grounded, as we think,) that motion increases these synovial cavities, would it not be well to avail ourselves of this suggestion, to be better enabled thereby to protrude these synovial bodies into pouches of the capsular membrane, and thence into the neighboring subcutaneous tissues?—*T.* See supra.] (See *Lond. Medico-Chirurg. Journ.*, Oct., 1840.)

The subcutaneous principle, for the removal of a ball, was ingeniously and successfully applied, at La Charité, in March, 1841, by M. Velpeau, (the author of this work,) in the case of a soldier, wounded in 1813, and in whom the ball lodged about two inches above the inner side of the articulation of the knee. The ball was pushed upward and outward, and retained in that situation by the fingers of an assistant. A very small puncture having been made by a bistoury a short distance from the ball, the tenotome was introduced, and carried towards the ball, dividing thus the capsule of the joint and the superincumbent layers. The ball immediately

escaped to the external wound, which latter was then sufficiently enlarged to enable it to fall out. Before the ball was removed, pressure was applied between it and the joint, notwithstanding which half a glass of synovia flowed from the knee. The patient recovered perfectly, without the joint becoming involved. (Vid. *Gaz. Méd. de Paris*, Fév. 4, 1842; and *Annales de la Chir. Franç. et Etrang.*)

Subcutaneous Section in Congenital Luxations.

M. Guérin, in a recent highly interesting memoir on the subject, considers *active muscular spasmodic retraction* the cause of these luxations, as of all other articular deformities. This is further illustrated by their frequent coincidence with congenital defects of the nervous system; the same as is seen in striking signs of cerebral or spinal disease in the dissection of monsters.

If all the chief muscles round a joint are affected, the luxation may be *complete;* if only some, and late in fœtal life, it may be only a *sub-luxation;* if the direction only is changed, a *pseudo-luxation.* M. Guérin has seen thirty different kinds of congenital luxation in the joints of the spine, pelvis, clavicle, and extremities.

Muscular retraction rarely produces more than the sub-luxation, except in the very young fœtus. The complete displacement is then effected subsequently by the *arrest of development* in the retracted muscle; its physiological contraction and the influence of gravity, the same as all those influences, modify the character of club-foot, curved spine, &c. One of the first effects of the muscular retraction is to prevent the proper development of the muscles it affects, hence, the *skeleton* in the *fœtus* growing faster than *they do*, the partial becomes a complete luxation.

The practical rule of treatment, says M. Guérin, is, "that the muscles of the fibrous tissues which are felt beneath the skin hard, and strongly resisting the replacement of the parts, must be divided by *subcutaneous incision* so as to remove those obstacles, which are otherwise insuperable against the application of the mechanical means necessary for the reduction of the dislocated bone and its maintenance in its restored position." But we are to consider that not only are those muscles shortened in which the active retraction commenced, but those which by the dislocation have their insertions approximated, are also shortened and *passively* retracted, presenting nearly as great an obstacle to reduction as the first set. The first set, whose tension is further increased by the growth of the bone drawing upon them, become thus transformed into a *tough fibrous structure*, which, however, is rare. In the *passively retracted muscles*, on the contrary, the common change is that into a *fatty tissue.* Those muscles which, in the altered position of the limb, have to perform forcible voluntary movements, become simply *hypertrophied.* In short, says M. G., the rule is this: the muscles that are stretched become fibrous, those that are relaxed become weak, then fatty, and those that have to be much exerted, hypertrophied.

The first are the chief obstacle to reduction, and their subcutaneous division is indispensable; the second and the third will generally yield to extension without division. The actively retracted, whether fibrous or still muscular, must be divided; the passively retracted may not require more than stretching. The arteries about a congenital luxation are always small and tortuous. There is, therefore, no fear of their being torn in attempts at reduction. The veins do not become so tortuous, but are always large and numerous.

The nerves always go in a straight course, and are often so much shortened, as to constitute a considerable obstacle to the reduction, both by their resistance and by the pain caused by their extension. The cellular tissue is usually abundant and loaded with fat, the skin elastic and exactly fitted to the subjacent parts, and neither of these are likely to form any obstacle to the reduction.

The ligaments and capsules of the joints may be either elongated or shortened—shortened by active retraction, or passively, by the approximation of their insertions, when the luxation has taken place; or, when the insertions are separated, they may yield, elongate, become thin and weak, and exactly adapt themselves to all the changes, in form and size, of the parts which they unite or enclose; a circumstance in which the original luxations may be always distinguished from those that result from external violence. There is a condition in the capsule of the hip-joint, when thus lengthened, which often exists, and forms an insuperable obstacle to the reduction of the dislocation, namely, that, as the head of the femur moves further from the acetabulum, the middle of the tube formed by the lengthened capsule is apt to become constricted, so as to produce a kind of hour-glass contraction.

In addition to these changes of form, the ligaments, like the muscles, suffer also alterations of structure.

In the same circumstances under which the muscles become fibrous, that is, when they are kept *tense and still*, the ligaments become *osseous;* in those in which the former grow fatty, the latter become weak and thin. The degree of alteration is to be considered in connection with the time the luxation has existed.

The head of the dislocated bone is commonly much deformed, but the changes are infinite.

The head of the *femur* is generally decreased in size, and so also is the neck, in general; its sphericity is lost, and generally its cartilage is almost or completely destroyed, becoming dry and grayish, and then gradually diminishing in thickness. When the head is so placed as to become continually pressed against the border of the cotyloid cavity, or against any firm surface, it commonly soon receives a corresponding impression; and a similar influence of local pressure often gives rise to changes in the relations of the head and neck to the shaft of the bone, the latter becoming shorter and more horizontal than is natural.

The articular cavities, such as the cotyloid, for example, in most cases undergo changes exactly proportioned in degree to those

of the heads of the bones displaced from them. They become smaller and more shallow, and are sometimes almost obliterated by the elevation of their bases, and the production of an excessive quantity of cellular and adipose tissue within them; such are the changes where the luxation is complete.

The equality of the above changes may facilitate reduction, but are obstacles to its maintenance. The exception to this equality in the change of structure does not exist when the head of the bone, escaping from its capsule, has come in contact with another osseous surface, so as to be constantly rubbed and pressed upon it; for then a new joint is always found between the two surfaces, and the dislocated head retains or acquires the same size as it would have had in the healthy joint. Both in respect to the bones and articular cavities, the muscles, and other tissues, the *earlier* the attempt at reduction is made, the greater is the probability of success, for the changes are then less, and less fixed in their relations.

The alterations often extend from the luxation over all the neighboring parts of the skeleton. The treatment for congenital luxations embraces: 1. The preparative extension of the retracted muscles; 2. The sub-cutaneous section of those which the mechanical extension has not sufficiently elongated; 3. The continued extension of the retracted ligaments, and, if this be not sufficient, then sub-cutaneous division; 4. The usual manipulations for reduction adapted to each case; 5. A proper consecutive treatment to consolidate the reduction, and then, by passive motion, to complete the coaptation of the articular surfaces, and to restore the normal movements of the joints, (vid. *Recherches sur les Luxations Congénitales, par le Dr. Jules Guérin*, Paris, 1841; also, *London Lancet*, 1841–42, pp. 513, 514, 515; vid. also, Remarks of M. Guérin, supra.)

The Sub-Cutaneous Section for Psoas Abscess, Buboes, Ganglia, and for Melicerous, Adipose, Ætheromatous, and Steatomous Tumors.

It is well known that the great principle of the sub-cutaneous section was long since insisted upon in *psoas* and all large abscesses. Mr. *Watt*, of Glasgow, (according to Professor Hunter of that city, —see *Lond. Med. Gaz.*, 1840–41, p. 21, et seq.,) has introduced this practice for buboes, making the first puncture through the skin with a narrow lancet, then by a grooved needle introduced into this puncture, he carries the point of the latter to the abscess, perforates it, and thus discharges as much of the contents, and as frequently as may be desired, keeping the external aperture in the intervals closed by gold-beater's leaf. Prof. Hunter says very truly, perhaps, that unseemly cicatrices and intractable sores are thereby prevented; but there are certainly, in our opinion, and practice confirms it, sub-cutaneous purulent collections in the groin and elsewhere, and which are caused generally by mercurialization, whether the lymphatic glands are involved or not, which demand free dilatation that they may granulate from the bottom, and which are thus

far more speedily and healthily cured by the stimulus of the air. These will be found (as we have stated above in the text) more especially in old mercurio-syphilitic cases.

Prof. Hunter also asserts that Dr. Cumin, formerly of Glasgow, was among the first to recommend the sub-cutaneous section in ganglia and melicerous tumors, by means of a cataract-needle, and then pressing the fluid into the surrounding cellular tissue. Prof. Hunter advises, in addition, to break down the cyst, as now generally recommended.

He also ingeniously proposes (as we have already ourselves suggested above) the sub-cutaneous section for adipose, ætheromatous, and steatomous tumors, by the cataract-needle, so as to destroy the cohesion of the parts and break up the cyst. Mr. George Macleod, of Glasgow, some years since stated that he had succeeded, in this manner, in dissipating tumors of the eye-lids.

The Sub-Cutaneous Section for Bursal Tumors, Cysts, &c.

M. Velpeau, in a late essay, has drawn more particular attention to this new mode of dispersing these inconvenient and often serious enlargements. This practice, as I have hinted in the text, (vid. supra,) goes to revive the ancient but so often completely successful method of sudden immediate rupture, and often total dispersion and destruction of these cysts by sudden percussion. M. Velpeau's treatise, however, is more especially limited to the utility of this process in sanguineous tumors, (*De la rupture ou de l'encrasement sous-cutané des tumeurs en général, des tumeurs sanguines en particulier*,—vid. *Jour. des Connais. Méd.-Chir.*, Jan., 1844.)

The value of this principle of rupture is of course founded on the long-recognised and well-established pathological principle of the innocuousness and safety of wounds sheltered from contact with the air, and its successes corroborate to the same degree the philosophy and truth of the sub-cutaneous section of tendons, muscles, bridles, &c. Bloody tumors (*des tumeurs sanguines*) are also instantaneously cured by M. Velpeau, by rupturing or crushing them, [i. e., without, of course, breaking the skin,—*T.*,] though they may be of the size of an *egg*, or of the wrist. No dressing is required. The steady downward and utmost pressure of the thumb on a prominent point of the tumor, is all generally that is required, the part affected being placed on a solid plane. If this pressure does not suffice, a plate of wood on the tumor, and a stroke of a mallet, &c. on this, will answer. If any bumps remain, these are to be also crushed. Bloody tumors in accidental cavities are more curable than those in natural ones. The cure requires (M. Velpeau thinks) that the contents of the tumor, thus dispersed in the cellular tissue, should be easy of assimilation. The synovial cyst, though the only one which for ages has been subjected to this treatment, is the least favorably disposed to it of all; for in these the walls of the cavity, unless *compression* is used subsequently, will not adhere, and thus the tumor will be reproduced. The same remarks

apply to *serous* tumors. The *melicerous* (*meliceris*) and the *steatomatous* are refractory, and if burst, the infiltrated matter may expose to suppuration and erysipelas. [We have not generally found the enlarged bursæ, as we have noted in the text, require any other treatment than sudden forcible percussion, in some cases to be slightly repeated, in order to crush the remaining irregular small lumps or fragments of the cyst into which the principal one now seems to be broken, but which in fact are, most probably, caused by the infiltration of the synovial fluid into the neighboring sub-cutaneous cellular tissue. Compression by a roller bandage, or spica, to the joint for example, or merely long strips of adhesive plaster, properly arranged and made to encircle and embrace the part closely, should there be no irritation existing from the blow, should be applied to the part for some ten to twenty days.—*T.*]

M. Guérin's Great Operation.

This master-operation in sub-cutaneous surgery having been frequently alluded to by us, we shall, for greater accuracy, here transcribe the operator's own account (from his *Gazette Medicale* of Paris, Sept. 5, 1840) in a letter, Aug. 31, 1840, to the Paris Academy of Sciences. M. Guérin makes the number of *forty-two* tendons, muscles, or ligaments, requiring twenty-eight openings through the skin. The following were the parts divided:—

Trunk, ...	—Pectoralis major, ...	1
The arms, . .	On each side Biceps cubiti, ...	2
	" " Pronator teres, ...	2
	" " Extensor carpi radialis, .	2
	" " Flexor communis sublimis,	2
	" " Palmaris brevis, ...	2
The forearms,	Tendons of the Extensor carpi ulnaris on each side, ...	2
	" " Palmaris longus and brevis, ...	4
	" " Abductor pollicis, . . .	2
The legs, . . .	The Sartorius — on each side, ...	2
	Biceps cruris "	2
	Semi-membranosus "	2
	Semi-tendinosus "	2
	Rectus femoris "	2
	Fascia lata "	1
	External lateral ligaments of the knee, .	2
The feet, . . .	The Tendo-Achillis — on each side, . .	2
	Tibialis anticus " " . .	2
	Extensor communis " . .	2
	Extensor proprius pollicis " . .	2
	Peronei antici " . .	2
		42

M. Guérin, in his Gazette Médicale for May, 1840, states that he had then already performed upward of a *thousand operations* for the section of muscles or tendons in different parts of the body; which (see supra) up to this time (1844) have been swelled to the number of upwards of *four* thousand. The following is his catalogue up to May, 1840, (including, no doubt, in this number the sections in his great operation—vid. supra:)

1. In the neck—the sterno-mastoideus, cleido-mastoideus, trapezius, angularis scapulæ, splenius, complexus colli, and cervicalis descendens.

2. In the back—the trapezius, (along its entire attachment to the scapula,) rhomboideus, (along its entire attachment to the scapula,) dorsalis magnus, sacro-lumbalis, longissimus dorsi, and transversalis dorsi.

3. In the upper extremities—the deltoideus, biceps, supinator longus, radialis anticus, ulnaris anticus, flexor sublimis, and extensor digitorum communis.

4. In the lower extremities—the psoas and iliacus, (*psoas iliaque*,) adductor-longus, sartorius, rectus anticus, tensor vaginæ, glutei biceps, semi-tendinosus, semi-membranosus, rectus internus, tendo-Achillis, tibialis anticus, tibialis-posticus, flexor communis longus et brevis, extensor longus communis, extensor pollicis, peronei anticus et laterales, plantaris, adductor et abductor digiti minimi.

5. Aponeuroses—fascia lata, and plantaris.

6. Ligaments—sterno-clavicular, scapulo-humeral, coxo-femoral, lateral of the knee, tibio-astragular, lateral and posterior astragulo-scaphoid capsule, and scaphoido-cuneiform scapulæ. [Vid. also, *London Medico-Chirurg. Review*, for October, 1840. See Dr. Darling's table of French and English names of the muscles of the human body, in the beginning of this volume.—*T.*]

Proposed Division of the Hyoglossus and Styloglossus Muscles for Stammering, by M. Velpeau.

At the time the section of the genio-hyoglossus (now mostly abandoned) for this infirmity was first attempted in practice, by MM. Dieffenbach, Amussat, Velpeau, and others, the last-named surgeon, at a sitting of the Paris Academy of Medicine, Feb. 16, 1841, in speaking of a case in which he made the *sub-mucous* division of this muscle, says, that inasmuch as the defect of pronunciation, or stammering, seems to be owing sometimes to one muscle, and sometimes to another, it might be advisable to divide also the hyoglossus and the styloglossus, or even to cut off the *apex of the tongue*. M. Gerdy could not, he said, rely on the section of the muscles, as the infirmity did not depend on an inability to pronounce the vowels and consonants when they are isolated, but upon an inability to unite them together so as to pronounce the words consecutively. The lips, teeth, and tongue, and the apex, middle, and base of the last, and the velum palati, exact for each sound, nearly, varied movements, which do not depend on any one muscle taken

separately. Therefore, the section of this or that muscle cannot cure stammering, (*Archiv. Gén. de Méd.*, 3e sér., tom. x., Mars, 1841, p. 359.)

Contraction of the Limbs in inflammatory softening of the Brain.

In ten cases examined by Dr. Hughes Bennett, lesions of the central part of the brain, on one side, were discovered. The symptoms, during life, consisted of contraction or paralysis of the extremities on the side opposite to the disease. In six cases there were lesions of the central parts on both sides; symptoms during life, contraction or paralysis on both sides of the body. In four cases, lesions of the peripheral parts only existed; this group was characterized by the absence of paralysis or contraction of the extremities, and by either delirium or coma. This paralysis seems favorable to the hypothesis which ascribes motion and sensation to the *central* parts of the brain—intelligence to the *surface.*

This subject has, within a few years, attracted much inquiry in the more exact investigations which have been made of the anatomy of the brain, spinal marrow, and nervous system generally; some contending that more or less rigidity and contraction of the muscles always exists, others, that it is merely incidental, or not at all present. Dr. Bennett, however, is of opinion that, in idiopathic inflammatory softening of the brain, contraction in one or more limbs is a common symptom. In simple hemorrhage into the brain, on the other hand, without the existence of any inflammation, contraction seldom if ever occurs. (See *Lond. Medico-Chirurg. Review;* also *Lond. Lancet*, Sept. 7, 1844.)

It has been generally remarked, for many years past, as I am informed by Dr. John L. Vandervoort, of this city, that, in the practice of the New-York Hospital, with which he has been long conversant, patients in whom there existed a ramollissement of the brain ending in idiocy, almost invariably manifest a constant inclination to place themselves upon the breech, and to draw up their legs under them, until more or less permanent fixed contraction is finally produced.

It is important that the precise relation of cerebral or spinal lesions, or both, with contraction of the limbs, a subject which near two centuries since elicited much inquiry, and more recently, in our own times, has been ably elucidated by Delpech, (see text of our author, supra,) should be clearly ascertained by still more accurate investigation and experiments. For all this class, at least, of contractions of the muscles, seem destined to become a forbidden domain, whose limitations present an almost insuperable barrier to the prospect of success from the use of the tenotome—a class of irremediable deformities, therefore, which should be most carefully discriminated and diagnosed from those in which subcutaneous sections are indicated.—*T.*]

Diseases to which the Subcutaneous Mode of Operating may be extended.

Under this title, Prof. Hunter, of Glasgow, (in an article in the *Lond. Med. Gaz.*, 1840–41, p. 22,) sanguinely predicted, as long ago as at that time, that this principle would, perhaps, be one day extended:

1. To inflammations of fibrous membranes of the body, periostitis, &c., wherever situated, in order to relieve the intensity of congestion, pain, &c., which, in fact, was an ancient practice, with this difference, that it involved the skin. The principle, however, is more rigidly carried out in the acupuncture of the Orientals, in rheumatism, &c.

He would particularly suggest this section in periostitis, paronychia, and other diseases implicating the white fibrous membranes.

2. In inflammation of the skin itself, phlegmonous, circumscribed erysipelatous, scarifying the parts subcutaneously; also in cutaneous eruptions.

3. In hydrops articuli, and purulent effusions into the joints, as in hydrocele.

In reference to the dread of air in the joints, he says: "I have seen M. Jules Guérin frequently cut across the lateral ligaments of the ankle and knee, and penetrate these articulations, in his subcutaneous treatment of deformities of these joints, and in no instance did the slightest bad consequence follow. Guérin, in his lectures, states that he is in the daily practice of performing such operations, and that his practice is not only free from danger, but eminently successful." This practice, however, he remarks, requires the utmost caution, and the smallest possible apertures; and that the apertures in the skin and capsule should be as far apart as possible.

In ordinary tapping for dropsy, Prof. Hunter recommends that the subcutaneous principle be closely adhered to. This, we think, would be a great improvement on the ordinary mode with the comparatively clumsy trochar. He advises a small trochar to be carried for some distance under the skin, before the cavity is penetrated.

