A system of operative surgery : based upon the practice of surgeons in the United States, and comprising a bibliographical index and historical record of many of their operations, during a period of two hundred years / by Henry H. Smith.

OPERATIVE SURGERY.

A SYSTEM

OF

Alfred Powell M.D.

OPERATIVE SURGERY:

BASED UPON THE PRACTICE OF

SURGEONS IN THE UNITED STATES:

AND COMPRISING A

BIBLIOGRAPHICAL INDEX AND HISTORICAL RECORD OF MANY OF THEIR OPERATIONS,

DURING A

PERIOD OF TWO HUNDRED YEARS.

BY

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ILLUSTRATED BY NUMEROUS STEEL PLATES.

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TO

CHARLES A. POPE, M.D.,

PROFESSOR OF THE PRINCIPLES AND PRACTICE OF SURGERY, AND OF CLINICAL SURGERY,

IN THE

MEDICAL DEPARTMENT OF THE ST. LOUIS UNIVERSITY,

The following Pages are respectfully Dedicated,

AS AN

ACKNOWLEDGMENT OF HIS DEVOTION TO THE PROGRESS OF SURGERY IN THE UNITED STATES,

AND AS

A TESTIMONIAL OF THE RESPECT AND ESTEEM OF HIS

SINCERE FRIEND,

THE AUTHOR.

PREFACE.

To the majority of those commencing the study of medicine, few subjects are possessed of greater interest, or surrounded by a more pleasurable excitement, than operative surgery.

With some few exceptions, every young man, at an early period of his pupilage, regards the performance of an operation as the highest test of professional acquirements, and under the impression that his knowledge of it is to be obtained by observation, is always anxious to embrace every opportunity of witnessing the efforts of an operator. Whilst, therefore, chemistry displays her secrets, and physiology tenders him in vain the principles of his profession, the surgeon, when limited to the least scientific portion of his duties, is always sure of a numerous audience, who, under the impression that they will be fully prepared to follow in his footsteps, simply by observing his course of proceeding, will readily repeat their visit whenever he can offer them a similar inducement.

Having, from long intercourse with medical classes, had many evidences of the existence of this condition of mind, and having, like many others, learned that seeing an operation and performing it are very different acts, the author has wished to lead the reader to a more correct estimate of the means by which operative skill is to be acquired, and sought, in the following pages, to furnish him a guide which might also serve as an instructor, whilst performing for himself the operations which he desires to study. In special anatomy, few have ever acquired a thorough knowledge of the structure of the body until by constant manipulation they have been able to separate each portion for themselves, and, in surgery, the same course must certainly be pursued. Study, observation, and the repeated demonstration of another are, doubtless, valuable aids to the acquisition of

knowledge, but, unless seconded by personal practice, they will all pass away as the baseless fabric of a dream.

The following pages are, therefore, presented to the Profession, in the hope that they may invite more general attention to the necessity of acquiring a knowledge of operative surgery by practicing, upon the subject, such processes as it is desired to master; while, at the same time, drawings have been added in order to facilitate the progress of those who cannot, at the moment, obtain the necessary material for repeating the operation.

In many portions of the work, the descriptions furnished will be found to be given in as condensed a form as seemed compatible with clearness, and have been thus presented in order to prevent the volume becoming too cumbersome for constant use. In addition to which, the author has not desired to go over ground which has so recently been well displayed by writers both in Europe and this country. Many details of history, pathology, physiology, and surgical proceedings which are essential to a complete treatise upon the subject have, therefore, been designedly omitted in this as not coming within the scope of its plan.

Although the idea of an instructor cannot be claimed as a novel one, having, in the hands of Messrs. Malgaigne and Fergusson, been most happily illustrated, there has yet been no work issued by the press which has presented the American practitioner with a comprehensive view of the opinions, operative methods, and instruments of those of his countrymen who have given to American surgery a character of its own.

At present, little more than two hundred years have elapsed since the first surgeon stepped upon our shores; yet, during that time, many acts have been performed that will favorably compare with the brightest achievements of the surgeons of Europe. To record these points and save them from unmerited oblivion, has been a pleasant duty in connection with the composition of the volume.

In its formation, the author is under many obligations to various sources, which he hopes he has suitably acknowledged. Basing his description of any operation chiefly on the views of his own countrymen, he has yet felt bound to display along with them the opinions of such European authorities as are universally received as sound; and to facilitate a judgment on the part of those whose knowledge might not be sufficient for the formation of an opinion of the value of the different methods referred to, he has appended to the

account an estimate of their advantages. This estimate, he wishes it to be distinctly understood, is founded solely upon his own opinion, based upon the experience acquired during a devotion of seventeen years, under auspicious circumstances, to the study and practice of a favorite branch of his profession.

To the liberality of the publishers, Messrs. Lippincott, Grambo, & Co., is due the opportunity of presenting a series of illustrations, that must materially contribute to the reader's comprehension of descriptions, the details of which might otherwise be difficult to follow.

For the accuracy and finish of the engravings he is indebted to Mr. John M. Butler, of Philadelphia, who has zealously exerted himself for the perfect execution of his part of the undertaking. To the latter gentleman is also due the author's acknowledgment of the untiring good nature with which all the alterations and renewed criticisms on his work have been received during the progress of the engraving.

In selecting the illustrations, various sources have been resorted to, but upon none has the author relied more than on the beautifully finished plates of Messrs. Bernard & Huette. Wherever, in any instance, previous figures did not present such views as were desired, the aid of the Daguerreotype has been invoked, and original drawings made with all the accuracy of the scene at the moment. In employing the illustrations of other writers, the effort has been made to credit accurately the original authority; but this having often proved a matter of impossibility, the author has merely attached the name of the work from which he has taken them. Heister, Froriep, Blasius, Seerig, Dupuytren, Sir Charles Bell, Labat, Gensoul, Serre, Bourgery, and Jacobson, and Pancoast have all drawn, more or less, from the same sources as Messrs. Bernard and Huette; but most of them have so transferred from work to work the result of their labors, that, with one or two exceptions, it is not easy to trace their origin.