4. In varicose veins, he thinks this section by a cataract-needle would be an improvement, as the ligature is apt to cause phlebitis. This suggestion is confirmed, he says, by the less danger of the ligature, when applied to these veins subcutaneously; and we may here refer to a further recent corroboration, in a remarkable cure of a *goître*, at Paris, by this same principle. (See account of this mode, infra, from the late edition of M. Malgaigne's Manuel of Operative Surgery.)

In support of Prof. Hunter's proposition, M. Ricord, of Paris, is cited, as having *twelve times* applied the ligature for varicocele, with perfect success.

5. Finally, in neuralgia, the professor also suggests the subcutaneous section, especially in the division of the fifth pair, to prevent

disfiguration as much as possible; and in the event of the infra-orbital and mental branches being concerned, he recommends introducing small dividing instruments through the mucous membrane of the mouth.—[See M. Guérin, in text, *supra*.]

ANAPLASTIC OPERATIONS.

BLEPHAROPLASTY.

Among those German surgeons who were the earliest after Dieffenbach in the successful treatment of loss of substance in the eyelids, by plastic operations, we have to mention MM. Beck, Schwœrer, and Burow, of each of whom a successful case is given, in Von Ammon's Monatschrift, Bd. 1, Heft. 1. (See also *Archiv. Gén. de Méd.*, nouv. sér., tome v., Nov., 1839, Paris, pp. 368, 369, 370.)

Case 1. That of Professor Beck. The patient, a robust man, aged thirty years, had a cancerous ulceration in the inner angle of the eye, with ectropion, and ending in total destruction of the lower lid. Prof. Beck, following the method of Dieffenbach, made two incisions from the commissures of the lids, one above and outwardly, the other above and inward, so as to include in the lower flap all the parts degenerated towards the temple and nose. The upper lid, on a line with those two incisions, was dissected to a small extent. Two new incisions, setting out from the external and internal extremities of the first, and uniting below upon the cheek, at an acute angle, so as to form with the palpebral border of the lower lid a triangular flap, allowed the opportunity of removing the altered tissues, one portion of which, deeply seated in the inner angle of the eye, had to be dissected with care. A new incision was then made horizontally from the outer angle of the eye towards the temple, and prolonged to an extent equal to that of the base of the bleeding triangle; the flap included by this and another incision, directed downward and inward towards the cheek, was dissected with caution, and placed upon the triangular space formed by the loss of substance, which it exactly filled. This flap was first attached at the inner angle of the eye by means of a suture, the needle being directed downward and outward, upward and inward; afterwards it was attached at the outer angle and base. A complete union and cicatrization of the wound of the cheek were effected at the expiration of some weeks. Perceiving then that the external palpebral commissure had too much extent, an incision was made at the outer angle of the eye, and the conjunctiva drawn and attached by suture, upon the upper border of the solution of continuity, making a continuation with the upper lid, while a layer of cellular tissue was applied to the lower border. The separate cicatrization of those two borders,

and their adhesion to the parts with which they had been placed in contact, fully carried out the objects of the surgeon and effected a complete cure. The lids now had their normal extent and direction; the lower was not inverted by entropion, its free border was pliable, and in no way impeded the ball by its contact. The cicatrix on the cheek was scarcely visible.

Case 2. That of Prof. Schwœrer. A scrofulous tumor on the free border of the upper lid of the right eye of a child aged nine years, produced excessive pain and severe inflammation of the conjunctiva. The tumor attained the size of a nut, and was accompanied with an ichorous bloody discharge of a cancerous character. The base and inner fourth of the lid were sound, while outwardly the degeneration extended to the palpebral commissure. The professor made an incision above the free border of the lid, to the extent of the three outer fourths of its length. The two extremities were united by a second incision which was curvilinear, with its concavity downward, and comprising all the degenerated portion, which was completely removed. To supply this deficiency, a flap, setting out at the outer angle of the eye, was cut above the eyebrow, and placed between the lips of the wound. The union was effected by second intention, and the cure was complete. The new eyelid was well formed and moveable.

Case 3. That of Dr. Burow, of Koenigsberg. A venereal affection of ten years' standing, in a man aged fifty-four years, had destroyed many of the bones of the face, and caused obstinate ulcerations, which produced much mischief to the left eye, and total destruction of its lower lid, with the exception of a small portion, which remained undiseased, at the inner angle, but which was in a state of ectropion, and so much drawn down that the conjunctiva was completely everted, (*dédoublée.*) The upper lid at the outer angle was also drawn downward by cicatrices in the same manner. The globe of the eye was the seat of a permanent inflammation. Dr. Burow, adopting the method of Dieffenbach, with some modifications, first excised a great portion of the conjunctiva which was altered, leaving thus a bleeding surface extending from one angle of the eye to the other, then cut upon the cheek a flap, whose pedicle was towards the nose, and, having adjusted it in its place, fastened it by three twisted sutures. The cure was complete on the fourteenth day, and the new eyelid perfectly fulfilled its functions.

A new and rather ingenious process in blepharoplasty for ectropion was proposed by M. Bérard, jeune, at the sitting of the Paris Academy of Medicine, Nov. 2, 1841. (Vid. *Archiv. Gén. de Méd.*, 3^{e} sér., tome xii., Nov., 1841, p. 387.) In the removal of a cancer from the cheek of a female patient, two years before, he was obliged to destroy the canal of Stenon. Cicatrization, however, took place without a salivary fistula. The retraction of the cicatrix, however, produced a traction and eversion of the outer part of the eyelid on that side. M. Bérard made a vertical incision at a centimetre from the outer angle of the lids, and three to four centi-

metres in length; the inner lid was detached from the cheek-bone, and the lids thus liberated assumed their normal state. He took his flap from the temple, and reversed it upon the vertical wound. The operation was successful, and the ectropion disappeared *almost* entirely. The woman having afterwards died of a visceral affection, the autopsy showed the union of the flap to the tissues to have been complete. The absence of a salivary fistula after the section of the canal of Stenon, was explained by the *transformation* which the *parotid gland* was found to have undergone into adipose tissue. This may have taken place after the section, or before, in consequence of the cicatrix of the cancer.

New Suggestions for Rhinoplasty.

Mr. William Keith, one of the surgeons of the Royal Infirmary, Edinburgh, dissatisfied with the shrivelled, unnatural, and bloodless character of most new noses, proposes, as practised by him in a recent operation, (See Cormack's *Lond. and Edinb. Month. Journ. of Med. Science*, Feb., 1844,) to make the pedicle of the flap not only unusually broad and thick, (say fully one-third of an inch wide,) but also to leave it undivided, and to agglutinate permanently to the cutaneous tissues beneath it, in order to have a better circulation and more nourishment to the flap. This latter result was effected, as had been previously recommended by others, (vid. text, supra.) by causing the pedicle to adhere to the root of the nose by rawing, (i. e., abrading,) by means of cantharides plaster, the two opposing surfaces. This plan of bringing the cutaneous abraded surfaces of the pedicle and root of the nose together does not, to us, appear as well calculated to effect extensive vascular inosculation as that which has been proposed, of cutting out for it a suitable groove on the root of the nose under the pedicle, and fastening it or imbedding it there in the bloody tissues. (Vid. our author in the text, supra.) This nose, however, of Mr. Keith's construction was, he says, *full, plump, and prominent* several weeks after the cicatrization and attachment were complete.

It came near being frozen one cold night, as the operation was imprudently performed in winter.

Cheiloplasty in Cancerous Lips.

Should the degeneration of parts be so great on the lower lip, for example, as to involve the muco-buccal membrane, and prevent our adopting the new method of M. Serre, of Montpellier, (vid. our notice of his recent excellent work, infra,) viz., dissecting off that membrane to cover the border of the new lip, we think it might be advisable in some cases to follow a mode practised in 1841, (April 5,) by Professor Andrew Buchanan, of the University of Glasgow, (see *Lond. Lancet*, 1841–42, p. 79–82.) The carcinoma being removed from the lower lip by an elliptical incision convex downward, and extending from commissure to commissure, the loss of

substance was restored by taking two flaps from the chin, each bounded by a curvilinear incision, which began at the median point on the border of the cut lip, and slightly curved as it proceeded downward to near the outer side of the indentation on the chin. From this last point a longer and straight incision, being the exact radius to the curvilinear, extended outward and upward to near an inch from the angle of the mouth. These flaps, dissected off and rotated on their radii, exactly filled up the space left, and formed an excellent lip, so that "*a perfect mucous membrane*," says Prof. B., "*lined the upper margin and inner surface of the flaps forming the lip.*" The flaps were secured by the twisted suture, adhesive plaster, and bandage. Two narrow triangular spaces, pointing outward, were left on each side the depression of the chin, in place of the flaps removed.

Early and successful Operation for Geno-Cheiloplasty, by Mr. Lisfranc.

In the ingenious and highly important plastic operations undertaken at an early period for the reparation of the lips, we mention with pleasure those of *M. Lisfranc.* As early as the summer of 1840, we have a case, aged fifty-five, of this eminent surgeon, wherein the destroyed parts, including the whole of the lower lip and part of the cheek, (from, as it appears, a papulous eruption treated by arsenical preparations,) were completely restored by a flap from the neck. The operation was performed June 28, 1840, by commencing with a semilunar and two horizontal incisions, which removed the whole of the diseased edges, the vascularity of the cut surfaces requiring torsion for ten small arteries. The next incision was along the median line of the neck to the thyroid cartilage, and dissected back a flap at either side. Diseased portions of the alveolar process were removed by the bone nippers, and several of the teeth also extracted. The projecting angle of the symphysis was removed by a saw, to prevent its protruding between the flaps. The flaps were perfectly adjusted by fourteen pins with twisted sutures. In three days all the pins were removed, except at the angles of the wound. A slight erysipelas on the neck, small abscesses at the angles of the mouth, and one below the chin, especially the latter, from the purulent sub-cutaneous infiltration it caused in the neck, gave some trouble; counter openings to the outer side of each jugular vein were found useful; after the removal of some dead cellular tissue from one of these openings, the erysipelas immediately subsided, and the purulent excavations became filled up with granulations. The cure was complete, (vid. *Gazette des Hôpitaux*, Aug. 20, 1840, Paris; also *Lond. Lancet*, 1839–40, p. 879.)

[The *geno-cheiloplastic* operations, however, of Dr. Mott given above, with plates, (performed in 1825 and 1831,) so far as priority is concerned, were probably among the first ever performed anywhere, especially that at the New York Hospital by this surgeon,

about the year 1825. Though the flap operations in all reparations of the face, however great the loss of substance, (as will be seen farther on,) are now entirely superseded by the French method of *déplacement*, it is, nevertheless, proper to chronicle these early and bold successes of eminent surgeons, in what now already may be called the rude period of anaplasty.—*T.*]

Anaplasty applied to the Operation for Hare-Lip.

M. Malgaigne, (vid. *Journal de Chirurgie;* also *Lond. Lancet*, Aug. 31, 1844,) to remedy the disagreeable depression which generally remains on the free border at the median line, after the operation of hare-lip, proposes that the paring should be commenced from above, and carried downward, the operator stopping when he has arrived so low that but a small pedicle remains. This is to be done on both sides. By this means we obtain two small flaps, which merely adhere to the lip by their pedicle. After uniting with pins the two sides of the labial division in its entire length, except at the lower extremity, the small flaps are turned downward, and placed in juxtaposition. The surgeon, having formed his opinion as to the length which they ought to retain, in order to form a substitute for the natural median prominence, then shapes them as he thinks fit, preserving a greater or less portion, according to the extent of the deficiency which he has to supply. He then completes the reunion by uniting the two flaps by means of a suture or two, or a very fine insect pin. If the pin or suture is placed very near the free edge of the lip, the cicatrix subsequently appears scarcely visible. The operation has been twice performed—once by the author, a second time by M. Guersant. M. Malgaigne states that in his case the operation was perfectly successful, but in M. Guersant's the median tubercle appears to have been rather too large. M. Huguier proposes to use the scalpel instead of the scissors.

[In relation to the above, Dr. Mott remarks: "That the object proposed by M. Malgaigne appears to be to remedy a small notch or deficiency, which often is, but never should be found to exist, when the ordinary mode of operating for this deformity is properly and judiciously performed; which mode is: 1. To remove, by a smooth cut with the scissors, a sufficient amount of the lip on each side, in order to take away all the flare; 2. To make the lowest stitch pass close to the vermilion border, and entirely through the lip, and *always* to tie the knot *on the vermilion border*, so as to adjust with great accuracy the coaptation of the lower edges; in fact, the making of the knot there keeps them adjusted. It may be asked how it is possible to unite the outer edge of the peduncular flaps, proposed by M. Malgaigne, so as to fill up the flare of the lip, inasmuch as it is bringing a natural surface to a natural surface; and if pared, they would render, we fear, the lip much more irregular than by the usual method."—*T.*]

The editor of the Gazette Médicale of Paris, (June 8, 1844,

tom. xii., p. 372,) in noticing this operation of M. Malgaigne, (as published in the *Journal de Chirurgie* of Paris, Jan., Fév. et Mars, 1844,) does not seem to attach much value to it. The difficulty is, he thinks, in giving the normal thickness to the vermilion border, and the danger of making the lip too long. He suggests this modification of the hare-lip operation, viz.: to pare the edges in a curved manner, so that their concavities may face each other.

Anaplasty for Ranula.

M. Jobert (vid. his first memoir to the Paris Acad. of Sciences; also his second memoir to the same, Aug. 28, 1843, in the *Gaz. Méd.*, Sept. 2, 1843, tome xi., p. 562) has applied anaplasty, in two cases, with complete success for the radical cure of ranula, (*grenouillette.*) He confines this disease exclusively to the tumor formed by a collection (*amas*) of saliva from engorgement, caused by obliteration or obstruction of the canal or duct of Wharton. Much difficulty has arisen, and many failures in the treatment been produced, from the carelessness of surgeons confounding with this disease other tumors which may form in the same place. Yet these last, he also thinks, will have most chances of cure by his anaplastic method.

Anaplastic Operation for the Cure of a Cicatrix from Burn.

In according to our countryman, Professor Mütter of Philadelphia, the honor of having first ingeniously and happily applied the principles of anaplasty for the cure of cicatrices from burns, we have unknowingly, but, as it will appear, innocently done injustice to Mr. H. D. Carden, surgeon to the Worcester Infirmary, England, who, by a paper of his inserted in the *Transactions of the Provincial Medical & Surgical Association*, vol. xii., London, 1844, p. 585 et seq., but, as far as we can learn, never before published or announced, appears to be entitled to all the honors of priority in this new treatment, having performed the operation on a case very similar to those of Prof. Mütter's, as early as November 1, 1839; while the *first* case of Prof. Mütter's was not performed until Jan. 12, 1841, (see *The American Journal of the Medical Sciences*, by Dr. Hayes, new series, vol. iv., Philad., 1842, p. 66 et seq.)

The case of Mr. Carden, was a girl by the name of Mary Ann Barnett, aged fourteen, who was admitted, says Mr. C., into the Worcester Infirmary, Sept. 9, 1839. The burn which occasioned the deformity, occurred on the anterior and upper portion of the neck about seven years previous. "The movements of the head (by the large cicatrix formed) are (says the surgeon) greatly restricted, the mouth remains permanently open, the tongue protrudes, the lower incisors project horizontally, and there is constant salivation. On attempting to raise the head, the eyelids are drawn considerably downward. The patient, as well as her friends, being most anxious to have something done for her relief, a consultation was held upon the case, when it was admitted that the

experience of modern surgical authorities was not in favor of such attempts; and that where excision of the cicatrix had been practised, the deformity had generally been increased rather than otherwise. Under these circumstances, a *new mode of proceeding was suggested*, which, on explanation, was sanctioned by my colleagues, and performed, November 1, 1839, in the presence of and assisted by Messrs. Sheppard and Pierpoint, surgeons to the hospital, Mr. Cole, house-surgeon, and the pupils. A contrivance for keeping the head erect during the after treatment of the case, had previously been provided.

"The patient being placed on a well-cushioned table, with her head and shoulders somewhat elevated, I commenced the operation by carefully gathering up the cicatrix from below the left ear to the top of the sternum, between the fingers and thumb of the left hand, which enabled me to transfix and divide the whole of that side at a stroke; the same was repeated on the right side, and a short cut over the top of the sternum connected the two incisions. In this manner the whole transverse extent of the cicatrix was rapidly divided, the wound terminating in sound skin on each side. The chin was then drawn upward by an assistant, and every tense band of cicatrix successfully divided by repeated strokes of the scalpel, until the head was released into nearly its natural position. By this mode of dissection, although nothing had been removed, the hiatus produced was very great, *and extended from above the chin and edge of the lower jaw, to below the upper border of the sternum*, exposing the greater part of both sterno-mastoid muscles, and external jugular and thyroid veins, the latter being particularly large and prominent. The quantity of blood lost was very trifling, scarcely requiring the torsion forceps. As soon as all bleeding had ceased, I proceeded to select a *portion of sound skin on each side*, about three inches long and two and a half wide; these were raised and detached, except at their junction with the outer edges of the wound, and brought together across the centre of the neck, and there united by hare-lip needles. The side-wounds left by the flaps were then brought together, and the exposed parts covered with lint. The flaps were carefully supported by adhesive plaster, leaving apertures for the points of the needles, and the whole of the wound and surrounding integuments were well supported by long plasters and bandages.

"She bore the operation, which was severe and necessarily protracted, with great fortitude, and without fainting, and went on favorably. The needles were withdrawn two days after the operation; the dressings were not removed until the sixth day, when the flaps were found to have retained their position; but *the upper border of each, being composed of old cicatrix, had perished, diminishing the breadth of each to less than two inches.* The complete healing of the wound occupied nearly twelve months, during which time *various contrivances, in addition to that first used, were had recourse to for keeping the head in the erect position; but the bodily and*

mental suffering was so great, each time the wound was dressed, from these repeated stretchings, that I discontinued them altogether.

"She was made an out-patient in May, 1840, and in November following she presented the following appearances:—Wound healed; position and movements of the head greatly improved; can close the mouth, retain the saliva, and articulate distinctly; teeth regaining their natural position. *A narrow cord has sprung up between the flaps*, which threatens to draw down the centre of the lower lip, and also to prevent the farther expansion of the flaps, which has hitherto been steadily going on, and forming the most satisfactory feature of the case.

"I passed a curved bistoury under this and divided it, enjoining pressure and farther extension; but from that time she avoided attendance at the hospital, and neglected all directions, and I saw no more of her until October 23d, 1843, when I sent for her and made the sketch figure 4, [in the work cited.] She has become stout in person, has enjoyed good health, and is very grateful for the improvement gained. The teeth are quite upright, and I regret that one was extracted before the operation, although at that time it appeared hopelessly displaced. The flaps now measure three inches on the right side, and two inches and three quarters on the left, from above downward; but there is an *increased contraction in the central cord*, which is strongly marked in the sketch. This she has consented to have divided and separated from the flaps, which may then, I trust, be permanently united, and her appearance considerably improved.

"Four years having elapsed since the operation, a fair estimate may now be formed of its merits. I should, however, have considered it premature to submit it to the notice of the profession, until further trials in my own practice had rendered the subject more complete, had not my attention been called to an interesting paper by Dr. Mütter, of Philadelphia, in the *American Journal of Medical Science*, the result of whose operations, undertaken at a subsequent period to that above detailed, appears fully to establish the value of the flap method, or, as Dr. Mütter calls it, the 'autoplastic operation,' in these very distressing deformities."

We have given the above in detail, because it is related with a degree of candor becoming the dignity of the profession, and the courtesy which should never be forgotten in the emulous and honorable rivalry for distinction.