For an opportunity of consulting the many works required in connection with the Bibliographical Index, as well as with the matter embodied in the text, the author is indebted to the valuable libraries of the Pennsylvania and New York Hospitals, to the Loganian portion of the Philadelphia Library, and to the private collections of many friends. To the Librarian and Library Committee of the Pennsylvania Hospital he is under especial obliga-

tions for the free use, at all hours, of their valuable and extensive collection.

To Dr. John C. Warren, of Boston, and also to his son, Dr. J. Mason Warren, is due the acknowledgment of the aid afforded by an extended manuscript, as well as by a collection of pamphlets which have furnished much valuable information in connection with the surgery of Boston. From the "American Journal of Medical Sciences," edited by Dr. Isaac Hays, there has also been gained many scattered facts connected with the doings of the surgeons of this country.

In describing the anatomical relations of the various parts concerned in the different operations, reliance has been chiefly placed upon the accounts furnished in the "Anatomie Topographique" of Blandin, as well as on that given in the "Special Anatomy and Histology" of Dr. Wm. E. Horner, of the University of Pennsylvania.

In bringing his labors to a close, the author also recalls many acts and suggestions on the part of friends which he cannot properly specify, and which he regrets he did not note at the moment.

Hoping, at some future time, to have the opportunity of remedying this, as well as some other omissions connected with the press, he cheerfully submits the volume to the judgment of the Profession in the belief that it will be received as a contribution to facilitate the progress of those who have yet to acquire their surgical experience.

That his seniors may find it to embody correct views of practice, whilst recalling by-gone scenes, and his juniors be tempted to refer to it in moments of doubt, is all that is anticipated by

THE AUTHOR.

PHILADELPHIA, *October* 1851.

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HISTORY OF SURGERY.

A BRIEF HISTORICAL SKETCH OF SURGERY, COMPILED AND COLLATED FROM THE BEST AUTHORITIES.*

THE origin of surgery, being coeval with that of medicine, dates from the earliest periods of the human race, the reception of injuries naturally requiring that some effort should be made to alleviate them. That surgical operations were performed, at a very remote period, is shown by the laws of Moses, describing minutely the operation of circumcision, which is yet practiced among the Jews according to ancient usage, and by the embalming of Joseph, indicating the possession of such surgical knowledge as was necessary for the opening of bodies.

The earliest individual, directly spoken of in connection with the practice of surgery, and the reputed originator of the science, is the mythological person of Chiron, the Centaur, supposed to have been born in Thessaly at some unknown period.

Next, we find mention made of ÆSCULAPIUS, a son of APOLLO, B.C. 1142, who is believed to have been a pupil of CHIRON, and then we have more positive information in the account by Homer of the events of the Trojan war, where he describes PODALIRIUS and MACHAON as sons of ÆSCULAPIUS, and as surgeons in the war, B. C. 1192.

PODALIRIUS is reported to have been the first bleeder, having opened a vein in either arm of the daughter of the King of Caria, and received her hand in marriage as his recompense.

The ASCLEPIADES, or reputed descendants of Æsculapius, constitute the only surgeons spoken of during the ensuing 500 years, after whom came PYTHAGORAS, B. C. 608; and, after him, the following may be briefly mentioned in the natural order of time.

DAMOCEDES, a cotemporary of Pythagoras, treated King Darius

* The facts here stated have been collected from Miller, Richerand, Sharp, Black, Chelius, and from the Dictionary of Antiquities, by William Smith, LL.D.

for a sprained ankle, and his queen, Atossa, for cancer of the breast; and after him came the great father of medicine and surgery, from whom all the rest may be traced.

Hippocrates, B. C. 460, or 357, was among the first of the distinguished surgeons, and practiced many operations, often claimed as modern. He employed the actual cautery of various shapes; used moxa made of rolls of flax; resorted to issues and tentes as counter-irritants; operated for calculi in the kidney by incision, but did not cut for stone, lithotomy being then confined to a peculiar class of practitioners. He also reduced dislocations and fractures by means yet resorted to; employed the obstetrical forceps for delivering the fœtus; frequently employed the trepan in depressed fractures of the skull; resorted to percussion to prove the presence of fluid in the thorax; and performed empyema, or paracentesis thoracis. He also wrote many excellent surgical treatises.

After him, Diocles Carystius invented an instrument for extracting darts, and bandaged the head for wounds, by bandages often employed at the present time.

Praxagoras, of Cos, who followed in his footsteps, also proved himself an accomplished surgeon, and some of his operations are yet resorted to. He incised the fauces freely in cases of inflammation; excised the uvula; made an artificial anus, or an opening into the bowels in cases of obstruction in ilius; he also first observed the difference between the arteries and the veins, and noted the pulse, though this fact has also been claimed for Aristotle.

Aristotle gave the name to the Aorta, and showed that all the blood-vessels centred in the heart. After him came the anatomist and surgeon, Herophilus, about B. C. 320, though the exact year is unknown, and he was the first who practiced dissections.

Erasistratus, his cotemporary, did the same thing, and invented many instruments. This surgeon is reported to have reduced a dislocated humerus for Diodorus Cronus, and by this operation to have convinced him of the possibility of the existence of *motion*, which he had previously denied.

Xenophon, his follower, was the first to arrest hemorrhage from the extremities, by a tourniquet, having recommended the encircling of the extremity with a cord, in order to check the flow of blood. Lithotomy, at this period, as during the time of Hippocrates, was avoided by the surgeons, and performed entirely by a peculiar class of individuals who devoted themselves to this one operation.

AMMONIUS, surnamed Λιθοτομος, devoted much time to the study of calculous affections, and employed an instrument to crush calculi, being the first surgeon who operated for Lithotripsy.*

CASSIUS, B. C. 96, exhibited considerable knowledge of the physiological action of the brain, having described the paralysis of one side of the body as induced by injuries of the opposite portion of the head.