Mr. Carden, in the concluding portion of his paper, fully concedes to Dr. Mütter the superiority of his method in completely excising the cicatrix, dividing one or both the sterno-mastoid tendons, and making use of a sufficiently large flap in the beginning.

The very diminutive flaps, not making allowance for subsequent contractions, was the principal defect of Mr. Carden's operation, and the cause of the difficulties which ensued; others were the leaving a portion of the cicatrix on the borders of his two small flaps. Hence the gap, the new cord, &c.; all of which he has very ingenuously admitted.

Remarking on Dr. Mütter's proposed modification, by taking, if necessary, *two flaps* instead of one, as Mr. Carden did, the latter says he finds, by a curious coincidence, that he also, in his notes of his own case, (Nov., 1840,) had also, without then knowing of Dr. Mütter's case, suggested the large single flap which that surgeon used in his first case, thus:—"In a future operation, I should endeavor to procure more complete union between the flaps in the centre, or (which, perhaps, would be better) should, if possible, cover the whole hiatus with a single flap." On this point he prefers the operation of Dr. Mütter. "In future, (says Mr. Carden,) I should avoid the inconvenience experienced in my case, and which is very apparent on looking at figure 4, of a cord springing up in the centre, by making the flap, or flaps, if taken from each side, sufficiently long to reach across the neck."

Mr. Carden also, from what he has related in this case, properly condemns, in unqualified terms, the use of *extension* apparatus, and which (as is seen supra, in the text) Mr. James, of Exeter, much enlarges upon the advantage of in these cases, even after the Mütter operation has been performed.

It appears, therefore, that there can be no difficulty in *adjusting* the respective claims of the English and American surgeon on this subject. Inasmuch as the merit of priority in first suggesting and partially carrying out this now most invaluable improvement in autoplastic surgery, in a large class of distressing deformities that have for centuries baffled the greatest minds in our profession, belongs unquestionably to Mr. Carden. While the full and entire honor of establishing, by a most skilful and successful process, the value of this operation, is to be as unhesitatingly accorded to Prof. Mütter.

To both surgeons the profession owe much; and but for the perfection of the process by Dr. Mütter, we should, from the creditable modesty of the gentleman who first originated the idea of this operation, not have had an opportunity, probably, of chronicling this present record in behalf of the *priority* which belongs to his share in the matter.

Uretroplasty.

The new process proposed by M. Segalas, in a letter to M. Dieffenbach, 1840, and which was brought before the notice of the Paris Academy of Sciences July 26, 1841, (vid. *Journal des Connais. Méd.-Chir.*, Sept., 1841,) does not, nevertheless, appear to have been generally adopted. M. Segalas had considered, very properly, that the chief cause of failure, and of non-union in reparations of loss of substance in urethral fistulas, &c., was the difficulty of preventing the infiltration of urine through them. This he imagined he could obviate, by "temporarily diverting the urine from its natural course, by opening for it a free exit (*une large issue*) in the perinæum, and in conducting off the urine through this passage by means of a catheter." In 1841, M. Segalas furnished, for the con-

sideration of the Academy, a case in support of his method. The patient had all the intermediate portion of the urethra between the scrotum and glans destroyed by gangrene. The process of the surgeon named was completely successful. M. le Docteur Ricord had also succeeded equally well in another case. In a third case of M. Segalas, the fistula was in the anterior part of the urethra, with great loss of substance; and it was for the purpose of inspecting the process of M. S. in this case, that he solicited a commission of the Academy, which was granted. Their report on the subject (if ever made) we have not been enabled to find.

Episcoraphy, or Episcoplasty.

This operation, which consists in dissecting off each labium with a small portion of its mucous surface, and then uniting the raw edges of the tissues by strong sutures, as recommended by Dr. Fricke, of Hamburg, and which, in fact, virtually sews up the passage, excepting for the mouth of the urethra, was performed in 1841 by Mr. Lightfoot, of Newcastle-on-Tyne, (Eng.,) for prolapsus of the bladder with the anterior wall of the vagina, producing a tumor protruding through the vulva, (*Lond. Lancet*, 1841–2, pp. 322, 323.) It is unnecessary to say that the remedy must, from moral considerations, and the physical obstacles it creates to the functions of the parts, be worse than the disease—and can only be justified in such extreme cases as that of Mr. Lightfoot, and in which the success was complete.

Penoplasty, or Exsection of a portion of Hypertrophied Penis, and Transplantation of the Glans Penis on the Stump.

An American surgeon, Dr. Mettauer, of Virginia, (see *American Journal of the Medical Sciences*, July, 1842,) has the credit, we believe, of being the first who has ever performed the operation of patching and repairing a deformed useless penis by exsection, so as to make a new organ thereof, for all the functions required of it, and which process may be called *penoplasty*.

A young man, aged nineteen, came under Dr. M.'s care in 1841. His penis was eight inches in length from the scrotum to the extremity of the glans, in a non-erected state; the anterior three fifths dilated laterally, flaccid and non-erectile, with great expansion of the corresponding portion of the urethra—the latter being capable of containing two ounces of fluid, the cavity which it formed being bounded anteriorly by the concave glans. The other two fifths, or pubic portion, constituted the stump of the organ, and was well formed and capable of erection. The orifice of the urethra opened upon this, forming a sort of *os tincæ*, looking into the cavity above described. There was also a fistulous opening in the perinæum, from which most of the urine escaped, anterior to which the urethra for eight lines was nearly impervious. There was an artificial fistulous opening, also, in the central portion of the pouch-like

portion of the urethra above described. The testes were large, and strong sensual desire existed.

Dr. Mettauer laid open the pouch by an incision along the raphe. A belt was then removed from the interior of the cavity. seven lines in width, entirely round the base of the glans, and quite to that organ, so as to leave that part of the wall of the pouch to consist only of integument and cellular membrane. A like belt was removed from the inferior portion of the pouch, quite down to the circumference of the face of the erectile stump, which was then carefully denuded in every part of it. *The glans was placed with great care upon the face of the stump*, taking care that the denuded margin at its base should exactly correspond with the circumference of the opposed surface of the stump. A short bougie was passed in the meatus, and carried to near the contracted portion above mentioned. This holding the glans in position, the latter was fastened to the stump by eight points of the Glover's sutures. The loop-like tegumentary intermedium on the dorsum was reduced one half, leaving the other to nourish the glans. On the twelfth day, the glans had firmly united to the stump. The superfluous tegument was excised a few months after. The new penis was full two inches long, and comely in shape ; and the glans, which after the operation lost its sensibility, had now recovered it, so that the organ could perform its proper functions, being, when erected, four and a half inches long. The interruptions in the urethral passage were removed by a long trochar, and the passage then kept open by a bougie, and the fistula healed by suture. The success was complete.

ARTIFICIAL JOINTS—EXSECTION OF ARTICULATIONS.

The Elbow-Joints and the Knee.

M. Velpeau, in the text, has placed under the general head of *reparations and restitutions*, not only the legitimate and extensive class of anaplastic operations and sub-cutaneous sections, but also the rupture or the exsection of an angular callus or anchylosed joint, the making of an artificial joint in the bony structure of the body of a limb, after the example of Dr. J. Kearny Rodgers, of New York, and the operation of exsecting a wedge-shaped segment from the bones of the leg, in order to give perpendicularity to the plane of its axis, after the ingenious and original method of Dr. J. Rhea Barton, of Philadelphia. Had this plan been carried out by M. Velpeau, he might, perhaps, have treated in that place still more *in extenso* of other deformities of the bones and joints in which such reparations are required. He has, however, gone more largely into the department of *exsections* of bones, in his second volume.

We will, however, as the subject is one of great interest, recur briefly in this place to the operation of *exsection of joints*, which, in

the matter of that most useful and important articulation, the *elbow*, more particularly, has been of late years improved upon to such extent, by Mr. Syme, of Edinburgh, and others, as to give this operation an inappreciable value, in the unexpected success which has attended it in the *restoration* of the movements and other functions of the whole arm.

As early as 1826, Mr. Syme (as he informs us in a late interesting paper in the *Lond. and Edinb. Month. Journ. of Med. Science*, for August, 1844) published his first paper on the *excision of the elbow-joints;* and, in 1829, this surgeon recorded three cases by him of excision of the elbow-joint, (See *Edinb. Med. and Surg. Journ.*, 1826 and 1829,) thus recalling the attention of the profession to what had long since been performed (but in a far less perfect manner) by Moreau, Baron Percy, and others. Since then, M. Roux and Sir Philip Crampton, and others, have performed the same operation; but in 1831 Mr. Syme published a treatise on the subject, wherein he recorded *fourteen cases* of this operation.

In his last paper above referred to, (*Lond. and Edinb. Month. Journ. of Med. Science*, Aug., 1844,) he describes two additional cases, with a greatly improved mode of operating. In one, a young man aged eighteen, the operation was performed June 28th, 1844. The elbow had become inflamed and enlarged, from the maltreatment of a bone-setter, and finally ended in a continued suppuration from the joint.

The operation was performed by his usual mode. The articulating surfaces of all the bones, being divested of cartilage and carious, were exposed in succession, and removed by the saw, which Mr. Syme prefers to the cutting pliers. The case went on kindly, and the parts soon healed. Such was the entire restoration of the functions of motion, that the patient was enabled to return to his occupation of "skinner."

The next case was that of a woman aged fifty-three. The joint had swelled to a great size, and gave such severe pain on the least motion, that she was obliged to keep it at rest. A suppurating drain here also took place from the joint, and gave some relief. The disease then remained stationary. The elbow could not be extended beyond a right-angle. The operation was performed Nov. 15, 1844, by cutting out the articulating extremities, which were completely carious. The soft parts, being unusually sound, healed quickly, almost entirely, by the first intention, so that the patient was dismissed quite well on December 18th following, and soon after was enabled to employ herself in *knitting stockings.* Mr. Syme claims to himself the merit of having been the *first to improve the operation* so as to *make it of practical utility.* Thus before his paper, (1826,) "no distinction had been drawn between the *truly carious portion of bone, which alone requires to be removed, and the effusion of new osseous substance*, which causes an irregular thickening of the bone considerably beyond the extent to which it is diseased. In consequence of thus confounding the sound and morbid parts, much more was taken away than required removal,

and the cure was not only greatly protracted, but rendered much less complete than when the operation is properly performed."

Excision of the elbow-joint, for a caries of the humero-cubital articulation, was successfully performed, in 1841, by M. Robert, of Paris, on a woman aged twenty-six. The operation appears to have been performed upon the principles enforced by Mr. Syme, in his cases, as the only secure basis of success; but whether Mr. Syme had already announced his process before M. Robert operated, we are not enabled to say. This process (as is seen in Mr. Syme's cases, related above) consisted in sawing as close to the articulations as possible—in this case, immediately above the condyles of the humerus, and below the coronary process of the ulna and articular extremity of the radius. The limb was immediately placed in the apparatus of M. Guizot. A tedious suppuration continued for eighteen months, after which (it being found impossible to approximate the divided bones) a *dense but very flexible tissue*, when the arm hung down, was perceived to have been formed in the intervening space, occupying an extent of three fingers' breadth, and allowing the fore-arm to move freely in all directions. But when flexed, this space was effaced by the extremities of the bones mounting up and finding a fulcrum on the humerus. Thus the patient could easily carry the hand to the head and opposite shoulder, and raise a chair. Pronation of the hand could be made in a moderate degree; but the movements of the fingers were perfectly free, and she could, with some degree of force, grasp with her fingers and hold in her hand bodies of small size. She was enabled to resume her occupation of a seamstress, sewing with her left hand, and fixing and holding her work with the right, and relieving the right arm of fatigue by wearing two pieces of leather, the one embracing the upper, the other the fore-arm. (*Séances de l'Académie des Sciences*, and *Lond. Med. Gaz.*, 1841–2, p. 654.)

Exsection of the Elbow-Joint, in the United States.

The following two cases occurred in the service of Dr. Gurdon Buck, at the New York Hospital. I am indebted for them to my friend John L. Vandervoort, M. D., of New York.—*T.*]

Excision of the elbow-joint, in a case of suppuration and caries of the bones, by Gurdon Buck, M. D., surgeon to the New York Hospital. The patient, a seaman twenty-five years of age, of robust health, was admitted into the New York Hospital on the 10th of June, 1841, with inflammation of the right elbow, which had commenced spontaneously six months before, with pain in the joint, followed in six weeks by slight stiffness, which did not prevent the use of the arm until two months prior to his admission. On admission, the arm was in an extended position, the joint stiff and painful on attempting motion. Cupping, blistering, and the actual cautery were tried, but without success. In August, an opening formed over the outer condyle, and discharged a large quantity of yellowish-white matter. Up to January, 1842, no im-

provement took place. The condition of the limb now was as follows: it was kept at a right angle in a sling, and admitted only slight motion at the joint; there was considerable swelling about the elbow, above and below, and the limb was much wasted; there was an opening of the size of half-a-dollar over the outer condyle; the head of the radius was exposed, and could be rotated; the bone was carious; along the inner margin of the joint there were two small openings, and there was abundant discharge with synovia.

Operation, Jan. 16th, 1842. A transverse incision was first made across the triceps muscle at its insertion, with a straight bistoury, introduced at nearly a finger's breadth above and on the radial side of the inner condyle, and carried down to the bone, the point of the bistoury emerging at the outer condyle, and the edge kept close to the olecranon process. Two longitudinal incisions were next made; the whole together in form of the letter H. The olecranon process, being freed from its muscles, &c., was sawed about two-thirds through, an inch and a quarter from its extremity. This section, from the extent of the disease above the external condyle, was made to include one inch of the extremity of the humerus on its outer edge, and half an inch on its inner. Nearly half an inch of the radius was then sawed off. All the soft parts were infiltrated and thickened. The case, excepting an attack of erysipelas, progressed favorably, and the patient left the hospital in March, much improved. He now (October, 1844) is able to use his fore-arm in his usual occupation, an hostler, nearly as well as any of his co-laborers. The principle of Mr. Syme appears to have been here as closely adhered to as possible.

A second case analogous to the former was admitted into the hospital, June 6th, 1844, and was operated on in the latter part of July. An incision was made from the middle of the olecranon, three inches upward, and carried the same length downward along the fore-arm. The triceps tendon and muscle were next raised towards the outer condyle. The olecranon process being denuded, more than an inch was sawed off; an inch and a half was then removed from the lower end of the humerus; subsequent to this, the end of the radius, as well as the articular surface on the side of the olecranon, were removed. After the operation the arm was laid on an angular splint, which was suspended from the ceiling. This case, like the former, has progressed favorably, and the parts are now nearly restored to a healthy condition. The principle of Mr. Syme here also formed the basis of Dr. Buck's process.

Exsection of the entire Knee-joint, for Anchylosis.

A case of anchylosis of the knee-joint of seven years' standing, the result of a wound made by an axe over the inner condyle, was recently admitted into the New York Hospital, and an operation performed in the month of October, 1844, by the same surgeon, Dr. Buck, with the view of straightening the limb, which was bent at a right-angle.

A T-incision was made in front, the extremities of the bones exposed and sawed off, including a portion of the patella, the condyles of the femur, and the head of the tibia, as near the articulating surfaces as possible. The sections formed together a wedge-shaped segment. The details of this case, and which we merely allude to now, as being the first of its kind ever performed in this country, we hope to be able to give in its more appropriate place in the second volume, under the head of Exsection of Bones. We will only remark, that the wedge exsected was made narrow and acute, the apex pointing posteriorly, in order that the consolidation might bring the leg into slight flexion upon the thigh, so that its shortened length would be compensated by the extension of the foot bringing the metatarso-phalangeal articulations to the ground. [This case is still progressing favorably, Nov. 15, 1844.—*T.*]

In regard to the elbow-joint, we have the authority of Dr. Hayes, in his excellent American Journal of the Medical Sciences, (Oct., 1842, vol. xxx., p. 517,) that the *first operation for exsection* [not *resection*, the word here commonly used, for that means that there has been a previous section—*T.*] of the *elbow-joint* in this country, was that described in the same journal, for Feb., 1837, p. 341 et seq., as performed by Dr. Thomas Harris, (surgeon of the U. S. Navy,) in June, 1835.

The above case of the total exsection of the knee-joint, was made as close as possible to its articulating surfaces, these being sound, and thus admitting, to their full extent, Mr. Syme's injunctions on the exsection of the elbow-joint. Should it terminate successfully, as there is every reason to hope from the present favorable symptoms, we believe it will be the first case on record which has so resulted, and will therefore be a notable triumph for the operator, and for American surgery. We are sustained in the opinion that this exsection has never been successfully performed, from this remark of Mr. Syme: "Though experience has not yet fully decided whether the limbs that might be preserved by *cutting out* the KNEE and *ankle-joints*, would be preferable to the artificial substitutes which may be worn in their stead, it seems PRETTY WELL ASCERTAINED THAT THEY WOULD NOT." Similar objections, also, he makes to exsection of the *wrist-joint*. (*Principles of Surgery*, by James Syme, F. R. S. E., &c., third edition, 1842. See also, *Lond. Medico-Chirurg. Rev.*, Jan., 1843, vol. xxxviii. p. 185.)

ANAPLASTY, AS APPLIED TO THE DEFORMITIES OF THE FACE.

Since this work has been going through the press, we have had an opportunity of examining the interesting volume recently published at Montpellier and Paris, 1842, by Professor Serre, of the University of Montpellier. This invaluable contribution, being the first elaborate and regularly-systematized work on the whole of that extensive and most important class of deformities to which

anaplastic surgery is so happily applied, those of the face and features, is entitled, "*Traité sur l'art de restaurer les difformités de la Face, selon la méthode par déplacement, ou méthode Française.* Par M. Serre, *Professeur de clinique chirurgicale à la Faculté de Medecine de Montpellier*," &c. It is accompanied by a beautiful quarto atlas, of thirty lithographed plates, representing a hundred and fifty figures of anaplastic restorations, effected upon the nose, cheeks, lips, corners of the mouth, eyelids, eyebrows, &c., for cancerous affections, contractions and losses of substance from syphilis, burns, &c., all of which are delineated in an excellent and perspicuous style of execution. They present, it may be truly said, perfectly arranged diagrams and outlines of incisions, combined and adjusted on true mathematical principles, as well in relation to the shapes and forms of the voids or chasms of the destroyed parts to be embraced by the flaps of those incisions, as in relation to the composition of forces which are afterwards to come in play upon those reparations, by the tractions in various directions resulting from the processes of agglutination and cicatrization, so as to produce the most perfect degree of coaptation of the new tissues, and as near a resemblance to the previous normal condition and position of the parts as possible.

We look upon this work, indeed, of M. Serre, as one which displays a masterly talent and tact in this delicate mechanical department of surgical science, more especially by the *ingenious application which he has made of sound mathematical principles in the composition of forces to the laws which govern the restitution of parts in organic life.* This will be seen to be beautifully illustrated, by inspecting his diagrams of incisions, and noting the truly scientific manner, we repeat, in which he arranges their outlines, so that they may all combine harmoniously in the process of cicatrization and agglutination; by which exact calculation the different kinds of flaps, whether angular, rectilinear, circular, or elliptical, are made to come together, or to dove-tail, as it were, into nice, accurate, and natural coaptation, with the corresponding spaces left by the diseased parts which have been excised and freshly pared.