CELSUS, the cotemporary of Horace, Virgil, and Ovid, practiced surgery at Rome in the beginning of the Christian era, upwards of 150 years before GALEN. He was the first to describe Lithotomy, and his mode of performing it (central incision), as well as numerous other operations, is yet often resorted to by the surgeons of the present day. He described the operation of Cataract by depression; mentions the subject of artificial pupil; gave accurate and judicious rules for the application of the trepan; was the first to notice that there might be an effusion and compression within the head without fracture; first recommended the application of ligatures to wounded arteries; improved the operations of amputation; applied caustics to the treatment of carbuncle; described several species of hernia; and operated for hare-lip, &c., by methods yet in use and often claimed as modern.

ARETÆUS, A. D. 54, reign of Nero, first employed blisters and resorted to cantharides as a vesicating agent. This surgeon condemned the operation for tracheotomy, lest the cartilages should not heal.

RUFUS, the Ephesian, A. D. 98—117, reign of Trajan, wrote on diseases of the kidneys and bladder, and operated by ligating the brachial artery for varicose aneurism at the bend of the arm.

HELIODORUS, the physician to Trajan, about A. D. 120, and cotemporary of Juvenal, wrote on injuries of the head.

ANTYLLUS, about A. D. 340, recommended tracheotomy, which had been previously practiced by the Asclepiades in threatened suffocation from diseases of the throat; he practiced arteriotomy in great emergencies, and showed the importance of dividing an artery entirely across, instead of incising it obliquely in order to arrest hemorrhage. In the treatment of aneurism, he tied the artery above and below the sac, and, opening the latter, allowed the wound to heal by granulations; he also alludes to the operation of cataract by extraction; and reports cures of hydrocele by incision.

* Smith's Dict. Greek and Roman Antiquity—Art. Chirurgie.

Claudius Galen, born in the autumn of A. D. 130, wrote upon luxations of the femur backwards, a variety not mentioned by Hippocrates; he also described spontaneous luxations of the femur, and trepanned the sternum in empyema.

Ætius, about A. D. 475, scarified the legs in anasarca; employed the cautery; excised hemorrhoidal tumors; employed lithontriptics to dissolve calculi, and wrote on hernia, diseases of the testicle, and castration.

Alexander, of Trallis, a surgeon of the time of Justinian, A. D. 545, wrote on diseases of the eye, and on fractures.

Paulus Ægineta, about A. D. 670, is reported to have bled freely in cases of gravel. He opened abscesses by caustics; defined the points for paracentesis abdominis; sounded the bladder by the finger in the rectum in cases of stone; cut on the left side of the raphé (lateral operation) in lithotomy, and believed aneurism to be caused by rupture of the coats of the artery. He also extirpated the breast by a crucial incision; performed laryngotomy, and first performed tracheotomy, but made a transverse incision instead of a longitudinal one, as at present practiced. He practiced the operation for strangulated hernia; was the first to treat of fracture of the patella, and originated embryotomy.

Caliph Haroun, among the Arabians, had charge of a hospital at Bagdad about A. D. 790, where no fewer than six thousand students, chiefly Christians, are said to have attended the practice of the house.

Rhazes, about A. D. 924, first described Spina Ventosa and Spina Bifida; he opposed all operations for cancer when the tumor was not entirely free from the surrounding parts, and cauterized poisonous wounds.

Haly Abbas, A. D. 980, advised the application of caustics to hydrocele, and punctured the linea alba a little below the umbilicus in cases of ascites.

Avicenna, A. D. 1000, distinguished between closure of the pupil and cataract; preferred depression in cataract to extraction; first resorted to the flexible catheter, and also employed a saw similar to that now named after Hey.

Albucasis, A. D. 1100, is supposed to have been the first who noticed the effect of a clot in the arteries in arresting hemorrhage; he described an instrument of his own for curing fistula lachrymalis, and also the cataract needle of his own period. He also reports

having operated for hydrocephalus, but with doubtful success; removed tumors by the ligature, and first described lithotomy as performed on the female; in the male he practiced the lateral operation. He also excised the tonsils and uvula; extracted polypous tumors from the fauces; objected to any attempt at extirpating goitrous tumors; invented the probang; employed sutures in wounds of the intestines; condemned tracheotomy in acute inflammation of the windpipe, and when it had reached the bronchia, and strongly doubted the propriety of operating in cancerous tumors; *declaring that he never cured, or saw cured, a single case.* He also advised the partial evacuation of large abscesses, as subsequently practiced in England by Abernethy and others.

Pope Innocent II., A. D. 1139, retarded the progress of surgery, by describing its practice as degrading, and forbidding the clergy from pursuing it.

Pitard, A. D. 1271, established the College of Surgeons in Paris.

Gilbertus Anglicanus and John of Gaddesden, two surgeons of distinction, practiced in England A. D. 1300, 1320.

Guy de Chauliac, A. D. 1360, first described the Cæsarian operation.

John of Arden, A. D. 1370, operated very successfully for fistula; improved the trepan, and added the centre pin.

Valasco de Taranta, A. D. 1410, practiced at Montpellier, and first proposed the application of arsenic to the cure of cancer.

Germain Colot, surgeon of Louis XI, A. D. 1460, restored the operation of lithotomy to the profession by an act of the law.

A. D. 1440—1450 was distinguished by the discovery of Printing, which had a marked influence on the progress of the profession.

A. D. 1492, Discovery of America. It may, perhaps, specially interest the American student to know that Syphilis was described by Albucasis, Avicenna, Valesco, and John of Gaddesden, nearly 100 years before this period,* and that its origin in connection with the expedition of Columbus is by no means established.

Vesalius, in A. D. 1550, taught Anatomy; and Eustachius, in A. D. 1560, did the same.

Ambrose Paré, in France, A. D. 1560, created a new period in surgery, both by his practice and writings. He wrote on gunshot wounds, firearms being first introduced at this period; employed

* See Lectures of Sir A. Cooper, by Lee.

ligatures more than the actual cautery, and first resorted to the twisted suture in hare-lip, copying the mode in which the ladies and tailors carried the thread and needle in their cuffs.

TALIACOTIUS, an Italian, in A. D. 1597, revived and systematized the class of plastic operations which had previously been practiced in a very irregular manner by empirics.

FABRICIUS AB AQUAPENDENTE, A. D. 1610, the preceptor of Harvey, introduced the modern trephine, or the instrument that is generally resorted to both in England and America; he also invented the curved canula, formerly employed after tracheotomy.

WISEMAN, A. D. 1676, the surgeon to Charles II, advocated immediate amputation in military surgery, and especially before fever set in.

JAMES YOUNG, of Plymouth, A. D. 1679, first proposed the flap amputation, since claimed by Verduin and Sabaurin, and first recommended compression being limited to the artery in amputation.

FABRICIUS HILDANUS, A. D. 1653, of Germany, and SCULTETUS, each wrote an armamentarium chirurgicum, which includes a large number of surgical instruments illustrative of the practice of their own and preceding periods.

DIONIS, BELLOSTE, SAVIARD, and MOREL, in France, all practiced during the seventeenth century.

HEISTER, A. D. 1710, was highly distinguished as a surgeon, and wrote a large and excellent work on the Practice of Surgery, to which modern surgeons are largely indebted.

DESAULT, A. D. 1730, first taught surgical anatomy. This distinguished surgeon made many improvements in surgery; among others he changed the curved amputating knife to the present straight one; first suggested the cure of artificial anus, by removal of the septum between the ends of the bowel, and also first proposed ligating the distal side of the tumor in aneurism.

PETIT, A. D. 1740, did much to advance French surgery; he invented the screw tourniquet, and was the first who operated for fistula lachrymalis by transfixing the sac.

LE DRAN, SABATIER, GARRANGEOT, LOUIS, and FRERE COSME were also eminent French surgeons during the eighteenth century.

AMERICAN HISTORY.

HISTORICAL RECORD OF SOME OF THE PRINCIPAL FACTS OF INTEREST CONNECTED WITH THE ORIGIN AND PROGRESS OF MEDICINE AND SURGERY IN THE UNITED STATES, ARRANGED TO FACILITATE REFERENCE.*

THE history of Surgery in the United States is so closely identified with that of Medicine, as to render it impossible to separate them; nor is it advantageous to do so, the existence of surgery, as a separate branch, being only produced by violence, both having naturally a common trunk and one universal root. In the United States, any attempt to separate the practice of the one from that of the other is altogether futile, the most distinguished surgeons having been, and yet being, in many instances, the most accomplished physicians of their respective localities.

The United States, in its earliest periods, being a colony of Great Britain, the medical wants of the settlers were necessarily supplied by the practitioners who emigrated with them from Europe. A large number of these emigrants being also those who left their homes on account of religious persecutions, we find that many of our early physicians united the clerical function with that of medicine, or were the public officers, who undertook the treatment of the complaints of the hardy colonists.

The following facts, though mainly of local interest, and specially connected with the origin of the profession in particular towns, are

* For the facts and dates furnished in this synopsis, I have drawn upon various authorities, but especially upon the following writers:—

American Medical Biography, or Memoirs of Eminent Physicians who have flourished in the United States, by James Thacher, M. D., Boston, 1828.

Annual Address (on American Medicine before the Revolution), delivered before the Medical Society of the State of New York, Feb. 1842, by John B. Beck, M. D., President of the Society.

A Review of the Improvement of Medicine in the Eighteenth Century, by David Ramsay, M. D., Charleston, 1800.

yet deemed worthy of general notice, as showing the condition of the profession during a period of over 200 years. In 1620, the United States of America was a wilderness. In 1850, it had more than 40,000 practitioners of medicine, and a population of 25,000,000 souls.

The first record of the presence of a physician, as a resident of the colonies, is found in the settlement of Virginia, where, in 1608, one year after the settlement of the colony, Dr. WALTER RUSSEL arrived from England.

In 1620, Dr. SAMUEL FULLER, a deacon in the church of the Rev. John Robertson, arrived at Plymouth in the first ship with the Puritans.

In 1635, Dr. THOMAS THATCHER came over from England, and subsequently published the first American medical work.

In 1637, Dr. JOHN FISK arrived and settled at Salem as a clergyman and physician.

In 1638, Harvard University, Mass., was founded. Many of its early graduates, after obtaining medical degrees in Europe, returned to practice their profession in their native country, bringing with them the views and practice of their European teachers, thus establishing medicine in this country on the basis of that taught during their pupilage in the European schools.

In 1642, SAMUEL BELLINGHAM and HENRY SALTONSTALL graduated at Harvard University, and then took the degree of M. D. in Europe.

In 1644, Dr. THOMAS OLIVER is spoken of, in the Journal of Governor Winthrop, as a skillful surgeon.

In 1649, a law was passed in Massachusetts "regulating the practice of chirurgeons, midwives, and physicians."

In 1650, Dr. JOHN GLOVER graduated at Harvard, and obtained a medical degree at Leyden. Dr. HOWARD did the same.

In 1651, Dr. ISAAC CHAUNCEY graduated at Aberdeen, and settled in Massachusetts.

In 1662, Dr. JOHN WINTHROP was made Governor of Connecticut. He was one of the founders of the Royal Society of England, being in London at that time as an agent for the colony.

In 1667, Dr. THOMAS THATCHER, of Massachusetts, published a medical tract, entitled "A Brief Guide in the Small-pox and Measles," being the first medical publication in the country.

In 1669, Dr. Henry Taylor, of Boston, practiced surgery in that town, and "had his rate remitted for attending the poor."

In 1673, Dr. Samuel Fuller was appointed Surgeon-General to the Forces.

In 1674, Dr. Edmund Davie, of Harvard, obtained the degree of M. D. at Padua.

In 1682, Dr. Thomas Wynn and brother, Welsh physicians, located themselves in Philadelphia, and were the earliest practitioners in this city.

In 1691, William and Mary College, in Virginia, was founded for the education of young men, but without any medical department.

In 1700, Dr. John Nicoll, a graduate of Edinburgh, located in New York city.