We deem this part of anaplasty to the face, and indeed to any region—we mean the proper calculation, arrangement, and demarcations, required to be made before-hand, of the length and character of the incisions and excisions to be executed, in reference to the direction and force of the tractions which will be brought into play during the process of healing—as a matter of far higher importance in the success of anaplasty than the mere cutting out and adjustment of the flaps, which in themselves are operations of minor surgery, demanding, comparatively speaking, but little skill, and incurring little or no danger. The manipulating process of adjusting the flaps, however, exacts a delicacy and adroitness which, with the preliminary dissection of the flaps, will offer the safest guarantees of perfect success. Inasmuch, therefore, as the frequent failures of these operations, and the substitution, which they too often produce, of a deformity worse than the original, are the

result of inattention to the exact rules laid down by M. Serre, and the importance of which we would earnestly wish to enforce, his work should, in our opinion, rank as one of the most valuable, if not the best, manual and vade mecum on the subject, for the student and practitioner, which has yet been published.

It was precisely from the absence of any systematized classical work on anaplasty, whatever detached and scattered notices had been made of it by MM. Dieffenbach, Labat, Blandin, Zeis, and others, or that had appeared in almost every periodical, that M. Serre felt the necessity of precisely such a work as that with which he has favored the profession. Thus, as may be anticipated from what we have said, M. Serre does not, for example, think with M. Velpeau, (vid. text, supra,) that cheiloplasty (or the art of restoring the lips) is, any more than any other branch of this department of surgery, one that the surgeon has rather to devise than learn, and which cannot be submitted to detailed rules, but must be modified as often as performed, (loc. cit., p. vii.) Although we may agree, however, with M. Serre, that certain general rules may be established applicable to this or any other branch of anaplasty, we must concede to M. Velpeau the justness of his remark, that each particular case demands special modifications and a plan of operation peculiar to itself, and for success in which the surgeon, however aided he may be by certain general principles, must finally rely on his own immediate tact and resources, to overcome the obstacles which each individual case presents as contradistinguished from all others.

In proof of the success of his method, M. Serre states that in a hundred and fifty operations he has lost but one single patient.

In allusion to the utility, and necessarily, therefore, the spread of plastic surgery, M. Serre states that *oscheoplasty*, as first practised by Larrey, Delpech, and others, has been introduced into Egypt, at Alexandria and Cairo, by M. Clot-Bey.

M. Serre thinks it quite as probable as otherwise, that the Brancas of Sicily were the inventors of what is called the *Italian* method, as that the hints for it were imported from India; because there was a period formerly when criminals throughout Italy and Sicily were punished with the loss of the nose, lips, and ears. Of which opinion is the Italian jurist, Paul Zacchias, (see *Diction. des Sc. Méd., Art. Ente Animale*, par Percy, tom. xii., p. 346.) M. Serre, though he does not look upon Tagliacozzi as the inventor of the Italian method, considers his work, published in 1597, on restorations of the face, and entitled "*De Chirurgiâ Curtorum per Insitionem*," as the only one which had ever been written with an enlarged view and with surgical ability. Ambrose Paré, however, who appeared soon after, retarded any farther progress in this art, by the derision which he threw upon the work and method of Tagliacozzi.

M. Serre, in an historic résumé of anaplasty, (or, as he prefers to call it, autoplasty,) makes particular mention of the recent labors of those surgeons of Italy and Spain, who, notwithstanding

the political oppression which those countries have suffered under for so long a time, have made valuable contributions to this useful department of our art. Among these, he enumerates Baroni of Rome, Signoroni of Padua, Riberi of Turin, Pecchioli of Sienna, Regnoli of Pisa, (vid. *Bulletino delle Scienze Mediche di Bologna*, 1833, vol. vii., p. 267; *et Novi Commentarii Acad. Scient. Instituti Bononiensis—Omodei, Annali Universali di Medicina*, Agosto et Settembre, 1833, vol. lxvii.; ib. id., Aprile et Maggio, 1833, vol. lxxiv.; *Osservazioni Chirurgiche Raccolte nella Clinica e Pratica del P. Regnoli*, Pisa, 1836;) also the late work of M. Hysern y Molleras, in Spain, on blepharoplasty, (*Tratado de la Blefaroplastia Tempero-Facial, ó del Método de Restaurar las Destrucciones de los Párpados*, Madrid, 1834.) Señor Castells, of Barcelona, is also mentioned as having performed with success many plastic operations on the face according to the French method.

In Germany, which has been appropriately called "the classic land of autoplasty," we have, of course, among other well-known and eminent names, the following as the most distinguished contributors: Ammon, Beck, Benedict, Bunger, Chelius, Dieffenbach, Dzondi, Frich, Heidenreich, Rimer, Ruppius, Rust, Textor, Walter Vernuk, &c.

We have cited these names from one of the most modern and valuable works on anaplasty, for the benefit of the student who may wish to recur to the works and writings of the authors themselves.

M. Serre wholly and justly condemns, as we think, the Italian process, except where the neighboring parts are too much degenerated to have recourse to the Indian or French method.

It is unnecessary to dwell on the inferiority of the Indian method, or that of torsion, (as M. Serre not inaptly terms it,) to the French method of *déplacement*, (or glissement, or *en tiroir*,) as it is obvious that it not only makes a new wound, but that the torsion of the flap must, from the obstruction it creates to the lymphatic and sanguineous circulation, necessarily expose to gangrene. Nevertheless, it is the only method available in rhinoplastic operations, where there is great loss of substance to repair.

Among those who have particularly distinguished themselves by the improvements they have made in plastic surgery, M. Serre gives a pre-eminent rank to MM. Graefe, Dieffenbach, Lisfranc, Labat, and Blandin.

Among the more recent improvements of importance, he specifies two in rhinoplasty: 1. That of preserving better the primitive form of the nose, by doubling the deep-seated surface of the flap upon itself, inasmuch as the flap is found to retract less in proportion as there is less suppuration from it. 2. That of dispensing with substances to keep the nostrils open, by means of shaving off (*en dédolant*) the skin destined to form them, and making use of it as a mucous membrane to cover their edges. [Experience having proved that the cutaneous surface will become a mucous one, and vice versa, whenever they reciprocally change their normal posi-

tion.—*T.*] 3. That of dissecting the mucous membrane of the buccal cavity in cheiloplasty, to hem the same upon the free border of the new lip, and which, M. Serre says, he has demonstrated will be found to be sufficiently healthy, when taken even from the surface of cancerous tumors. 4. In blepharoplasty, the fact stated by MM. Dieffenbach, Dzondi, and Wisemann, (*De coalitu partium à reliquo Corpore prorsus disjunctarum*, 1824,) of transplanting hairs, so as to form eyelashes in a new eyelid. 5. Those plastic operations which have, in fact, resulted in the recovery of the sight, smell, and taste; by which he unquestionably means, (making allowance for the enthusiasm of the author on this subject,) not the creation of those senses, but such reparation of the tissues or parts essentially connected with them, as shall enable them to perform their functions.

M. Serre makes a correct distinction, as we think, as to the prospect of success, between repairing congenital deformities, which, in fact, seem to be only the result of a limited development, while the surrounding parts to take the supply from are fully formed; and those deformities which are the result of severe traumatic lesions, suppurations, &c., and where we are too often compelled to make further losses of substance before we can effect a restoration.

In allusion to the sound pathological views of Delpech, on the formation of that inelastic contractile material which he calls the *inodular tissue*, and which constitutes the substance of cicatrices resulting from loss of substance and suppuration, M. Serre justly remarks, that a great portion of the deformity resulting therefrom would be prevented, could losses of substance from cutting instruments or fire-arms be immediately repaired, as soon as they occur by the coaptation of their borders. This was the course pursued by Baron Larrey during the memorable campaigns of Napoleon, in which he relates the case of an officer in whom the cheek was carried away, from the commissure to the masseter, by a pistol-ball, but so well repaired on the spot, by paring the edges and the application of sutures, that scarcely any deformity remained, (*Larrey—Clinique Chirurgicale*, tom. ii., p. 4.) M. Serre might have added, that if Baron Larrey had known of the cheiloplastic operations of the present day, his natural surgical adroitness would have been made still more effective by loosening the cheek from its natural attachments to the jaws, according to the method of Franco and Chopart, i. e. the French method, or *décollement*, or *déplacement*.

In cases of constitutional affection, M. Serre doubts the policy of attempting too rigidly to efface, before operating, every trace of the disease, or of the deformity which it may have caused. He remarks, with much good sense, that the general affection sometimes seems to have departed from the system, except upon a particular point, [externally,] where its force would appear to be circumscribed (*se cantonner*) and concentrated, and that the plastic operation, now coming into play, may happily result in extinguishing it effectually.

In only one instance, out of the numerous cases of cancers of the face and other parts that the author has removed, has he found it necessary, contrary to the recommendation of M. Martinet, (de la Creuse,) to take the flap from a distance, and not from the parts in the immediate neighborhood.

The analogy which M. Van Mons (*Ponomonie Belge, Expérimentale et Raisonnée*, Louvain, 1833) supposed to exist of animal flaps to vegetable graftings, by imputing to the former a high degree of vitality, which even influences and predominates (as in the latter) over the organization of the part which it is grafted upon, is clearly erroneous. The remark of M. Burggraeve, (*Annales de la Sociéte de Médecine de Gand*, Juillet, 1839 ; *Mémoire sur une Restauration de la Face*, par le Professeur Burggraeve,) that autoplastic flaps generally remain alienated (*étrangers*) to the vital motions of the surrounding parts, is much more consonant to truth.

M. Burggraeve cites, in illustration, a case of M. Dieffenbach, in which, six months after complete restoration of the nose by a flap from the forehead, the patient was attacked with jaundice, and was suffused with a yellow color in every part but the new nose, which, moreover, assumed a white color when the patient was excited, and a blue color when he was cold. M. Serre therefore considers the idea chimerical and unpathological, that for such reasons as MM. Van Mons, Martinet, Dieffenbach, C. Phillips, &c. have advanced, autoplasty could eradicate from, and protect the system against syphilis, cancer, and other constitutional affections.

He appears to agree with M. Phillips, that the most frequent cause of failure is the engorgement and death of the flap from the current of arterial blood, constantly conveyed to it through the pedicle, finding at first no means of exit, either through the cut arterial branches which have been closed by the sutures of the borders, nor any means of passing into the circulation through the veins, inasmuch as these latter are no longer continuous with their corresponding arteries. Such are too often the results of the Indian method, or torsion; but the reverse takes place in the French method, which constitutes one of its chief advantages.

Besides the beautiful operation of Dieffenbach, in enlarging a contracted mouth, (vid. supra, text,) wherein he practically applied the well-known fact, that the mucous and even serous membranes exposed to the air assume the character of skin, it is to Delpech (says M. Serre) that we owe the application of the opposite, and to autoplasty no less valuable principle, that the surface of the skin, secluded from the air, acquires the character and properties of mucous membrane.

Facial Autoplasty.

Erysipelas is the accident most to be dreaded in these reparations. The preparatory practice of dry frictions, stimulants, &c., to the part whence the flap is to be taken, as recommended by

some, in order to give greater vitality to the tissues, is censured in unqualified terms, as calculated to induce erysipelatous inflammation and gangrene. Even the razor and soap in shaving the part, except it be five or six hours before the operation, may tend to the same results. So also the nitrate of silver, which some use to mark out the flap. M. Serre has always found common ink to answer this purpose sufficiently well.

M. Serre has seen rhinoplasty by the Indian method practised TWELVE TIMES with *perfect success*, [the greater part, it is presumed, his own operations.—*T.*,] which, we presume, is as much, if not more, than almost any other surgeon (if we except, perhaps, Dieffenbach) can say. Twice only he has seen it attempted by a flap from the arm, and in both it was followed by gangrene. This difference is readily explained. The cutaneous tissue of the scalp is not homogeneous with that of the arm; the former being not only more abundantly supplied with vessels, but nourished by one identical and special arterial arrangement, viz., the temporal, auricular, and occipital arteries. But what so often secures success in the Indian mode of rhinoplasty is, as Delpech pointed out, this, that the arterial branches of the ophthalmic, which go to the root of the nose, are included within the pedicle of the flap.

The defect of vascularity in the arm explains why the Tagliacotian method required, as a preliminary, that the flap should remain detached for some time, in order to acquire a separate vitality before being applied.

These facts above explain why M. Serre disapproves entirely of the recommendation of Dieffenbach, not to leave any large arterial branches in the pedicle, but to divide them if they are met with. Dieffenbach says, if we do leave them, we expose to sanguineous engorgement and gangrene of the flap, and are compelled to have recourse to leeches, &c. Though there are cases where leeches, cold applications, &c., are found necessary, M. Serre has seen others, where hot and stimulating applications have been attended with the best effects.

The flap should not be applied at the moment it is separated, as the tissues at first undergo a sort of spasmodic movement, and the cut vessels of the borders of the flap, and of the part to which it is to be accommodated, bleed too much. The proper time for the attachment is after the lapse of ten or fifteen minutes, when the sanguineous effusion has given place to a serous exudation, the diminution of activity in the skin, as has been remarked by Dieffenbach, (*Considérations Générales sur la Transplantation des Parties Animales*, par Dieffenbach, *Journ. Complémentaire des Sciences Méd.*, tom. xxxviii., p. 278,) evidently favoring the elaboration of the plastic processes. Hence the interval of time, which has usually elapsed between the total removal of a nose and its replacement, has been fortunate and favorable to reunion, rather than the contrary.

M. Serre has never, in all his *cheiloplastic* operations, found it necessary to have recourse to the incisions of Celsus, to give greater

distensibility to the flaps. Extensive dissection of the cheeks from the maxillary bones, however, in order to facilitate the displacement, he deems of the greatest importance in cases of great losses of substance. Another means of great value is, the *division* [i. e., *scoring*] *of the lining membrane of the mouth*, (*la muqueuse buccale*,) by incisions made through this membrane, *in a direction perpendicular to that which we wish to give to the flap*. This was suggested to him from the resistance which he found this membrane made in the dead body, to the displacement of the skin, (see his Réclamation on this subject, against Dr. Payan, of Aix, in the *Revue Médicale*, 1839, t. ii., p. 461.) This has the preference over the external incisions of Celsus, because it does not enfeeble the flap so much, and leaves no visible cicatrix.

In many cases it is only necessary to dissect loose the parts, to restore an organ that was apparently lost; as, for example, a sunken nose, in which case, as M. Dieffenbach calls it, the operation is a simple *rhinoraphy*, rather than rhinoplasty.

Often, in actually enlarging the loss of substance by our incisions for the flaps, we effect, by means of very acute angles properly arranged, and by thus changing the form of the wound, a far better restoration of the part than by any other means.

Every arterial vessel should be immediately secured by ligature, or torsion. M. Serre has not found ligatures so reprehensible, in point of consecutive inflammation and suppuration, when compared with torsion, as Mr. C. Phillips represents them to be, (*Esquisse Physiologique sur les Transplantations Cutanées*, p. 24.) The subsequent hemorrhage which may arise from neglect of this precaution, is not to be confounded with that caused by the *centrifugal reflux* of the general febrile reaction which may follow the operation, and render bleeding by the arm necessary.

MM. Graefe and Dieffenbach prefer the twisted suture for the flaps, and pins similar to those used by entomologists for impaling insects. M. Serre inclines rather to the practice of M. Blandin, who does not multiply the pins to the extent that Dieffenbach does, but generally, in rhinoplasty, for example, uses but five; that is, one for the columna, and two to each side of the new nose. In blepharoplasty, M. Blandin abstains altogether from any sutures, using only a small roll of lint for compression on each side the wound, and keeping the edges together by adhesive straps. M. Serre imputes two of his failures in autoplasty to the obstruction to the circulation from too many pins. M. Dieffenbach contends that gangrene never occurs, except some days after the operation, and from the parts having become heated and swollen. M. Blandin says there are two kinds of gangrene: one during the first days, and *dry* from defect of blood; the other, generally after the sixth day, is *humid* from too much blood, and the inflammation which such engorgement produces. He has never seen or met with a well-attested case of alleged gangrene from cold, any considerable period of time after the operation.

M. Serre considers the pins used by MM. Dieffenbach and Graefe

not strong enough, at least in the French method. He even finds the hare-lip pins, which he is in the habit of using, not always of the proper strength. Adhesive plasters, he thinks, are particularly objectionable from their tendency to favor erysipelas. So of all uniting bandages and dressings which impede the venous and lymphatic circulation, and mask the parts.

Absolute silence and repose, and exclusion from cold, are indispensably necessary. Hence, in cheiloplasty and genoplasty particularly, it is not advisable to operate in those who have catarrh, or who are asthmatic. The vertical position, slightly inclined, is the best, as it gives greater relaxation to the muscles of the neck and face, and retards the upward arterial current of the blood, as well as facilitates (he might have added) the gravitation of the general mass of the blood downward.

Though some cases render it necessary to defer the completion of the operation to two or three stages, M. Serre recommends it, if possible, to be finished at the first sitting. He, however, lays it down very properly as a most important principle, that the operation should not be hurried, as the length of time required has nothing to do with the dangers that may exist. Out of all the numerous autoplastic operations he has performed at Montpellier, during the seven years he has been surgeon-in-chief of the Hôtel-Dieu of that city, he has lost but one patient, which patient was seventy years of age, and died in consequence of inflammation of the throat, resulting from the tearing out of the sutures, in consequence of falling upon his face from the bed on the third day after the operation. All, it is true, have not been so fortunate. Thus, out of *eighty-four autoplastic* operations performed by M. Blandin, *thirty-nine* were for rhinoplasty, *seven* for blepharoplasty, *fourteen* for cheiloplasty, *nine* for genoplasty, *one* only for otoplasty, *three* for bronchoplasty, *two* for cystoplasty, *four* for uretroplasty, and *five* for various kinds of cutaneous autoplasty.

The youngest was six years of age, and the oldest sixty-seven.

Twelve of them had morbid bridles from burns or old ulcerations; *three* had congenital defects of conformation; *nine*, losses of substance from gangrene; *fifteen* had been recently operated upon for cancer; *nine* had old fistulas; the remaining *thirty-six* presented mutilations from wounds, and eruptive, scrofulous, or syphilitic diseases. *Five* of these died from consecutive diseases, of which the operation had been the accidental cause.

Forty-two had been affected with various accidents after the operation; in *nine* there was gangrene of the flap; in *three* the parts did not unite; *twenty-three* had inflammation, in almost every instance erysipelatous; and *six* had nervous symptoms, more or less severe.

Sixty-one out of the eighty-four cases were cured in a satisfactory manner.

Cancer returned in two of the fifteen who had been operated upon for that disease; but in both these, which were cancer of the

lips, the operation was performed by simple sliding (*glissement*) of the parts.

Thus, by this statement *three out of four* in autoplasty are cured, one out of seventeen dies, accidents are developed in one half, and gangrene occurs in one out of nine, (Blandin—*Autoplastie*, p. 263.)

The want of success is often to be ascribed, according to M. Serre, to neglect of preparatory precautions on the part of the surgeon, as in operating upon persons whose skin is not freed from syphilitic or exanthematous affections. Besides repeated purgation and blisters in such cases, he has found an issue to the arm or leg a serviceable drain from the skin, to diminish its predisposition to inflammation.

Robust, sanguineous patients do not do so well, and in such it is advisable to use such means as will moderate the inflammatory and febrile tendencies, especially towards the head.

Immediately after the operation, he warmly recommends, as in the practice of Delpech in most operations, a suitable opiate, as nervous accidents are thereby often suppressed in the very onset, and a manifest amelioration obtained in the condition of the patient.

The surgeon should guard against operating in seasons when an erysipelatous predisposition is prevailing; and should this disease supervene, active depleting remedies must be had recourse to, avoiding those evacuants that provoke vomiting.