In the same year, Dr. Hamilton, a Scotch physician, settled in Maryland.

At the same period, Dr. John Mitchell, of England, settled in Virginia.

In 1700, Yale College, Connecticut, was founded.

In 1704, the first newspaper was published in the United States, and doubtless had its influence on the profession, in disseminating general information.

In 1705, Dr. John Clayton, of England, settled in Virginia.

In 1707, Dr. Grœme came over with the governor, and settled in Philadelphia.

In 1712, Dr. Gustavus Brown, of Scotland, located himself at Port Tobacco, Maryland, and was the most distinguished practitioner of this and the adjoining State.

In 1716, Dr. William Douglass, of Scotland, emigrated to New England.

In 1718, Dr. Colden, of Scotland, settled in New York.

In 1720 or 1730, Dr. Lloyd Zachary, one of the founders of the Pennsylvania Hospital, commenced practice in Philadelphia.

In 1720, Dr. Colden wrote an account of the climate and diseases of New York city, recommending it especially to consumptive patients.

In 1721, Dr. Benjamin Colman, a clergyman of Boston, published a pamphlet on Inoculation, defending the practice introduced by Dr. Boylston.

In 1721, Dr. Cotton Mather introduced inoculation in Boston. Experiments were also made by Dr. Boylston in June, 1721, upon

his own family. This practice created such inflammatory conduct on the part of the other physicians and the populace as to endanger their lives. The first case, Lady Mary Wortley Montague, was inoculated in England, in April, 1721.

In 1725, Dr. BOYLSTON was handsomely received at court in London, and was the first American elected a fellow of the Royal Society. The ensuing year, he published in England, at the request of the Royal Society, "An Historical Account of the Small-pox, inoculated in New England."

In 1730, Dr. NATH. WILLIAMS wrote on the Practice in Small-pox.

In 1732, Dr. WALTON published an essay on Fever.

In the same year, Dr. THOMAS HOWARD published a treatise on Pharmacy.

In 1734, Dr. WILLIAM BULL, of North Carolina, after studying under Boerhaave, graduated at Leyden, and wrote on lead colic.

In 1736, Dr. WILLIAM DOUGLASS published "The History of a new Epidemical Eruptive Fever" which prevailed in New England in 1735, 1736.

In 1736, Dr. DOUGLASS employed calomel in the treatment of inflammation. This practice has been claimed for Dr. Robert Hamilton, of England, but his attention, it is well known, was not called to it until 1764.

In the same year, Dr. JOHN TENENT, of Virginia, published an account of the Polygala Senega.

In 1737, 1741, 1742, Dr. JOHN MITCHELL, of Virginia, treated yellow fever by copious bleedings.

In 1740, Dr. MAGRAW, of Scotland, settled in New York city.

In the same year, Dr. THOMAS CADWALADER, of Philadelphia, published an "Essay on the Iliac Passion," recommending mild purges and opiates instead of the violent treatment previously pursued.

In 1741, Dr. COLDEN published an account of the Fever which prevailed in New York; also a paper on Cancer.

In 1743, Dr. JOHN MITCHELL, of Virginia, published letters on the Yellow Fever of 1741, in Virginia, also on "The Causes of different Colors of People in different Climates."

In the same year, Dr. CLAYTON published the "Flora Virginiana," which was republished by GRONOVIUS, at Leyden, in 1762.

In 1746, Dr. COLDEN, Lieut.-Governor of New York, gave Madeira wine freely in yellow fever, with much success.

In 1746, Princeton College, New Jersey, was founded.

In 1748, Dr. JOHN LINING, of Charleston, published a description of the American Yellow Fever.

In 1749, Dr. JOHN MOULTRIE, of Charleston, graduated at Edinburgh, being the first native Carolinian who obtained this honor.

In 1750, Drs. JOHN BARD and PETER MIDDLETON injected and dissected the body of a criminal for the instruction of the students, being the first dissection recorded in the United States.

In 1752, the Pennsylvania Hospital was established in Philadelphia, being the first general hospital in the United States, and has always been noted for the amount of its surgical practice.

In the same year, patients were received into its wards.

In 1753, Dr. JAMES LLOYD, after enjoying the instruction of Warner, Sharpe, Smellie, and Hunter, of London, settled in Boston, and was the first systematic practitioner of midwifery, &c. in that section.

In 1754, Dr. LIONEL CHALMERS, of Charleston, wrote a paper on Tetanus, then very prevalent in that city, recommending bleeding, the warm bath, and opiates.

In the same year, Dr. THOMAS BOND, of Philadelphia, wrote an account of a worm found in the Liver.

At the same period, Dr. Bond was actively engaged in the Pennsylvania Hospital.

In 1755, Drs. ANDREW ROBINSON and JAMES CRAIK came over as surgeons to Braddock's army, and settled in Virginia.

In 1756, Dr. WILLIAM SHIPPEN, Jr., of Philadelphia, returned from Europe, and commenced practice in his native city. He was elected Professor of Surgery in Philadelphia in 1765, and was the first Professor of Surgery in the United States.

In 1759, inoculation was generally adopted in Philadelphia.

In the same year, Dr. JOHN BARD, of New York, published several papers on Yellow Fever, and on the Pleurisy, which prevailed on Long Island in 1749.

In 1759, Dr. BOND wrote on the use of bark in Scrofula.

In 1760, the General Assembly of the Province of New York ordained that no person should practice as a physician or surgeon in the city of New York before he had been examined and approved by one of his majesty's council. During the same year, Dr. WILLIAM DOUGLASS published a summary of the progress and planting

of the British settlements in America, which contained a notice of the state of the profession.

In 1763, Dr. JOHN MORGAN, of Philadelphia, graduated at Edinburgh, and maintained in his inaugural essay that *pus was a secretion*. The credit of this doctrine has usually been assigned to Mr. John Hunter, but there is no doubt of his having been anticipated by Dr. Morgan.*

In 1765, Dr. MORGAN delivered an address on the institution of medical schools in America, at the first commencement of the University of Pennsylvania. The University was established this year.

In 1768, Columbia College, New York (then King's), was founded.

In the same year, Dr. CHALMERS, of Charleston, published an "Essay on Fevers," and in 1776, "Meteorological Observations taken at Charleston, from 1750 to 1760."

In 1769, Dr. KEARSLEY, of Philadelphia, wrote a paper on Angina Maligna.

In the same year, Dr. PETER MIDDLETON, of New York, delivered an address on the State of Medicine at the opening of King's College. Dr. John Jones was elected Professor of Surgery this year.

In 1769, Dr. SAMUEL BARD suggested the establishment of the New York Hospital. The building was erected in 1773, but destroyed shortly afterwards by fire when nearly completed, and did not receive patients until 1791.

In 1770, 1781, Dr. BAYLEY, a surgeon of New York, described† the false membrane in croup as the result of inflammation, and treated it by bleeding, tartar emetic, and calomel. The credit of this practice was incorrectly claimed for Dr. CHEYNE more than twenty years subsequently to Dr. Bayley's publication.

In 1771, Dr. SAMUEL KISSAM, of New York, published an inaugural essay on the anthelmintic virtues of Cowhage.

* Dr. James Curry, Lecturer at Guy's Hospital, in referring to the priority of this opinion of Dr. Morgan, says, "I cannot avoid giving the merit to Dr. Morgan, who discussed the question with great ingenuity in his Inaugural Dissertation on taking his degree at Edinburgh in 1763, and I can find no proof that Dr. Hunter taught, or even adopted such an opinion until a considerably later period.

See also Cullen's "First Lines," by Charles Caldwell, vol. i. p. 225, note by Dr. Caldwell.

Also, Lond. Med. and Phys. Journ. for 1817, and New England Journ. of Med. and Surgery, vol. vi. p. 401. (Quoted from Dr. Beck.)

† New York Medical Repository, vol. xiv. p. 136.

In 1775, Dr. SAMUEL ADAMS, of Massachusetts, attended the soldiers wounded at Lexington, and Dr. MILES WHITWORTH, of Boston, was surgeon to the American prisoners wounded at the battle of Bunker Hill.

In the same year, Dr. JOS. WARREN, an eminent surgeon of Boston (then a general), fell at the battle of Bunker Hill.

In 1776, Dr. JOHN JONES, Professor of Surgery in New York, published a volume on Wounds and Fractures, which was of much service to the army surgeons during the Revolution.

In the same year, Dr. BENJAMIN RUSH was a member of Congress, and one of the signers of the Declaration of Independence.

In 1777, Dr. CROSBY, a graduate of the University of Pennsylvania, was surgeon to General Washington's guard.

In the same year, Dr. MERCER (then General) fell at the battle of Princeton.

In 1780, Dr. JOHN WARREN, surgeon of a military hospital in Boston, commenced a course of anatomical lectures, which were probably the first given in that city.

In 1782, Dr. BAYLEY, of New York, assisted by Dr. WRIGHT, first amputated at the shoulder-joint, being the first in the United States, and the first successful operation, as far as is known, in any country.*

In 1786, the Philadelphia Dispensary was established, being the first institution of the kind in the United States.

In 1787, the Philadelphia College of Physicians was established.

In 1792, Dr. PHYSICK, afterwards the most distinguished surgeon in this country, graduated at Edinburgh.

In 1794, Dr. Physick was elected one of the surgeons of the Pennsylvania Hospital.

In 1795, he invented the stylet for cutting strictures of the urethra, and first operated for lithotomy in 1797. The cutting of the internal pudic artery in this operation led, in 1802, to the invention of his needle for the ligature of this and other deep-seated vessels. Previous to this time, surgeons had deemed the ligature of the internal pudic a matter that was almost impossible.

In 1798, Dr. JOHN WARREN, of Boston, extirpated the parotid gland, being the first known.

In the same year, Dr. NATH. SMITH founded Dartmouth College,

* Thatcher's Biography of Bayley.

and was the sole professor for twelve years, lecturing on all the different branches.

In 1800, Dr. WATERHOUSE, of Cambridge University, was the first who vaccinated in the United States; being one year after the discovery of Jenner.

In 1802, Dr. JOHN C. WARREN, of Boston, commenced practice as a surgeon.

The same year, Dr. PHYSICK operated for the cure of false joint, by introducing a seton between the ends of the bones. He ligated the brachial artery for varicose aneurism at the bend of the arm, in 1803.

In this year, Dr. JOHN C. WARREN ligated the femoral artery. Previous to 1800, capital operations seem to have been rare, or were unrecorded, though, doubtless, the Revolution afforded many occasions for their performance by the surgeons of that period.

In 1809, Dr. PHYSICK operated for artificial anus, by inducing adhesion between the two ends of the bowel, and then dividing the septum.

In 1809, Dr. MCDOWELL, of Kentucky, removed large ovarian tumors through the abdominal parietes of three different patients, all successfully.

In 1810, Dr. DORSEY, of Philadelphia, tied the external iliac, being the first time in America.

In the same year, Dr. DEADERICK, of Tennessee, first amputated half of the lower jaw, being the first operation of the kind upon this bone.

In 1812, Dr. STEVENS, of New York, ligated the external iliac artery successfully.

In the same year, Dr. WM. GIBSON, then of Baltimore, ligated the primitive iliac in the case of a wound in the groin, and Dr. WRIGHT POST, of New York, about the same period, tied the primitive carotid artery, being the first time in this country.

In 1814, Dr. BOWEN, of Providence, amputated at the shoulder-joint.

In 1815, Dr. HUBBARD, of Connecticut, ligated the axillary artery successfully.

In the same year, Dr. WHITRIDGE, at Sackett's Harbor, ligated the external iliac artery. At the same period, Dr. WHITRIDGE also amputated, successfully, at the shoulder-joint.

In 1816, Dr. HUNT, of Washington, excised the head of the

humerus, and Dr. PHYSICK published an account of the use of animal ligatures for ligating arteries.

In 1817, Dr. WRIGHT POST, of New York, tied the subclavian artery externally to the scaleni muscles. This was the first successful operation ever performed on this vessel.