M. Serre, after his extensive experience, is constrained to believe that there is much less danger of such accidents as phlebitis, angioleucitis, and purulent collections, from the French method of autoplasty, than is apprehended by M. Velpeau. [The marked difference in the dry, mild, and sunny atmosphere, and pure sea breezes of Montpellier, as compared with the long wintry damps of Paris, may (as we can from a residence in both assert) in part account for the far greater prevalence of such results from autoplastic operations in the latter city, to say nothing of the *hospital class* of patients at Paris being generally of a much more vitiated and impoverished constitution than the more hardy and rustic poor of Languedoc and Provence, on the healthy shores of the Mediterranean.—*T.*]

In fine, the most minute and careful attention to the dressing is fully as important as the operation itself, (pp. 1 to 94, inclusive.)

OPERATIVE PROCESSES IN RESTORATIONS OF THE FACE.

Cheiloplasty.

The method of Chopart and others, of displacing the dissected teguments in mass from the neck, having, like the Indian and Italian methods, the constant objection of introversion, or wrinkling (*recoquillement*) of the lip, and the exuding of the saliva, M. Serre at last

devised the means of obtaining, for the prevention of these difficulties, a remedy, which Delpech had long foreseen the want of, but sought for in vain. This consists in making use of the *lining membrane of the mouth to serve as a suitable covering for the free border of the new lip.*

M. Serre claims this new method as *legitimately his own*, and as one which he has been in the constant practice of for seven years past. [This discovery is, however, as is seen in the text, supra, usually given to Dieffenbach, but, as it seems, and as will be seen farther on, erroneously.—*T.*]

Its originality and high value may be appreciated (as already remarked) in those common cases of cancer of the lower lip, [of which Plate II. of M. Serre's excellent and most useful work is a graphic example,] where, strange to say, the mucous or buccal lining directly beneath is frequently found, according to M. Serre, *totally free of any degeneration.* Thus, a perpendicular incision immediately outside the cancerous ulceration, externally, was carried down from each angle of the mouth to below the chin. A rectangular portion, including the lower lip and its cancer, was then carefully dissected off clean from its attached mucous lining on its buccal surface. A sufficient portion below this, of the remainder of the tissues between the two incisions, was then detached from the jaw, and chin, and supra-hyoid region, and the new flap, being drawn and lifted up to its place, was carefully adjusted to the lining mucous membrane, upon which it exactly fitted, the upper edge of this membrane being first brought over and hemmed to the upper border of the new lip, for its new vermilion border, and the sides of the flap adjusted to the raw surfaces of the perpendicular incisions on either side, and carefully fastened there, as well as its middle portion to the reserved buccal mucous, by twisted sutures. The mucous membrane thus served as a posterior partition-wall, or floor, to secure the exact and proper coaptation and position of the new lip. For, as on either side beyond the excision of the cancer, it was continuous with the general buccal lining of the mouth, it acted as a broad plane, or distended velum, for the transposed new tissues from below to rest upon, and adapt themselves to, in their new situation, much better than any mechanical or forced means possibly could enable them to do—such we understand to be the peculiarities of M. Serre's process.

We certainly consider this pressing into the service of cheiloplasty, of a large and continuous portion of the entire natural mucous lining of the buccal cavity intact, and ready for the reception of the new lip, (however much M. Serre may for its first suggestion, or its point of departure, be indebted to the operation of M. Werneck, or M. Dieffenbach, in their operation for enlarging the commissures of the lips,) a new, original, and most invaluable improvement in anaplastic surgery. It seems to have been all that was wanting to give the finishing stroke to this branch of restorations upon the *face.* All the functions of the lip, in the case we have alluded to, were completely restored—the normal flow of the sali-

va, the articulation, &c., to say nothing of the perfectly natural form and expression of the external contour, and especially that of the vermilion border. According to the figures of Plate II., the restoration was most perfect and natural.

This first case will fully answer as a sample for all of this order, and for illustrating the great principle which M. Serre claims to be the author of, and upon the value of which reposes the extraordinary success (as we learn from his work) he has met with in these operations. There can be no doubt, that where the buccal mucous is undegenerated, that the preservation, by M. Serre's method, of a normal membrane like this, in normal position and continuity with the general mucous lining of the cheeks and mouth, must constitute a more perfect and sure guide or platform for the exact adjustment of the newly-raised-up tissues, than the sutures alone to each side, directed by the eye only, could possibly effect. Where the cancer does not extend down below the union of the tissues to the chin, [i. e., the *bucco-mental*, or *genio-buccal* groove, as it may be called,] it need not be at all invaded by the knife, and success is so much the more certain.

Before proceeding to notice less important improvements than the above-described fundamental process of M. Serre's plastic operations for the face, it is requisite, says Dr. Mott, to caution the operator, in respect to cancerous degeneration of the lips, that, where the disease has legitimately assumed the carcinomatous character, but faint reliance can, in his judgment, be placed upon any expectation of finding the buccal mucous lining unimplicated. So that it would be labor lost, or, what is worse, it would be giving extension to the disease, to attach the undiseased flap below to the dissected mucous partition, when this latter has previously become involved in the cancerous diathesis. Previous to such change, and while a *scirrhous condition* only of the tissues exists, the process of M. Serre might, Dr. Mott thinks, be available, and would then, indeed, be a resource of incalculable value, and the credit of devising which reflects much praise upon its author. In *affections of the lips, of a truly cancerous character*, however, Dr. Mott *never has seen the lining mucous membrane to such tissues within, otherwise than participating fully in the disease, and does not believe that they can then be at all depended upon in the process of restoration or reparation.*

[Within a few weeks past, (October, 1844,) Dr. Mott had an opportunity, for the *first* time that he has attempted it, of testing M. Serre's process of lining the new flap, in a cancerous lower lip, with the buccal mucous. The patient was about forty years of age, and the cancerous affection had existed for seven years, during which the destruction of parts by the ulceration had left several irregular deep grooves, running lengthwise on the vermilion border—while the *lining of the lip within*, though the tissues themselves there were also so indurated and scirrhous as to be in a state almost cartilaginous, was comparatively sound, so far as its glossy natural appearance indicated. Dr. Mott made two parallel vertical incisions,

one from each commissure down to the supra-hyoid region. He then, at right angles to these, made one below the cancer down to its inner mucous lining membrane, which he dissected upward so as to detach perfectly from the diseased lip. Thus excising out the cancer, he shaped and brought the narrow hem of the mucous lining in front and upon the fresh-incised lower border of the transverse incision, and fastened it there carefully by interrupted sutures. He now proceeded to detach this new-formed vermilion border, and the flap of which it formed the superior edge, from their connections with the chin, and base of the jaw, down to the extent of the vertical incisions. This rectangular flap was brought up with great facility (as the tissues were here thick) to its proper place, on a line with the commissures, where, and also on the sides of the vertical incisions, it was carefully attached by suture. To all appearance the man's mouth immediately looked perfectly natural, and one could scarcely imagine that the orbicularis could not play as usual in the functions of speech, instead of being immoveable when he spoke in reply to questions put. The jaw and parts were kept in place by a containing bandage. In a few days, however, though the parts were left free to the air, and every symptom went on perfectly well, Dr. Mott had the chagrin to find that the new vermilion mucous border lost its vitality, and sloughed off from the parts to which it had been attached.—*T.*]

M. Serre himself is evidently impressed with doubts of the integrity of the buccal lining in such cases, though he would desire to dispel them by the fact that cancerous tumors are often dissected out without at all interfering with or removing their enveloping cysts, a remark which can scarcely be made to apply to tumors truly cancerous.

Mr. Charles Phillips was the first to adopt or follow the new method of M. Serre, and speaks of the facility with which the buccal, after dissecting it off from the border of the incision for a quarter of an inch, may be freely separated, even with the handle of the scalpel alone. (See his treatise, *Autoplastie après l'Amputation des Cancers*, 1839, p. 36.)

One of the first patients upon whom M. Serre appears to have operated by his new method, and who is the first in his list, (see his Case I., Plate II.,) entered the hospital of Saint-Eloi, (Montpellier,) of which M. Serre was then and is now the principal surgeon, Oct. 18, 1834, and, though no mention is made of the date when the operation was performed, we are left to infer that it took place very soon afterwards. He speaks also of another similar case, which he does not detail, but which was operated upon by him, April 3, 1836, with the same happy results as to the perfectly natural, and even *elegant*, aspect of the vermilion lip, &c., (see this case, as related by M. le Docteur Burin, *Thèses de Montpellier*, année 1836, No. 49, pp. 18, 19.) A similar, but more formidable case than either of these last, (see his Case II., Plate III.,) involving also a portion of the cheek, above the left angle of the mouth, was operated upon, with complete success, by an equally felicitous arrangement of the

incisions, (viz., before the preceding case, and as early as June 29, 1835.) In this last case, as an evidence of the extremely distensible nature of these tissues, the sound portion of the lip (less than one half of it) was stretched so as to serve effectually for an entire lip and natural mouth, and for the attachment to it of the upper border of the flap below, and of the lower extremity of the united flaps which covered the acute angular space from whence the cancerous portion on the cheek had been removed.

But if there be not some error of date, there was still another case (see his Case iv. and Plate v.) in date, but not in the order of description, anterior to the three preceding, in which M. Serre operated, and with, if possible, a more brilliant success, and by a more ingenious application of his new method than in the preceding, or in any case subsequent thereto. This dates as far back as Sept. 15, 1831, while M. Serre was officiating in the hospital in the absence of Delpech. The lower lip was occupied with a cancerous affection (having the same cauliflower aspect of vegetation that most of the similar cases represented in M. Serre's plates have) throughout nearly its whole extent, and even beyond the commissure. Instead of a semi-lunar incision, which most surgeons would have made, and which would have neatly included the diseased part without going down to the chin, the professor of Montpellier preferred two long incisions, beginning just outside of each commissure, and proceeding downward and inward, in a straight line, till the branches of the V they formed met at the thyroid cartilage. Two lateral incisions at the upper extremities of the last, and extending horizontally with a slight convexity upward till they reached to near the anterior edge of the masseter, completed the outline of the flaps. The long oblique lateral triangular flaps thus formed, were completely detached to beyond the base of the jaw on either side. From a remark rather indistinctly expressed, we are led to infer that the buccal lining upon which the cancer was situated was dissected off from it, and found sound. The flaps, therefore, in being stretched forward and upward, and then fastened by twisted sutures, must, at their upper vertical line of union, have rested on this membrane, while the upper edge of that membrane was brought outward and forward and turned down, and hemmed by numerous sutures to the cutaneous edge of the lateral incisions, now serving by their slight curve to imitate a perfectly natural lower lip, so much so, says M. Serre, that in a few weeks afterwards the restoration was so complete and deceptive, that no one would have suspected that any operation had ever been performed upon the mouth. If there be no error in the date of this operation, we think it will be found that the priority of the idea of making use of the mucous membrane in these restorations, as well as the application of it, must, in its totality, be wholly conceded to the surgeon of Montpellier; and that the application of this principle by Dieffenbach, (see text, supra,) in the making of new angles to the mouth in the abnormal contractions (congenital or acquired) of that aperture, must have been derived by the Berlin professor

in part at least from M. Serre. In this part also it is seen, that the single, short, lateral, and horizontal incisions of M. Serre, more neatly (in our judgment) executed this office, when stretched forward, than if he had dissected out a longitudinal strip of flesh, as M. Dieffenbach does in the cases just mentioned.

M. Serre dwells with emphasis upon the important result he obtains of avoiding, by means of his short lateral incisions, the duct of Stenon, and, by the outline of his vertical flaps, the wounding of the facial nerve, both which dangers, he remarks, have hitherto been too much overlooked.

As an illustration of this he cites a remark of Mr. Charles Phillips, (in his work entitled *La Chirurgie de M. Dieffenbach*, première partie, p. 121,) that, until M. Dieffenbach adopted the practice, in removal of portions of the upper jaw, of separating the tissues by an incision running down the back of the nose and middle of the upper lip, (and which practice, or at least its principles, M. Serre contends, originated with the school of Montpellier,) nothing was more common after such operations than to meet with paralysis of one side of the face, from the wounding of the facial nerve, and also the offensive accompaniment of a salivary fistula from the wounding of the duct of Stenon.

In case No. v., (Plate vi.,) the same operation as the last was performed, for one half of the lower lip, and the deception of the vermilion border, and form of the lip, &c., was complete. Nothing could be seen but a slight traction and elevation at the place of insertion of the pins in the line of union towards the chin. M. Serre has found this slight inconvenience prevented by *an incision upon the mucous membrane on the inner surface of the flap*, to be made perpendicular to the direction in which the displacement is to take place. This, however, is nothing more than the lateral inner scorings, as practised in the ancient methods. (Vid. text of M. Velpeau, supra.)

M. Serre, in order to establish the priority of his method in due season, took an early opportunity to communicate it, in a short official letter (dated February, 1835) to the Academy of Medicine of Paris. (See *Bulletin de Thérapeutique*, tome viii., p. 148, année 1835.) In that letter even, he insists that, in a great number of cases of *cancer* of the lower lip, (its usual locality,) the mucous membrane is *rarely affected*, except on its free border. He also asserts that he had, therefore, as long as *three years before*, (i. e., 1832,) used the *healthy portion of the buccal membrane of the flap for the border of the new lip, attaching it by suture.*

M. Serre having read, in the Journal Hebdomad., (April 4, 1835, tome viii., p. 23,) that Prof. Sanson, a member of the Academy, had stated, in the sitting of March 31, that this method belonged of right to Dieffenbach, immediately wrote to the editor of that journal. (*Ibid.*, tome viii., p. 90, 1835.)

It appears that M. Zeiss himself, the pupil of Dieffenbach, and who has published his preceptor's operations and processes in autoplasty, awards the honor of the above method to M. Serre, but

claims (very unjustly, M. Serre thinks) the credit of the *lateral incisions* in cheiloplasty for M. Dieffenbach. It would appear, however, from the representations of M. Serre, (see his Plate xxx., fig. 2,) that the surgeon of Montpellier is equally entitled also to originality and priority, for the singular tact and perfection he displays (as we have already shown) in his mode of procuring, cutting, and adjusting his flaps, in cheiloplastic operations, as for his method (by far the most important) of calling into service the buccal membrane; for it is very clearly shown that M. Dieffenbach, in these operations, proposes to make, from the extremity of each lateral incision, a vertical incision to aid the approximation, and by which an unseemly triangular gap would be left on each side of the cheek, and a salivary fistula perhaps produced. (See M. Zeiss—*Handbuch der Plastichen Chirurgie*, von Eduard Zeiss, pp. 425 and 426; § 376, 377, 378, 379.) The method of M. Serre is also briefly alluded to by M. Velpeau, in the present work, but not in detail, as the former surgeon had not then (1839) published his treatise.

We have thought it due to M. Serre, to give the above statement of the history and advantages of his method, as strikingly exemplified in cheiloplastic and geno-cheiloplastic operations, as contrasting with some of the more objectionable processes which had been hitherto in use. (See M. Serre's treatise, from p. 95 to p. 135, inclusive.)

Autoplastic Restoration of the Commissure of the Lips, in Cancerous Affections.

Though M. Serre has not yet had but few opportunities of applying his ingenious method to these deformities, those in which he has done so have been attended with a success equally as brilliant and complete as in those we have enumerated above. Case vi. (Plate vii.) is a beautiful illustration of this remark, wherein the cancerous ulcer on the right commissure was, by means of carrying out the surgeon's almost mathematical skill (as we have before remarked) in the arrangement of his diagram of incisions, completely embraced in four incisions, forming in their union, external to the commissure, and obliquely downward, two of the salient angles of a perfect *stellated* incision. The respective four sides of these two salient angles being then ingeniously brought into coaptation one with the other by sutures, and the buccal membrane adjusted, the perfect restoration surprised every one who saw it. Two years after, M. Serre saw the patient, and found the parts had remained perfectly healthy.

In elucidation of the superiority of this process, (which to be understood must be examined in the plates of the author's treatise,) this surgeon exhibits cases where, in similar affections of the commissures, the deformity has been deplorably aggravated by means of erroneous and awkward modes of operating, hastily determined upon without any preconcerted reflection upon the harmonious

combination, proportion, and adjustment of the incisions required. M. Serre shows that, in some of these deformities or distortions upward and downward of the corners of the mouth, and which are frequently met with, that a simple longitudinal lateral incision, horizontally outward from the commissure and through the cheek, and then immediately dissecting its buccal, [above and below—*T.*] and hemming it to the [cutaneous] borders of the incision, was quite sufficient to accomplish a perfect restoration of the deformed parts to a normal condition.

In this (as we have above hinted) he has again, as we think, established a process far preferable to that which M. Dieffenbach claims to be the author of, viz., the removal of a *horizontal narrow strip of tissue* from the commissure outward, and dissecting down to the buccal, and then dividing that into two equal halves, to be attached to the bleeding surfaces at the angle of the commissures and the edges of the wound, above and below. (See text of M. Velpeau, and his ingenious modification.)

Case vii. (Plate viii.) is a fine example of both of M. Serre's processes, the patient being an ancient officer of the guard, who, in a fit of despair, nearly destroyed by a pistol-shot both angles of the mouth, thus causing, after cicatrization had taken place, a distortion of the right-angle downward, with a large gap exposing the jaw, and attended with the constant flow of the saliva, while the other angle of the mouth was drawn upward; the united deformities impeding speech and mastication, and preventing closure of the lips. To the right commissure he applied his ingenious *stellated* incision, and to the left, a single short lateral horizontal incision, as above described, adjusting the dissected buccal to the two borders of the latter. The restoration of the form and functions of the mouth was complete in every part.

Case viii. (Plate ix.) is certainly one of the most adroit applications of this *geometric stellated method* in M. Serre's treatise. The patient was a young lady aged twenty-five, in whom a severe burn, when she was a child, destroyed a portion of the left angle of the mouth. The cicatrix formed from this drew down the corner of the mouth in a repulsive manner, the gap exposing the teeth and opening a constant passage to the saliva through it. After much reflection, and figuring out the diagram of the required incisions with ink, such portions of the cicatrix were destroyed as enabled the surgeon to form, external to the commissure, two *salient angles* of a stellar incision, one of which, above, pointed outward and slightly upward, while the other pointed downward on the outer part of the chin, and reached to near the base of the jaw; secondly, to form or shape, out of the left extremity of the tissues of the lower lip, an angular flap making in its outline a third and smaller salient angle, which fitted exactly into the loss of substance left by the upper or greater containing salient angle of the two just described, and the extremity of the lower side of which smaller angle or flap terminated below, towards the chin, in the lower side of the containing salient angle in that place.

Nothing more was now to be done than to stretch the smaller angle or flap upward and outward into the large containing salient angle above, which movement of course, at the same moment, brought the two sides of the lower large angle into perfect coaptation with each other. The mouth was thus immediately restored to an almost perfectly normal shape, leaving only the slightly-traced outline of two acute stellar angles, one pointing upward, the other downward, filling up also the revolting gap, relieving the loathsome annoyance of the flow of saliva, and enabling the patient to articulate distinctly. The former cicatrices, however, from the burn, were too numerous in the neck to prevent the head from being somewhat drawn down on that side, as it had been before the operation. (Serre—op. cit., p. 135 to 150, inclusive.)

There can, therefore, scarcely be a doubt that the method of M. Serre, founded as it is on geometric forms and arrangements of the flaps and incisions, so natural and purely mathematical, and the tractions of which, therefore, in the process of agglutination, can thus be so accurately calculated, and, as it were, measured and provided for before-hand, on the mechanic laws of the *composition of forces*, (which laws, the centripetal and radiating directions of the fibres of cicatrizating surfaces and of the growths of structures show to be, in part at least, applicable to organic life and its processes,) there is no doubt, we repeat, that a method so philosophical and exact will, for the future, entirely supersede all those other rude processes hitherto employed, and that it will thus become the basis of every rational modification of autoplastic surgery.

M. Serre especially condemns a process of M. Von Ammon, (much vaunted by M. Zeiss,) of borrowing, for these deformities and losses at the commissures, a flap by transplantation from the cheek.

Restorations of the Upper Lip.

In cases of *compound hare-lip*, where there is a labial or tegumental median lobule or pedicle, and where its adjustment to the fissures on either side might, in uniting, flatten the nose, M. Serre proposes, with Dupuytren, and performed, in a girl aged seventeen years, the operation of exsecting, with the nippers, the corresponding middle incisor bone, and then fastening the lobule back at the upper part of the void left by the exsection, so as to make it serve as the columna to the nose. In addition to this, after having pared the two edges of the now single fissure, he made through the tissues of the lip on either side, and near its junction with the nose, one of his lateral horizontal incisions, about half an inch long, which, with the separation of the lips from their natural attachments to the jaw, gave it great distensibility, and allowed the two pared edges to be easily stretched over in front, and to be brought into exact coaptation by means of the twisted sutures. The restoration was perfect, and surprised all who saw her. The cleft in the vault of the palate remained open, as before.

In a case of M. Gensoul, of Lyons, (alluded to by M. Serre,) and

which that surgeon operated upon in 1830, (*Journ. Clin. des Hôpit. de Lyons*, Janvier, 1830, p. 23,) he first forced back, until he had *fractured*, the osseous projection which stood out three quarters of an inch horizontally from the middle portion of a double hare-lip, and thus brought it into a line with the alveolar arcade. This was aided by pushing back also, but without extracting it, the right canine tooth, which also projected.

In regard to the early period of infancy at which these operations should be performed, M. Serre says the *Ephémérides Médicales de Montpellier* (tom. vi., p. 377) contains numerous facts to show that they may be done with safety almost immediately after birth; and where the fissure in the vault of the palate is excessively large, they can scarcely be performed too early.

For a cancer on the right side of the upper lip, and which projected into the nose, M. Serre happily applied his quadrilateral stellar principle of forming the flaps, with the preservation of the buccal surface of the lip which remained sound, and upon which the flap was neatly adjusted, except for a small ulceration taking place on the border of the lip, from using too many pins. (See his Case xii., and Plate xii.)

In a frightful case (see his Case xiii., Plate xiv.) of an enormous bleeding fungus, covering the whole upper lip, the tumor was, after various treatment by a V (inverted) incision through its middle, caustics, &c., finally removed by the ligature in mass, so applied as to save the buccal membrane beneath, and which greatly aided in the adjustment of the long lateral flaps on either side, forming altogether a tolerably decent lip, with a slight fissure, however, in the middle.

Restoration of an entire Mouth.

A horrible case of mutilation of the face from explosion of powder came under the care of M. Payan, of Aix, (France,) (see *Gaz. Méd. de Paris*, Sept. 4, 1841,) in which a large portion of the left cheek and the totality of both lips were destroyed, while the bones of both jaws were fractured in every direction. Terrible as the mutilations were, M. Payan, after the cicatrizations took place, succeeded, by large lateral flaps almost exclusively from the right cheek, and by aiding their distensibility by incisions on the mucous membrane within, in stretching the parts together, and with a hem of the buccal lining making an *entire new mouth, and lips, and border* complete, which served so well the functions of a natural mouth, and acquired such sensibility and motion, that the patient was not only enabled to articulate, but also to take his food and resume his labors.

M. Serre contends that this process of M. Payan is virtually, step for step, that which he adopted for the case of fungus just described, and which was long anterior, in point of time, to M. Payan's operation, (*Serre*, p. 203.)

Stomatoplasty (stomatoplastie) is the name given by German sur-

geons to those reparations designed to enlarge the buccal aperture, or mouth, when preternaturally contracted (then called *atresia*) from congenital or accidental causes, diseases, &c.; and also to make an entire new mouth, or opening into the œsophagus, when from any cause whatever that normal communication is imperforate, or does not exist. The aperture, when it does exist, is hard and callous, and sometimes so small that the little finger can scarcely be introduced. Rust (loc. cit. op. of *Serre*, p. 209) relates cases of *atresia*, where the buccal aperture has been in this manner so abnormally contracted, and presented such difficulties to the introduction of food, that the subjects of this deformity have *died of hunger*.

Although the invention and priority of the process for enlarging a contracted mouth has been generally assigned to Dieffenbach, and is also so accorded by our author, M. Velpeau, in the text, M. Serre disputes this appropriation, and declares that it belongs to M. Werneck, also a German surgeon, (*Rigaud—Thèse de Concours sur l'Anaplastie*, 1841, p. 100,) who was the first to introduce into practice this important operation, viz., in 1817, on a person named Antoine Vital. He first enlarged the aperture at the commissures by a blunt-pointed bistoury, and then keeping the jaw firmly pressed downward, he made, with the convex bistoury, an elliptical incision down to the mucous membrane of the cicatrix, and excised the tissues thus circumscribed by the elliptical incision. He now dissected the mucous membrane to the extent of three lines, and then brought it forward to form the vermilion border of the lips, fastening it there by points of twisted suture, using the Glover's suture at the angles of the commissures, (*Serre*, op. cit., pp. 210 et seq.)

To Dieffenbach, however, unquestionably belongs the honor of having so modified the process of M. Werneck, as to have made it one of the most ingenious and perfect in anaplastic surgery. M. Serre, however, in applauding it, finds a serious disadvantage from it in the destruction which it causes of the orbicular muscle, and in the difficulty and pain, and length of time, which are necessarily required for its performance, (ib., p. 246.)

M. Serre claims to have improved the process of MM. Werneck and Dieffenbach, in the case of a young man upon whom M. Delmas operated at Montpellier, in 1839, upon the plan suggested to him by M. Serre, and which, in reality, appears to have differed only from that of Dieffenbach, in excising a *narrower* portion of tissues horizontally from each commissure than M. Dieffenbach did, (*Serre*, op. loc. cit., Case xvi., Plate xv.) There was, however, this shade of difference, and which, as we conceive, was an important one: That the strip of tissue at each commissure appears to have been wedge-shaped,* forming thus a long *prism*, as it were, the base outward, and the apex resting on the mucous membrane within, so

* After making a horizontal incision, of four lines extent, through the tissues from each angle, M. Delmas, finding the tissues so thick and indurated as to interfere with the approximation of the mucous membrane to the skin, "enleva fort à propos, *dans l'épaisseur même de chacune des lèvres des plaies, qu'il venait de faire, une tranche de parties molles*, qui facilita ainsi la réunion," &c., (*Serre*, loc. cit., pp. 219, 220.)

that there was no sacrifice of parts, except of the external indurated tissue, and none whatever of the undegenerate *soft* portion of tissue within, covered by the internal buccal membrane; consequently there was less painful dissection, and less time consumed.

M. Serre, with his accustomed ingenuity in anaplastic reparations, made a felicitous application of the great principle of the reversion of the buccal membrane, in a case of extreme contraction of the aperture of the mouth, complicated with cancer of the lower lip, and in which he completely excised the cancer by two incisions, forming together an acute triangle, whose apex reached below the chin; after which, by two simple lateral incisions, (one at each commissure,) he brought the parts into such perfect arrangement, as to surprise all who saw the natural mouth and lips thus formed in a patient whose deformity had excited general remark, (*Serre*, op. cit., Case xvii., Pl. xvi.)

Werneck himself, the alleged inventor of *stomatoplasty*, also so far anticipated the present improved modes, as to obtain a *mucous lining* from the neighborhood where that of the diseased tissues themselves was degenerated, (*Serre*, op. cit., pp. 228–230; also *Graefe und V. Walther's Journal*, bd. 14, p. 202.)

Rhinoplasty.

In a case where a destructive ulceration existed on the lobule, M. Serre circumscribed it by a narrow triangle, the apex resting on the dorsum upward; but, finding some difficulty in bringing the pared dissected flaps together on the median line, from the resistance of the septum and lateral cartilages, he very properly sacrificed a portion of these last, when the union was immediately and perfectly accomplished, resulting in a complete restoration of the organ, (op. cit., Case xx., Pl. xviii.)

In regard to restorations of the *entire nose*, whatever be the process adopted, M. Serre candidly declares that he has never been entirely satisfied with them, neither in those cases upon which he himself has operated, nor with those of others, (ib., p. 272.)

Genoplasty.

In *genoplasty*, M. Serre gives the entire preference to the French process of anaplasty. As a striking illustration of which, he cites the case of a woman, aged *seventy-four years*, who, from the age of ten, had, in consequence of some disease of the part, lost a great portion of the cheek on one side, so as to expose in a frightful manner the jaws, teeth, nasal fossæ, &c. MM. Vaust and Anten, of Liege, (*Gaz. Méd. de Paris*, Fév. 1, 1840,) completely succeeded in filling up this great loss of substance, by detaching and paring the edges of flaps from the cheek-bone, lower part of the cheek, and wing of the nose, so as to give a very respectable appearance to the face, and afford the patient infinite relief and comfort.

M. Serre, in these operations, cautions the practitioner particularly against the use of too many sutures, as interrupting a free

circulation, and favoring gangrene. For the same reasons he specially directs the sutured flaps to be left naked, and uncovered with any bandage, (ib., p. 326.)

[*Anaplasty for Immobility of the Lower Jaw.*

M. Serre, in his twenty-ninth case, (p. 329 et seq., Atlas, Pl. xxiii.,) upon a youth with *immobility of the jaws*, excised, by means of two vertical triangles united at their base on a horizontal incision, the whole of the tissues th circumscribed, in order also to excise thereby the thick cicatrices and bridles they included, and by which, it appears, the jaws were held together. He was obliged to tie several vessels of some size, and the flaps were a long time in uniting. Finally, the separation and movement of the jaw were not obtained over half an inch to an inch in width, and that could only be maintained by the employment of a dilating apparatus. This operation was performed by M. Serre at La Pitié, Paris, 1830.

M. Serre refers to *one* case in which Dr. Mott also felt himself obliged to make a long incision, from the commissure horizontally and through the tissues of the cheek, in order to divide completely the numerous inodular cicatrices it included. But Dr. Mott has now performed the operation *for immobility of the lower jaw* more than *twelve* times, and with perfect success, and has in no instance found it necessary to resort to any anaplastic process. The complete and free division, incision, and liberation of all the adhesions, cicatrices, and bridles between the jaws, as well as of those between the jaws and cheek, and in, or on the cheek itself—by means of the scalpel cautiously employed in the directions required, together with the indispensable use of the screw-wedge *dilator* for a certain period of time afterwards—has, in every instance, achieved the most satisfactory results, and entirely restored the jaw to its normal functions. These operations, therefore, which Dr. Mott claims particularly as his own, (they constituting an entire *new chapter* in surgery,) and of which he had published several cases before the year 1830, and before Dupuytren, or any other surgeon, even attempted their cure, cannot properly come under *anaplasty*, nor even under sub-cutaneous section of bridles, (as that is but a part of the process of cure;) but will be reserved for their more appropriate head in a subsequent part of this work, immediately following *Anchylosis of Joints*, to which this disease seems to be more nearly allied, though anchylosis is rarely complicated with it, except in cases long neglected, and in which no relief from Dr. Mott's process can be anticipated.—*T.*]

Blepharoplasty.

In *blepharoplastic* operations, M. Serre urges the adoption, also, of his great and essential principle in all the forms of *facial autoplasty*, to wit: the lining the internal surface of the flap, or flaps, of the new lid, or lids, with the *palpebral conjunctiva;* a neglect to attend to which, and which, we believe, no other surgeon has ever

before thought to recommend, explains, in his opinion, most of the failures in these operations. Unfortunately, in many of these deformities, the results of destructive burns, wounds, &c., there is no palpebral membrane left to obtain a supply from.

The adaptation of this principle was beautifully illustrated by M. Serre, in a case in which, through mal-treatment of a malignant pustule at the external angle of the eye by caustic potash, the upper eyelid became firmly adherent to the globe, and the lower lid everted by an ectropion. An incision of about three lines length was made transversely, (i. e., horizontally,) from the outer commissure of the eye, which enabled the patient immediately to raise the upper lid. To maintain this incision open, the palpebral conjunctiva was brought forward and attached, by two points of interrupted suture, to each lip of the wound. The union was perfect, and the restoration of the natural appearance and uses of the upper lid so perfect that the patient would not submit to a further operation. (See Case xxxiv., p. 375, et seq., and Pl. xxvii., Atlas.)

This principle was, if possible, still more effectually put into successful application by M. Ansiaux, in 1840, at Liege, in a case of total destruction of the lower eyelid, and part of the adjacent teguments of the cheek; in which, however, a portion of the conjunctiva remained unaffected. An incision was first made from each commissure of the eye, which incisions, meeting below, formed a triangle whose base corresponded with the lower lid, and thus included the degenerated parts. A lateral incision was then made, in a horizontal direction from the outer angle of the eye, and from the outer extremity of that incision another was brought downward and obliquely forward, so as to be parallel to the outer incision of the triangle. He thus obtained a quadrilateral flap, which being rotated inward, and its inner surface brought into coaptation with the *portion of palpebral conjunctiva remaining*, and fastened by points of suture, formed a perfect restoration of the lid. The wound left by the flap was also united by sutures. Considerable hemorrhage took place during the operation, which, however, did not prevent the necessity of some leeches and cooling applications during the cure. The restoration of the lid proved of inappreciable value to the patient in keeping the ball covered, which, with the ectropion in the upper lid, and loss of the lower, had been a source of great distress to the patient. (See *Serre*, op. cit., p. 397, et seq.; also, *Annales d'Oculiste*, par M. Cunier, t. v., 3^{e} liv., p. 130.)

M. Serre, in claiming the above process for the French method, and as anterior to and not belonging to Dieffenbach, thinks it much inferior to that of M. Hysern y Molleras, of Madrid, (vid. *Tratado de la Blefaroplastia Temporo-Facial, ó del Método de Restaurar las Destrucciones de los Párpados*, pag. 103, Madrid, 1834,) and which is called by its author the temporo-facial. This (to which our author, M. Velpeau, has alluded in the supplemental appendix, in a communication from M. Hysern) consists in excising the degenerate lower lid, for example, by a triangular incision, and making a quadrilateral flap external to it by an incision parallel to the outer

side of the triangle. A portion of the fibres of the orbicularis muscle are thereby retained, and a slight rotation enables the surgeon readily to adjust the flap to its place, while the lips of the fresh wound of the flap are united with the same facility.

According to M. Serre, (op. loc. cit., pp. 410, 411,) M. Hysern y Molleras practised this process as early as 1829, long before M. Dieffenbach.

This process is also applicable to the upper lid, and appears to us to include that of another Spanish surgeon, M. Argumosa, (vid. Professor Rigaud, *Thèse de Concours sur l'Anaplastie des Lèvres, des Joues, et des Paupières*, 1841.)

Without doubt the most extraordinary triumph in facial autoplasty, and far exceeding even the remarkable case of M. Payan above, is that performed in 1839, at Gand, by Prof. Burggraeve, (vid. *Annal. de la Soc. de Méd. de Gand*, Juillet, 1839,) on a soldier, who, by a gun-shot wound, had the entire upper lip and most of the front part of the cheeks and upper jaw carried away, and the nose driven in and finally agglutinated to the vault of the palate. It is impossible to form an idea how this hideous deformity, which exposed the tongue and fauces, was covered by flaps from either side of the face, and how the nose was brought out in place, and a new mouth made, and articulation and deglutition, &c., restored, without perusing the details of the operation; and even then it appears difficult to comprehend its various steps. Suffice it to say, that the patient obtained a degree of comfort and relief which clearly established the almost marvellous restorations which anaplasty can produce in the hands of skilful surgeons, (vid. *Serre*, op. cit., p. 426 to 439.)

M. MALGAIGNE'S MANUAL OF OPERATIVE SURGERY.

(Manuel de Médecine Opératoire,) 4th edition, Paris, 1843.

[The appearance of the fourth edition of this useful compendium (a work which has been well spoken of by our author, M. Velpeau, vid. sup.) during the time this edition has been in the press, makes it necessary that we should avail ourselves, in this concluding appendix, of the more important items of new matter it contains relative to subjects embraced in this volume of our translation of M. Velpeau's elementary work.—*T.*]

The Sub-Cutaneous Incision.

Of all the modes adopted in this new order of surgical incisions, which are now regularly described in works of operative surgery, (see *Malgaigne*, pp. 9, 10,) that which seems to be most preferred,

where it is practicable, is the one where the teguments are drawn tense to one side, so that when the section of the tendon, bridle, &c., is made, the puncture of the tenotome no longer corresponds either to the extremity or to the line of the incision. Whereby we have attained what is generally considered the most important result, and the highest perfection of the great principle of the sub-cutaneous method, that of an almost perfect occlusion of air.

Caustics and Cauteries.

The *new caustic of M. Récamier*, recently introduced into surgery by that practitioner as an application to cancers, is the *regal water*, (*l'eau régale*,) containing in solution a certain quantity of the chloride of pure gold, (*chlorure d'or pur.*) M. Malgaigne gives it the preference over nitrate of mercury, as we are enabled, he says, to cauterize deeply with it, while the eschar which it forms separates in three or four days, and a repetition of the application can be made at pleasure. If, as is asserted, it gives but little pain, and that its action is purely local, these qualities would give it, in the estimation of that surgeon, an unquestionable superiority over all other cauteries, (Malgaigne, *Manuel*, &c., Paris, 1843, p. 15.) [As to the *nitrate of mercury*, the remark of Dupuytren that he has seen its absorption produce violent cholics, diarrhœa, and bloody stools, is, in our opinion, a conclusive objection against it, and should cause it to be rejected from practice.—*T.*] Among solid caustics, M. Malgaigne, and also M. Mayor, very justly, as we think, put a high value on the *kali purum*, especially in repressing fungous growths, as it causes, says the former surgeon, but little irritation, forms a true saponaceous [and healthy] compound with the animal tissues, resembling, he adds, hospital gangrene, [but very different, in our opinion, from that disease, which is a putrescent decomposition,—*T.*] and may be easily washed off and applied also daily, (*Ib.*, p. 18.) [It should have, we think, in every respect a decided preference over all mercurial caustics, for the reasons above given.—*T.*]

The hot-iron cautery of M. Mayor, which he calls the double hatchet, (*bicultellaire*,) has the advantage of shortening the operation by making two rays of eschars at one stroke, (*Ib.*, p. 21.)

The Sub-Cutaneous Principle successfully employed in applying Ligatures for the extirpation of a Goître.

The inappreciable value of the *sub-cutaneous principle* could not be more beautifully illustrated, than in its very recent application by MM. Ballard and Rigal, of Paris, in the adjustment of ligatures for the complete sub-cutaneous absorption and eradication of that most formidable and common disease, *goître*. We shall give this in full detail in its proper place; but, in the mean time, think it due to the important and new branch, called sub-cutaneous surgery, to advert to this ingenious process in this volume, and to remark, merely, that although this method of placing ligatures in the form

of three separate sub-cutaneous nooses around and through the base of a goitrous tumor, requires great tact, and seems somewhat complicated, the complete success of the experiment in the hands of MM. Ballard and Rigal, while it reflects the highest honor on those surgeons, and meets with the entire approbation of so eminent a judge in these matters as M. Malgaigne, is destined, we hope, to add another brilliant triumph to surgery, in a disease which had hitherto been deemed beyond the resources of art. We may briefly state, for the benefit of science, and to give as speedy and immediate diffusion to this discovery as it may be in our power through this present American edition of Velpeau's Surgery, that the surgeons mentioned employed two long waxed ligatures, each armed with three needles, viz., one straight, and with a cutting edge, at one end of the thread; one round and pointed, in the middle part of the ligature; and one curved, with cutting edge, at the other end of the ligature. The skin was drawn forcibly up above the goître, opposite to its upper third, so as to make a vertical fold. This fold was pierced by the straight cutting needle, which was then drawn through. The fold of skin, now returning to its place, left, of course, the ligature forming a sub-cutaneous arc over this upper part of the tumor. The round needle was now made to pass by the same puncture which was first entered, so as to go under and directly through the base of the tumor, and thus bringing the median noose out by the other puncture, this noose was cut in two and tied there, by one knot only at first, so that it completely embraced this portion of the tumor at its base, by a sub-cutaneous noose, and also left another thread under the tumor at this part.