In 1818, Dr. VALENTINE MOTT, of New York, tied the innominata, the patient living twenty-six days subsequently.

In 1820, Dr. PHYSICK invented his instrument for excision of the tonsils.

In the same year, Dr. JOHN C. WARREN, of Boston, operated successfully for staphyloraphy, being the first operation in America.

In 1821, Dr. MOTT, of New York, amputated half the lower jaw after ligating the carotid; being the second case in the United States, but the first published.

In the same year, Dr. ANTONY, of Georgia, resected the fifth and sixth ribs nearly entire.

In 1822, Dr. NEWMAN, of Pennsylvania, amputated the tongue successfully for lingua vitula.

In 1823, Dr. A. H. Stevens, of New York, extirpated nearly the entire upper jaw successfully.

In 1824, Dr. DAVID L. ROGERS, of New York, removed nearly the entire upper jaw.

In 1825, Dr. MCCLELLAN, of Philadelphia, ligated the carotid artery in three children, five, nine, and sixteen years old.

In the same year, he extirpated the parotid gland, and repeated the operation on another patient in 1829.

In 1825, Dr. BUTT, of Virginia, resected and removed the entire radius successfully.

In the same year, Dr. BRITE, of Kentucky, is reported to have successfully removed nearly the entire rectum.

In 1826, Dr. RHEA BARTON, of Philadelphia, resected the femur near the hip-joint for anchylosis, and established a false joint upon which the patient walked.

In 1827, Dr. MOTT, of New York, ligated the primitive iliac artery successfully.

In the same year, he removed the entire clavicle.

In the same year, Dr. WHITE, of Hudson, New York, tied the internal iliac.

In 1828, Dr. JOHN C. WARREN, of Boston, removed half of the lower jaw.

In 1829, Dr. KEARNEY ROGERS, of New York, successfully straightened an anchylosed knee, by resection of the femur and patella.

In the same year, Dr. MOTT, of New York, relieved an anchylosed jaw by dilatation and incision of the soft parts.

At the same time, Dr. THOMAS HARRIS amputated half the tongue successfully.

In the same year, Dr. GILLESPIE, of Virginia, successfully removed the astragalus in a compound dislocation.

In 1831, Dr. BARTON removed nearly half of the lower jaw, but left the base of the jaw as a rim of bone to preserve the outline of the face.

In 1833, Dr. MOTT ligated the subclavian within the scaleni muscles.

In the same year, Dr. HALL, of Baltimore, ligated the innominata, but without success.

In 1834, Dr. THOMAS HARRIS excised the elbow-joint.

In 1835, Dr. BARTON resected the femur above the knee in a case of anchylosis, where the leg was bent at a right angle to the thigh, and straightened the limb so that the patient could walk.

In 1837, Dr. J. MASON WARREN successfully performed the Taliacotian operation for the restoration of the nose, being the first in the United States.

In 1841, Dr. GORDON BUCK, of New York, excised the elbow.

In 1842, Dr. SCHMIDT, of New York, relieved anchylosis of the lower jaw by a subcutaneous division of the masseter.

In the same year, Dr. JOHN C. WARREN removed the upper jaw.

In 1846, the Inhalation of Ether for the purpose of destroying the sensibility to pain in surgical operations was discovered by Dr. MORTON, of Boston, and brought into use by Dr. JOHN C. WARREN.

In 1850, Dr. WILLIAM E. HORNER removed the entire half of the upper jaw, without making any external incision in the cheek.

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OF

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PART I.

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PART II.

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Tumor in the Antrum Highmorianum extirpated, by Clarke Wright, M. D. New York.

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Am. Journ. Med. Sciences, vol. iv. N. S. p. 509, 1842.

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Am. Journ. Med. Sciences, vol. iv. N. S. p. 516, 1842.

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Charleston Med. Journ., vol. v. p. 43, 1850.

OPERATIONS ON THE LOWER JAW.

Excision of nearly one-half of the Inferior Maxillary Bone, for Osteo-sarcoma, in 1810, by W. H. Deaderick, M. D. Rogersville, Tenn., (claiming justly to be the first operation of the kind ever performed, being two years before that of Dupuytren).

Med. Recorder, vol. vi. p. 516, 1823.

Also, *Am. Journ. Med. Sciences*, vol. xiii. p. 521, 1847.

Case of Fracture of Inferior Maxilla, successfully treated by Seton, by P. S. Physick, M. D. July 1822.

Chapman's Journal, vol. v. p. 116, 1822.

Case of Osteo-sarcoma, in which the right side of the lower jaw was removed successfully after tying the carotid, by Val. Mott, M. D. New York, 1821.

New York Med. and Phys. Journ., vol. i. p. 385, 1822.

2d Case of Osteo-sarcoma, in which the left carotid was tied, and a portion of the lower jaw removed successfully. March, 1823.

New York Med. Phys. Journ., vol. ii. p. 157, 1823.

3d Case of Osteo-sarcoma on the right side of the lower jaw, removed at the articulation, the carotid tied—died 5th day, by Val. Mott, M. D. 1823.

New York Med. Phys. Journ., vol. ii. p. 401, 1823.

Removal of nearly one-half the Lower Jaw, by Thos. Hunt, M. D. Natchez, Miss.

Phila. Med. Recorder, vol. vii. p. 682, 1824.

Case of Amputation of part of the Lower Jaw, by Jno. Wagner, M. D. Charleston, S. C.

New York Med. and Phys. Journ., vol. v. p. 533, 1826.
Also, *Am. Journ. Med. Sciences*, 1824.

Removal of half of the Lower Jaw Bone for Osteo-sarcoma, cured by J. C. Warren, M. D.

Boston Med. and Surg. Journ., vol. i. p. 90, 1828.

Amputation of the Lower Jaw for Osteo-sarcoma, cured by J. Randolph, M. D. Philadelphia, July 1829.

Am. Journ. Med. Sciences, vol. v. p. 17, 1829.