The same principle was now adopted with the other long ligature to the lower third of the tumor, and the curved cutting needles remaining were then passed from above downward, under the skin laterally, and outside the base of the tumor, and their threads so tied with the two threads that penetrated under the base of the goître, as to form a complete sub-cutaneous noose around the whole base of the tumor, the threads forming three knots only at three punctures, and leaving the fourth puncture to be closed up. On the 20th day, the whole tumor had entirely disappeared, (vid. Malgaigne, *Manuel, &c.*, 1843, pp. 507, 508, 509.) [We have had the gratification, in the practice of Dr. Mott, of seeing an equally ingenious mode used by him in applying ligatures by continuous nooses, to remove carcinomatous indurations of the tongue; which method, though not sub-cutaneous, he has for many years been in the habit of using in those as well as other similar affections, all of which will be detailed when we come to the subject of operations upon the tongue.—*T.*] The process of MM. Ballard and Rigal cannot be understood without carefully perusing it in detail in M. Malgaigne's work.

To make Progressive Strangulation, upon the Pedicle of a Tumor, for example, M. Malgaigne prefers the *Serre-nœud* (or *knot-tightener*) of Graefe to that of M. Mayor, improved upon Roderic's. Graefe's is copied from the tourniquet of Petit, and consists of a

steel shaft, (*tige*,) or stem, pierced at its upper extremity, through which pass the two ends of the noose which has been already applied. At the other extremity is a screw, (*vis*,) which, on being turned in one direction or the opposite, causes to ascend or descend a moveable nut, (*écrou*,) to which the ends of the ligature are firmly attached. A simple turn of the screw suffices then to increase or diminish the constriction at pleasure. This instrument unites great simplicity to great force. (*Manuel, &c.*, 1843, p. 26.)

Compression of the Arteries and Veins to arrest Hemorrhage.

In regard to compression upon the *brachial artery* at the lower third of the humerus, the place usually recommended, because the ulnar and radial nerves are there separated from the artery, M. Malgaigne says it is of little value, inasmuch as the artery is constantly accompanied by the median nerve, (*Ib.*, p. 32.)

M. Malgaigne speaks with confidence of compression of the *abdominal aorta*, as recommended in uterine hemorrhages by M Tréhan. He, however, thinks it impracticable except in thin subjects. After placing the patient in a situation to relax the abdominal muscles, he prefers the umbilicus as the most favorable point upon which the pressure can be made, and advises that we should use, for this purpose, a strong pelote, to be applied crosswise to the abdominal walls. The continuance of this pressure for five or six minutes has, he says, effectually arrested uterine hemorrhage after parturition, by giving time for the uterus to recover itself. It may be used, also, in lesions of the iliac arteries. M. Faure and others have advised also, in uterine hemorrhage after delivery, to make pressure through the walls of the abdomen on the uterus itself, (*Ib.*, p. 33.)

The *femoral artery* may be compressed crosswise upon the iliopubic protuberance; and so effectually, that it is now, in conformity to the recommendation of M. Louis, who first introduced this mode in amputations, very frequently preferred to and substituted for the tourniquet. M. Malgaigne remarks, that we should recollect that the protuberance inclines forward and downward at a variable angle; for which reason, in order that the pressure may be made perpendicularly, it is necessary that it should be directed a little obliquely upon the artery, and upward and backward, forming with the horizon an angle of about forty-five degrees.

Where *venous hemorrhage*, in operations, is owing to the violent efforts of the patient in holding his breath, and thus obstructing free respiration, and causing a reflux of the blood into the cavas, M. Malgaigne says, that *two or three full inspirations* will sometimes *arrest a flow of venous blood that had been thought unmanageable*, (*Ib.*, p. 35.)

Cauterization with the Hot Iron.

Certain experiments of M. Bonchacourt, on the dead body, have thrown some new light upon this subject. He found that, heated to a white heat, the cautery too rapidly carbonized the vessel, and that, though its mouth closed, a small aperture was left in it, of one-third the diameter of the calibre of the vessel; whereas the cautery at a *dull red heat*, (*rouge obscur*,) frequently and gently applied, at short intervals, and for a few moments only at each time, not only carbonized the artery slightly, and closed it more rapidly and securely, but caused its cut extremity to retract within the calibre of the vessel, like the retracted finger of a glove, (by a species of introsusception,) to the distance of three to five centimetres, in trunks of some size; while the mouths of the small collaterals that were cut near the trunk, were also dragged into the calibre of the main artery along with its inverted extremity, and assisted in thus plugging it up, and effectually arresting the hemorrhage, leaving scarcely any perceptible aperture. These experiments have not yet been performed on living animals. M. Malgaigne seems to attach considerable importance to them, as establishing new rules for the application of the hot iron to arteries. (*Ibid.*, pp. 40, 41.)

The valet a patin, mentioned frequently in the body of this edition of Velpeau, is a steel forceps, whose branches are kept to the degree of approximation desired, by means of a small button gliding along a slit which is made lengthwise in the aforesaid branches. (Malgaigne, p. 43.)

Ligatures.

M. Malgaigne gives the preference to *deer-skin ligatures*, made round like thread, as introduced by our countryman, Physick. He finds that they cut the inner tunics of the artery as well as the ordinary kind, besides having this advantage, which suggested their employment, viz., that of allowing us to cut both their threads near the knot, as the latter is readily absorbed. Mr. Jameson also prefers these ligatures. (*Ibid.*, pp. 44, 45.)

Torsion

When the artery is sound, M. Malgaigne prefers this method, according to the process of Amussat, to the ordinary ligature. In the smaller arteries, simple torsion, without the necessity of traction upon the artery, and breaking its tunics by the *pince à baguettes* before twisting it, is quite sufficient. (*Ibid.*, p. 49.)

A new mode of securing arteries, and one which, according to M. Malgaigne, promises, when better established by further experiments, to become of great importance, and to supersede all other methods for the large trunks, is that proposed by M. Amussat,

of first applying a ligature in the ordinary way, and then, with his *pince à baguettes*, (i. e., forceps whose branches terminate in two slender rounded stems,) breaking up by pinching, as he does in torsion, (and which in this new process is called *par les mâchures*,) the two inner tunics of the artery in several places. What is remarkable, says M. Malgaigne, the clot of blood adheres solidly to the entire circumference of the artery, at all the points where the internal tunics, or coats, have been cut. It retains, however, its conical form, and even near the collaterals every portion of the cone, where the *mâchures* or pinchings have not been made, is found wanting; but the adhesion, nevertheless, is solid at each *màchure*. (*Ibid.*, p. 50.)

In the application of STRIPS OF ADHESIVE PLASTER, he gives a decided preference to the method of M. Gama and others, (*Ibid.*, pp. 51, 52,) of commencing their application by their middle part, (as on a limb, for example,) and on the point diametrically opposite to the situation of the wound, as they then act, he says, with the greatest force, are far more solid, and also not liable to become loose. The very reverse of this strikes us as the truth, and therefore we give a decided preference to the ordinary mode of attaching first, in a firm and secure manner, and at a sufficient distance from the wound, one extremity of the strip, at right angles to and on the side of one of the lips of the wound, and then, while the opposite lip is approximated by pressure of the fingers as close to its corresponding lip as possible, fastening firmly over it the other extremity of the strip, and crossing the ends on the opposite side of the limb. It has always appeared to us, in the constant use of these strips, that their power of approximating the lips of the wound is then the greatest, because its force is exercised by the middle portion of the strip, which is unyielding, whereas it is the ends of the strip, which have not this strong antagonist adhesive power to keep them in place, (even when crossed,) which is the reason why they, and not the middle part of the strip, are the soonest to become detached.—*T.*]

In lieu of the ordinary mode of applying the TWISTED SUTURE, it is proper to recollect, as a general principle, the method adopted by Dieffenbach in rhinoplasty, and other plastic operations where the tissues are thin and many pins are to be inserted. This is, to use delicate insect pins, whose extremities, *after their insertion, he bends upward*, so as to form a curve, whereby their action, by means of this curvature, keeps the lips of the wound in close coaptation, enabling the operator thereby to dispense altogether with threads. (*Ibid.*, p. 56.)

M. Malgaigne commends very highly, from his own personal experience, the new and, as it appears, very convenient mode of forcing a needle with facility through dense tissues, by means of fixing it in a solid handle, (*porte-aiguille*,) as recently introduced by M. Rigal de Gaillac. (*Ibid.*, p. 56.)

In the APPLICATION OF LEECHES, Dr. Mott has recently been much gratified with a method which appears to succeed where most

other modes fail. It is to introduce the leech head-foremost into a small glass tube, having at this extremity, where his mouth is, a smaller aperture than the other, and then, by means of a rod, which fills up like a piston the cylinder of the tube, compelling the leech, by forcing this piston down upon him, to take hold of the tissues in his own defence. Several tubes may thus be used at once; and this is certainly preferable to the delay, often vexatious and embarrassing, both to the patient and physician, which so frequently attends the application of leeches by the common modes.

On the same principle, and which is, in fact, analogous to the mode proposed by M. Loeffler, of forcing leeches down by means of a rod directed upon the narrow extremity of any hollow material, as pasteboard made into the shape of a cone, (see text, supra, of this edition,) the use of leeches has become a most invaluable therapeutic resource, by being introduced through the appropriate specula, to the *mouth and neck of the womb and the walls of the vagina*, and also by a *speculum open in its anterior part*, as recommended by M. Amussat, in *abstracting blood from the prostate through the parietes of the rectum*, all of which modes are noticed with approbation by M. Malgaigne, who also recommends, where a number are to be applied on an exposed surface, to cover them with a compress, and then effectually to secure their escape by means of a glass placed over the whole. (*Ibid.*, p. 61.)

We confess our surprise, however, that this author should recommend that leeches, after coming off, should be left to absorb the blood they have abstracted, and thus be preserved for a *second application!* According to our experience, they never bite so well a second time, and it is a practice, moreover, that may be attended with danger, not only from certain changes which the blood remaining in them (and it is familiarly known to all how long a time they retain it) may have undergone, but because morbid properties in the blood of one person, or virtually made morbid by the mere difference of the blood itself in one individual from another, may thus be transmitted to another, and occasion serious œdematous engorgement, erythema, or even acute and dangerous inflammation of an erysipelatous character, which, in certain habits, even the application of fresh, and healthy, and unused leeches, is almost always certain to produce, (in the flabby tissues, as the eyelids, neck, scrotum, &c.) Physicians as well as students, which latter should seize occasions to become familiar and practised in these minor operations in surgery, cannot be too cautious, therefore, (especially in this country, where we have to depend on foreign supplies,) both in the selection and application of this most invaluable remedial resource. The high price of leeches here may and does often tempt to their use a second time, by druggists and apothecaries who vend them; but, on the other hand, their extreme cheapness and excellent qualities in France, England, the West Indies, &c., render a repetition of the employment there of the same leeches almost criminal.

To arrest the bleeding of leeches, which, as we have said in the

body of this work, can most effectually be accomplished by a suture of fine silk with a fine needle, another and more prompt, cheap, and readily accessible mode has also been proposed by M. Hatin, viz., a *small piece of wood split at one end*, and by which, when made to include a fold of skin, the lips of the puncture may be firmly kept together. This ingenious contrivance, similar in principle to the small spring-forceps used in operations for arresting hemorrhage from small arteries when expedition is required, and we have not time to stop to tie the vessels, might do very well in grown persons or children who would be alarmed at the sight of a needle. (Vid. Malgaigne, p. 63.)

In *bleeding at the arm*, M. Malgaigne says that, where we are obliged to open the *median basilic over the brachial artery*, it is better to make the incision parallel with the axis of the artery, inasmuch as such wounds in arteries, should a wound be unfortunately made, are less dangerous than those that are transverse to their calibre. (*Ibid.*, p. 69.) This seems to be very judicious advice.

M. Coster relates that he has had complete success in the CURE OF GOITRE BY ELECTRO-PUNCTURE. His mode is to use this agent as a means of promoting the absorption of *iodine* by the tumor. To attain this object, he rubs on one side of the tumor a small quantity of *pure iodine*, and then transmits through the tumor the galvanic current, by placing in contact with it two poles of a voltaic pile. (*Ibid.*, p. 84.)

FOR PREVENTING THE REUNION OF BORDERS OF WOUNDS AFTER THE REMOVAL OF CICATRICES, the division of bridles and adhesions, as between the arms, legs, fingers, &c., either congenital or after burns or other injuries, M. Malgaigne attaches much importance to a method lately proposed by M. Amussat, viz., the *repeated division*, every twenty-four hours, and after the parts have begun to suppurate, of *the new inodular membrane*, which has such a constant tendency to reunite the edges. This is to be performed at the angle of junction of the two surfaces of the division. (*Ibid.*, pp. 136, 137.)

On the authority of M. Malgaigne we see it stated that M. Bonnet has divided the MASSETER MUSCLE. (*Ibid.*, p. 139.) The details of this operation we have not met with.

The same author also states that M. Guérin now divides almost all the muscles which surround the COXO-FEMORAL ARTICULATION, in order to facilitate the reduction of *congenital luxations*. (*Ibid.*, p. 140.)

As M. Malgaigne has recently made, in the Paris Academy of Medicine, (as we have stated above,) a bold attack on M. Jules Guérin, in relation to his practice, within a few years past, of extensive divisions of the tendons and muscles in cases of retraction, and especially in reference to *dorsal myotomy*, as performed by M. Guérin for lateral curvatures of the spine, it may not be improper, in elucidation of what we have given above, to quote from M. Malgaigne's late work on surgery a short paragraph which he has on this subject:

"I confess I fear that a sort of temporary éclat has allured surgeons a little further than was necessary or allowable. In the first place, sections of muscles have been made without a clearly defined indication, or in cases in which, though there were indications, they could have been well fulfilled without an operation. There remains also another question to clear up. When a muscle is divided, the fibrous cicatrix which reunites its two portions diminishes its force, but does not annihilate it; it is the same with the section of tendons shut up in a cellular sheath, like the tendo-Achillis. But what becomes, after these sections, of tendons that glide in synovial sheaths? Are they reunited in a manner to preserve the action of their muscles, or is this lost? However it may be, I do not wish to meddle with tendons of this description, except in cases of well-established necessity, and then it would be easy to apply to each tendon the processes of subcutaneous sections, and those which we are about to describe." (*Ibid.*, p. 140, 141.)

Division of the Tendo-Achillis.

In certain cases of *amputation of the foot* by the method of Chopart, it is found that the foot is thrown backward by the preponderating power of the solei (*soléaires*) and gastrocnemii muscles. The section of the *tendo-Achillis* has been recommended for this difficulty, and M. Malgaigne states that, in a case in which he had operated upon, M. H. Larrey made this section with complete success. (*Ibid.*, p. 144.)

As the veins, according to M. Scouttetten, in decided cases of club-foot, are morbidly (*pathologiquement*) distended, and describe, as well as the artery, (tibialis postica,) *flexuosities*, which oblige them to occupy a *larger space* than in their normal state, there is, therefore, reason (says M. Malgaigne) to fear that we might wound them in young subjects, in whom the deformity of club-foot existed to any considerable extent, and so much the more if we should divide the tendon at its most superior part, as the tibialis postica artery is there covered by the tendon. Whereas, in making the incision too low down, we incur the risk of wounding the bursa mucosa, which separates the tendo-Achillis to a considerable extent from the os calcis, immediately previous to its attachment to that bone.

For which reasons M. Scouttetten lays down the following rule: "*Draw a line transversely which divides* (partage) *the external malleolus and is prolonged to the tendon, and you will have the exact height at which the section ought to be made;*" which M. Malgaigne seems to approve of, as also the recommendation of M. Scouttetten, to make the puncture at the *inside of the tendon through a fold of the skin*, and to direct the edge of the tenotome upon it between the skin and tendon, cutting *from without* to its deep-seated surface, while the foot is firmly kept in a state of extension. (*Ibid.*, pp. 144, 145, 146.)

Morbid Cicatrices.

On this subject we confess ourselves again somewhat surprised to find M. Malgaigne reverting back to the now proscribed operation of simple excision of the cicatrix, as was recommended by Dupuytren. On the other hand, he makes no mention, (see his work, pp. 134 et seq.,) as far as we can discover, of the new and ingenious process of our countryman, Prof. Mütter, of Philadelphia, which was crowned with the most triumphant success, in the very worst forms of those cicatrices, viz., those from extensive burns on the neck, &c., (see details in the text, supra,) and which is certainly, therefore, applicable, we should reasonably suppose, to those of a less formidable character. Thus where, for example, as described by Dupuytren, cicatrices, leaving loss of substance, have caused adhesion, and shortening of the flexors of the fore-arm, and violent flexion of the fingers, instead of excision of the cicatrix and extension of the parts, with a view to procure a new and larger cicatrix, as he recommends, *why might not a flap of sufficient length and breadth, on Dr. Mütter's principle, be first made to occupy the place of the excised cicatrix; and after sufficient lapse of time for perfect agglutination of the same, what objection would there be to make the necessary sections of the retracted tendons and muscles?* We are aware of the meager and thin condition of the tissues here, and that this modification has been attempted, as we saw in one instance, by Dr. Detmold, without success; but it nevertheless seems to us practicable under certain circumstances, and where the cutaneous tissues are sufficiently nourished, as is proved by the success of the Tagliacotian process of rhinoplasty. (See text, above.)

M. Malgaigne says he has seen the method of Dupuytren succeed where the extensor tendon of the middle finger and the contraction or shortening of this tendon had reversed the first phalanx of that finger backward, and flexed the two other phalanges forward.

M. Malgaigne mentions also a case in which the extensor tendons being divided, their extremities were separated by the action of the flexors, followed by the formation of a cicatrix, in such manner as to leave too great a length to the muscles, whereby a forced degree of flexion was produced. M. Dutertre, he adds, in a case of this kind, removed the entire cicatrix, straightened the fingers by means of a suitable dressing, and approximated by suture the borders of the skin and the ends of the muscles themselves, obtaining thereby complete success. (*Ibid.*, p. 147.)

The ingenious and successful application of the sub-cutaneous principle, by M. Goyrand, of Aix, within a few years past, to the EXTRACTION OF FOREIGN BODIES FROM THE ARTICULATIONS, particularly from the knee, where they are most frequently met with, not having been given in detail, though noticed in our text, (supra,) we insert it in this place, from M. Malgaigne's work, where this method, we perceive, justly receives his entire approbation, and decided preference over all others.

Process of M. Goyrand.

The patient being placed on a bed, the surgeon on his left crowds the foreign body into the outer part of the upper *cul de sac* of the patella, where he holds it fixed, at the distance of four centimetres above this bone, continuing to press it from below upward with the left fore-finger and thumb. He then causes the assistant to raise up the skin upon the thigh, above the foreign body, into a large transverse fold, so as to bring to the neighborhood of the foreign body a portion of skin from a great distance. Then, with a sharp-pointed bistoury, whose blade has seven centimetres in length, and four only in width at its base, he plunges it from above downward into the base of this fold, and directing the point towards the foreign body, he cuts beneath the skin, and in a direction parallel to the axis of the limb, all the tissues which cover this body. He found it necessary [in his first operations] to repeat this manœuvre upon the tissues three times before he could divide them, after which the operator perceived the concrete body escape under his fingers. It had passed out of the articulation. The bistoury was then withdrawn, and the assistant let go the fold of the skin. Some drops of blood, mixed with bubbles of air, issued from the puncture, which last mounted upward to eight centimetres above the point where the synovial [membrane] had been divided. Some bubbles of air also remained in the sub-cutaneous cellular tissue below the puncture. The foreign body was lodged between the middle and outer portions of the triceps, at the distance of six or seven centimetres above the incision into the synovial. A compression was established underneath both, to prevent its retrocession, and to keep it in contact with the sub-cutaneous incision. This compression was removed on the sixth day. In the case given in illustration in the above description, M. Goyrand found, a few days later, that two other foreign bodies had made their appearance in the articulation. For one of them he repeated the same operation sixteen days after the first, with this difference, that he made his incision a little within the first, and incised the triceps and aponeurosis to sufficient extent to allow the foreign body to arrive under the skin; and though he did not succeed to the extent he wished, he caused it to arrive under the aponeurosis.

Eleven days later, presuming that all communication between this foreign body and the synovial was closed, the surgeon effected its extraction by an ordinary incision; but he did not feel inclined to try the same operation for the body which had become lodged under the vastus externus muscle; and he is of opinion that *it is better to confine ourselves to removing them from the joint and leaving them in the cellular tissue*, where they become encysted without causing any inconvenience, (ib. pp. 213, 214.) [We should suppose that after a sufficient lapse of time for the reunion, or adhesions of the synovial membrane, it would be better to remove them.—*T.*]

Artificial Joint.

After describing Dr. J. R. Barton's operation, M. Malgaigne suggests whether in an urgent case it would not be advisable to introduce a *steel chisel* through a narrow wound, and to strike upon it with a lead mallet, so as to break the bone without exposing it to the air, (ib., p. 215.) We should suppose so harsh a process would produce too uneven a division; in fact, a rough fractured surface together with splinters, endangering suppuration and destruction of parts, which might be followed by anchylosis, and thus defeat the great object that most surgeons aim at, which is to have a smooth transverse surface on the end of each fragment.

Under the head of the *redressement* of *angular* deformities *produced by a morbid callus*, may properly be ranged a new method, which lately succeeded with M. Wasserfuhr. In a child, aged five years, the ends of the bones, after a fracture of the femur four fingers breadth below the great trochanter, had consolidated in such manner upward and outward as to form a right angle, together with a shortening of the limb to the extent of twelve fingers breadth. The callus was large and solid, and three weeks had elapsed since the fracture. The operator, having stretched the skin below with his left hand, so as to make the projecting angle of the callus more prominent, made on this projection a transverse incision to the extent of a fourth of the circumference of the thigh. A second cut divided the muscles down to the bone. The retraction which followed exposing the angle of the callus, he proceeded with a fine saw to divide it to the extent of one-third of its thickness, the soft parts not allowing him to go any farther. His intention then being to break the remainder, under the impression that the *rough ends of the bone would better favor the process of consolidation*, [see M. Malgaigne's suggestion above, in respect to artificial joints, and probably based on this idea,] he placed the part across a truncated pyramid of wood, whose top was covered with deer-skin, and base fixed firmly upon the table. Strong efforts on the ends of the bone, in order to break the callus, not succeeding, the soft parts were dilated by another incision, which enabled the surgeon to saw the bone to some distance farther, when another application of force completed the fracture; the whole operation consuming but a few minutes, and causing the loss only of thirty grammes of blood, (ib., pp. 233, 234.)

Tarsoraphy.

This name has been given to an operation performed by M. Walther, upon the outer angle of the eye. An individual had a cicatrix, with loss of substance, on the temple, which drew outwardly the palpebral commissure, and gave it an irregular round form. The lids were bent outwardly, and the conjunctiva was inflamed. The operator encompassed the cicatrix by two incisions,

which united on the temple, and included the outer third of the tarsal cartilage of each lid. Two stitches of suture brought the wound together, and the double ectropion was completely cured, (ib., pp. 366, 367.)

Myotomy for Strabismus.

In relation to the anatomy of the eye, M. Malgaigne contends that under the conjunctiva there is a *fibrous membrane*, which has been forgotten by modern anatomists, and which, first *pointed out* by Ténon, but imperfectly, has been first *demonstrated and described* by him [M. Malgaigne] in his lectures, and in his *Anatomie Chirurgicale*. This membrane is white and elastic, and lines the ocular conjunctiva in every part of it, united at the base of the orbit with the palpebral ligament and periosteum, then extending up to the cornea, where it makes a duplicature backward to form a complete envelope to the sclerotica, until it finally reaches the optic nerve, with the neurilema of which it appears to be continuous. On the sclerotica it is very moveable, and a layer of cellular serous tissue separates these two membranes. At the points of insertion of the tendons upon the globe of the eye it is not perforated, but folds itself around those tendons in such manner as to form a short and fibrous sheath to them, which degenerates into cellular tissue on their fleshy fibres. This membrane M. Malgaigne calls the albuginea, (*albuginée.*) Some have called it the *fibrous capsule* of the eye; others, the *sub-conjunctival fascia*. They have called the part which lines the conjunctiva, the first layer, (*feuillet;*) that next the sclerotica, the second. M. Guérin has called that portion of it the *muscular toga*, where its fibrous fourreaux, reflected upon the muscles, leave, nevertheless, between the tendon and the sclerotica, a small free space, where they do not continue upon the tendon. When the section of the tendon is made very near the sclerotica, we divide only the anterior portion of the sheath; but to divide it entire we must carry the instrument to the fleshy body of the muscle itself.

M. Malgaigne disapproves the horizontal incision on the conjunctiva, as recommended by M. Lucien Boyer, because it renders the operation more difficult and less secure. He would give a decided preference to the sub-conjunctival method of M. Jules Guérin, except that it has the disadvantage of being very difficult; also that of endangering the wounding of the sclerotica, and depriving us of an opportunity of ascertaining if the whole muscle has been divided.

M. Malgaigne mentions having dissected an eye, in which the section of the rectus internus did not allow the eye to be drawn outward by the érigne, so forcibly had the superior and inferior rectus been drawn inward, by the retraction of the internal rectus.

He therefore determines in favor of the ordinary method, only that the incision should be small. This has the immense advan-

tage, he says, of enabling the surgeon to follow his instrument with his eye, so that he knows what he is doing.

M. Malgaigne gives the preference to the forceps over the érigne, to take up the fold of the conjunctiva, as unquestionably more secure. The double hook to raise the muscle has no advantage over the single, and is more complex and quite unnecessary.

The vertical incision is the preferable one, except where the sub-conjunctival puncture of M. Guérin can be substituted.

The *section of the obliquus superior* alone (*dû muscle grand oblique*) has never yet been undertaken for strabismus, but only after that of the internal rectus. The reason is, M. Malgaigne, himself a distinguished anatomist, confesses, because the part this muscle has in strabismus is not precisely known. M. Bonnet, in fact, affirms that its section, to say the least, is uncalled for (*au moins inutile*) in that disease. M. Gairal, however, has suggested the section of the *insertions of the fixed pulley* (*poulie de renvoi*) of this muscle at the inner and upper angle of the orbitar edge, and which would require only a simple puncture of the skin with the tenotome. This operation, however, M. Malgaigne thinks it is unnecessary to dwell upon, as there is no object to be thereby obtained.

When, after the section of the rectus internus, the strabismus (convergent) continues, especially if the eye is turned upward and inward, the *reflected portion* (*la portion refléchie*) of the *obliquus superior* has been laid bare and divided. The object here is not to look for its insertion upon the sclerotica, which is twenty-three millimetres behind the periphery of the cornea. But to effect our object we dilate upward the incision of the conjunctiva and *albuginea*, [i. e., the fibrous membrane (see supra) which M. Malgaigne claims to have first accurately described.—*T.*] The adipose tissue is divided directly upward, and a little backward, until the muscle appears. Some then pass backward a blunt hook very much curved, (*fortement recourbé,*) directing its concavity upward; others simply divide it with the scissors. This operation M. Malgaigne thinks somewhat hazardous, attended with a great deal of laceration in the orbit, and much more loss of blood than the mere division of the rectus internus, and, if the hook is not used, giving occasion to painful traction. Some operators, it is said, have inadvertently divided the muscle without laying it bare, and without being aware of it; after which they have uselessly endeavored, and at the cost of much suffering, to find where it was. M. Malgaigne apprehends that this division has been made without any well-ascertained necessity; since the most correct observations that have yet been made on the functions of this muscle induce us to believe, that instead of drawing the eye upward and inward, it draws it *downward and outward.* M. Bonnet, who is of this opinion, concludes, therefore, that if the section of this muscle has appeared to be attended with success, it is because, in order to effect it, we have been obliged to isolate the eye to a great extent from its fibrous capsule, and that we have thus destroyed all the

fibrous connections which retained the eye in its convergent direction. This explanation may appear hypothetical; but the indication of the section of the obliquus superior is still more uncertain, and, from all the information we have at present, ought not, from prudential considerations, to be attempted.

The section of the *rectus externus*, clearly indicated in divergent strabismus, which, however, is exceedingly rare, exacts attention to two important considerations: 1. That the muscle is inserted at *nine* millimetres from the cornea, consequently a little farther behind than the rectus internus, which requires the incision to be made in reference to this attachment; 2. That it is found immediately above the outer palpebral angle, and, consequently, that we must look for it above this angle.

The *rectus superior* and the *rectus inferior* have been still more rarely divided. The first is inserted at eight, and the second at *seven* centimetres from the cornea. It is scarcely necessary to add, that we must take care not to mistake either for the corresponding oblique muscles.

To make the section of several of these muscles, as has been done by several surgeons, it is necessary to make an extensive dilatation of the incision of the conjunctiva.

The section of the *obliquus inferior* (*petite oblique*) has been made by means of an incision into the conjunctiva, and M. Bonnet states that he has sometimes found an *advantage from* it, in conjunction with the section of the *rectus externus*. But, though there may be occasion of dividing this muscle (the inferior oblique) in certain cases of myopy, fatigue of the eyes, convulsive trembling, and even in certain cases of amaurosis, it is even, in such cases, much more simple and easy to divide the muscle by a sub-cutaneous incision, at its insertion at the orbit.

The obliquus inferior is inserted at the inferior edge of the orbit, at the distance of from *six* to *twelve* millimetres from the outer side of the lachrymal sac. Around this insertion there is neither nerve nor artery, nor any important organ, and the cutting instrument, glided between the lower wall of the orbit and the muscle, cannot be brought forward without hooking it up and dividing it.

The process of M. Bonnet.

The left being supposed to be the eye operated upon, the operator places himself on the right of the patient, and uses a tenotome sufficiently pointed to perforate the eyelid, and sufficiently blunted in its point not to catch in gliding along the floor of the orbit. The blade should have *four centimetres* in length, and *three millimetres* in breadth, and cut only to the extent of three centimetres, so that when it has penetrated to a proper depth, the cutting edge should be found entirely concealed in the tissues. The operator places his left fore-finger on the middle of the lower eyelid, so that the angle rests immediately above the orbitar edge. With this finger he pushes back the eye and lid, and thus leaves prominent (*met*

ainsi en relief) the middle of the inferior orbitar border. In front of the angle, and immediately behind the orbitar border, he plunges the tenotome held in the right hand in the manner of a writing-pen, pushes it first downward until it touches the floor of the orbit, then pushes it inward, while it grazes this floor, in a direction obliquely backward and inward, to the depth of two to three centimetres. When the point, which should never be allowed to leave the bony plate, [*le plancher osseux*, i. e., the osseous floor of the orbit.—*T.*,] has arrived near the ethnoid bone, the instrument, which has been gradually made to descend horizontally, is brought forward, with the cutting edge in the same direction. The point thus reaches under the skin, a little outside the lachrymal sac. In this way we must have necessarily reached the inferior oblique, but we may not have divided it. To make sure of its section, we first turn the blade downward, then against the anterior portion of the maxillary bone, so that the muscle, if we have not yet divided it, is placed between the bone and the cutting instrument, in withdrawing which last we cannot fail in completing its section.

At the moment of the section, the lower eyelid becomes gorged with effused blood, without any pain, and which never continues over twenty-four to forty-eight hours. At the expiration of this time it has entirely subsided, leaving only an ecchymosis, every trace of which ordinarily disappears by the fifteenth or twentieth day. It is unattended either with inflammation or suppuration. In a patient, in whom M. Malgaigne performed this operation on one eye, for gradual loss of vision and corresponding projection in both eyes, the eye operated upon became much diminished, and seemed to become sunken (*enfoncé*) into the orbit. As to the vision, it first returned to the eye which had not been operated upon, and, strange to say, afterwards in a lesser degree to the other, but to a degree so satisfactory to the patient, that he would not consent to be operated upon in the other.

M. Guérin, following out the idea of M. Dieffenbach, of snipping or excising out, in cases of slight convergent strabismus, a portion of the conjunctiva and albuginea, near the insertion of the external rectus, has, in a case where divergent strabismus followed the section of the internal rectus, and was not relieved by the section of the external rectus, inserted into the external albuginea near the outer border of the cornea, and by means of a needle, *a noose of waxed thread*, which he then fastened to the dorsum of the nose, so as to draw the eye inward, and thus effect the adhesion of the posterior end of the cut externus (previously detached from its new insertion) farther backward, by which means the eye was perfectly restored to its normal position, [ib., pp. 375 et seq.; see also, on this subject, the late treatise of M. Velpeau on Strabismus, incorporated with the text.]

A New Process of Cheiloplasty claimed by M. Malgaigne.

"It appears to me (says M. Malgaigne) that we might contrive

to unite the advantages of the two methods, viz., fill up the largest losses of substance, and obtain a moveable lip, by the following process, which assimilates (*se rattache*) to the ancient method, and which I was the first to describe."

In the first place, all the degenerated parts should be removed, either by a V incision, as in the ancient method, or by vertical incisions descending to the base of the lower jaw, (*l'os maxillaire,*) and united there by a transverse incision.

In the first case we should have a triangular loss of substance; it is then advisable to prolong the angles of the mouth on each side by a transverse incision, and to dissect in such manner as to obtain two triangular flaps. Their vertical borders should be united on the median line by means of points of suture; as to the upper border, all that goes beyond the extent that we wish to give the lip, will also be united to the other border of the horizontal incision. [This principle, it will be seen, (vid. the text, supra,) was recently happily applied by Dr. Mott, in attaching the border of the semilunar incision, left by the excision of the cancerous portion of the lower lip, to the upper border of the horizontal incision made at one angle of the mouth.—*T.*]

In the second case the loss of substance is quadrilateral. To the two incisions which prolong the commissures, it is necessary to add two other parallel ones along the base of the [lower] jaw. We then have it in our power to detach, by dissection, two quadrangular (*quadrilatères*) lateral flaps, which may be united to each other on the median line, and to the other incisions wherever it may be necessary.

This is, in fact, says M. Malgaigne, the process of Celsus, imperfectly comprehended (*mal compris*) by all his translators, showing that to translate a surgeon requires a knowledge of the science of which he treats.

It results from this process, that the cheeks alone contribute to form the lip, whose free border is formed by the bleeding border of the horizontal incision. In this manner the new lip contains muscular fibres belonging to the *orbicular* and its antagonists; behind it is covered by a natural mucous [membrane,] and we may also cover its free border by the mucous membrane, by making use of the process of M. Dieffenbach, [see text, and also M. Serre, supra.] This process, says M. Malgaigne, which I described in 1834, has been successfully employed by M. Bonnet, of Lyon, with this difference, that he is *of opinion* that we may dispense with sewing on the mucous membrane, as *it will spontaneously unite to the skin in the progress of the cicatrization.*

If the dissected portions could not be sufficiently elongated, we might have recourse to the semilunar incision of Celsus, by means of which the base of the flap on the side of the ear would be separated from the posterior integuments. M. Malgaigne does not think that the exsection of a too salient portion of the lower jaw, which was practised by M. Roux, (*Ib.*, p. 453, et seq.,) [see his case in the text, supra,] should be had recourse to but as desperate means,

when all others have been exhausted. [M. Malgaigne does not seem to appreciate the little danger which attends these exsections, when implicating even the entire half of the jaw, and which fact had been long since fully established by the *important operations on the lower jaw for osteo-sarcoma*, which Dr. Mott (and not Dupuytren, as M. Malgaigne in another part of his work asserts, nor any other person) was the first surgeon to perform. We can discover nothing original in the process above described by M. Malgaigne as his invention, and every part of which would seem, by M. Serre's elaborate and accredited work, to have been long before anticipated by either the Professor of Montpellier or the surgeons of Germany. Even the part of the process which M. Malgaigne does not claim, and which he gives to Dieffenbach, to wit, that of the *buccal* lining, M. Serre asserts that he himself is as fully entitled to it as the Berlin Professor, and that neither of them, in fact, nor any other person, have any claims to it but its discoverer or inventor, M. *Werneck*, (vid. our abrégé from M. Serre's work, above.)—*T.*]

In Bronchoplasty, M. Malgaigne, though according praise to the ingenious process of M. Velpeau in filling up fistulous openings in the trachea with a *bouchon-flap* of integuments in the neighborhood, (see text, supra,) thinks it might be superseded by that of Dupuytren; if, instead of converting the fistula into a longitudinal [i. e., vertical] wound, (as this last-mentioned surgeon did in a case where the fistula was situated between the hyoid bone and thyroid cartilage,) the wound should be made transverse, and the pared edges, therefore, united by the interrupted [and *not* the *twisted*] suture, and from above downward rather than from one side to the other. M. Malgaigne says his experiments on animals had convinced him that the union of wounds, in this part, *is much more favorable when transverse* than longitudinal, which is the reason why he adopts them in subhyoidean laryngotomy. It might, he thinks, be advantageous, also, to cut the two lips with bevelled edges, the upper at the expense of its outer border, and the inferior at the expense of its inner border, (*Ib.*, p. 499.) [These opinions touching the pathology of transverse wounds seem to be discordant with the text of our author, and with common belief and observation. But this difference may be only fallacious, and M. Malgaigne may be right, as wounds are properly transverse or longitudinal according to the direction of the fibres, not the mere position of the part, as, for example, between the ribs, &c.—*T.*]

Uretroplasty.

In fistulous openings into the urethra, with loss of substance, M. Malgaigne considers the *process recently proposed by M. Alliot*, founded on the ancient method, as one of the most ingenious and successful. It consists in circumscribing and dissecting [on one side of the fistula] a small quadrilateral flap; then removing from the other side a portion of the skin equal to this flap, he covers with

this latter both the wound and the fistula, so that the principal suture is found at a distance from the urine when it passes the urethra. As, however, the infiltration of urine, the great obstacle to the cure of all these fistulas, may still present itself, it is well briefly to notice here the new and ingenious process recently adopted with the happiest success by M. Ricord, of Paris, following out the suggestion first made by Dieffenbach, and afterwards again urged by M. Ségalas. This consists in making an artificial opening into the urethra beyond the fistula, and keeping therein a catheter to draw off the urine by this aperture, until the fistula is perfectly healed. (*Ib.*, p. 657.) [The process of M. Alliot is the same as that of M. Velpeau for certain kinds of *staphyloplasty*,—vid. supra.—*T.*]

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