Extract from a Report of a Committee upon the subject of Osteo-sarcoma of the Lower Jaw, to a Medical Society in New York, April 1, 1830, by David L. Rogers, M. D., Chairman.

Am. Journ. Med. Sciences, vol. vi. p. 533, 1830.

Longitudinal Section of the Lower Jaw for the removal of a Tumor, by J. Rhea Barton, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. vii. p. 331, 1831.

Case of Osteo-sarcoma of the Lower Jaw, successfully treated by amputation of the Bone, by W. W. Anderson, M. D. S. C.

Am. Journ. Med. Sciences, vol. x. p. 315, 1832.

Case of Exsection of half of the Lower Jaw (disarticulated), by Geo. W. Campbell, M. D. Tenn.

Trans. Journ. Med., vol. vi. p. 400, 1833.

Case of Elongation of the Lower Jaw, and Distortion of the Face and Neck, caused by a burn; successfully treated by operations, by S. P. Hulihen, M. D. Wheeling, Va.

Med. Examiner, vol. vi. p. 188, 1850.

OPERATIONS ON THE FACE.

Operation for the Removal of a large Tumor on the Face, by Jas. Webster, M. D. Philadelphia.

Phila. Med. Recorder, vol. viii. p. 275, 1825.

Case of Deformity of the Mouth from a Burn, successfully treated by Dieffenbach's method, by T. D. Mütter, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xx. p. 341, 1837.

Plastic Operations, by J. Pancoast, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. iv. N. S. p. 337, 1842.

Plastic Operations, by J. Pancoast, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. v. N. S. p. 99, 1843.

Genio-plasty for a Fungous Tumor of the Neck, by George C. Blackman, M. D. New York.

Am. Journ. Med. Sciences, vol. x. N. S. p. 327, 1845.

A Case of Cheilo-plastic Operation, by Abraham Stout, M. D. Easton, Pa.

Med. Examiner, vol. vi. p. 13, 1850.

OPERATIONS ON THE TONGUE.

Amputation of the Tongue for Enlargement, (the portion amputated measured, length $2\frac{3}{4}$ inches—circumference $7\frac{1}{2}$ inches, thickness $1\frac{1}{2}$ inches,) cured by H. S. Newman, M. D. Warren county, Penn.

Med. Recorder, vol. vii. p. 541, 1824.

Case of Glossitis, attended with alarming symptoms of Suffocation, removed by deep incisions made into the Substance of the Tongue, by Abner Hopton, M. D. N. C.

Am. Journ. Med. Sciences, vol. iv. p. 533, 1829.

Operation for Cancer of the Tongue (cured), by J. C. Warren, M. D. Boston.

Boston Med. and Surg. Journ., vol. ii. p. 157, 1829.

Chronic Intumescence of the Tongue (very large), treated by amputation (cured), by Thos. Harris, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. vii. p. 17, 1830.

Case of Hypertrophy of the Tongue (operated on) by Thomas Wells, M. D. Columbia, S. C.

Am. Journ. Med. Sciences, vol. x. p. 21, 1832.

Carcinoma of the Tongue, successfully treated with the ligature, by M. Donnellan, M. D. Louisiana.

Am. Journ. Med. Sciences, vol. xvii. p. 540, 1835.

Case of Congenital Enlargement of the Tongue (Lingua Vitula), by Thos. Harris, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xx. p. 15, 1837.

Case of Enlarged Tongue, Operated on by R. D. Mussey, M. D. Fairfield, N. Y.

Am. Journ. Med. Sciences, vol. xxi. p. 377, 1837.

Removal of Cancer of the Tongue, (believed to be rarely successful,) treated by Geo. Hayward, M. D. Boston.

Boston Med. and Surg. Journ., vol. xix. p. 158, 1838.

Case of Glossocele, amputated successfully by M. G. Delaney, M. D. U. S. N.

Am. Journ. Med. Sciences, vol. xvi. p. 294, 1848.

Removal of a Foreign Body (pin) from the Duct of Wharton, by H. F. Campbell, M. D.

Am. Journ. Med. Sciences, vol. xv. p. 572, 1848.

Observations on Ranula, with Cases, Treatment and Cure, (iodine injected into tumor,) by Jas. M. Gordon, M. D. Ga.

Southern Med. and Surg. Journ., vol. v. p. 65, 1849.

OPERATIONS ON THE THROAT.

Obstinate Cough, caused by Elongation of the Uvula, in which a portion of that organ was cut off, with a description of the instrument employed for that purpose, and also for excision of Scirrhous Tonsils, by P. S. Physick, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. i. p. 262, Feb. 1827.

Case of Consumption (?) relieved by Truncating the Uvula, by Augustus W. Mills, M. D. Ky.

Trans. Journ. Med., vol. xxii. p. 530, 1829.

Extraction of a Thimble from the Pterygoid Fossa, by Isaac Parrish, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xvii. p. 540, 1835.

Cancer of the Throat—Operation—Recovery—but the patient subsequently died of Peritonitis, by J. Mason Warren, M. D. Boston. *Am. Journ. Med. Sciences*, vol. xix. p. 120, 1836.

OPERATIONS ON THE TONSILS.

The Double Canula and Wire Ligature, recommended in Extirpating Tonsils and Hæmorrhoidal Tumors, by P. S. Physick, M. D. Philadelphia.

From Phil. Journ. of Med. and Phys. Sciences, vol. i. p. 17, 1820.

Treatment of Enlarged and Indurated Tonsils, with a new Mode (ligature) of removing these and Polypous Tumors, by Alex. H. Stevens, M. D. N. Y.

From N. Y. Med. and Phys. Journ., vol. vi. p. 523, 1827.

On an Improved Instrument for Excising Tonsils and Uvula, by C. B. Matthews, M. D. Philadelphia.

Phil. Med. Recorder, vol xiii. p. 309, 1828.

Remarks on the various modes generally adopted for the Removal of the Tonsils, by Alex. E. Hosack, M. D. N. Y.

Am. Journ. Med. Sciences, vol. i. p. 262, 1828.

Description of a Forceps used to facilitate the Extirpation of the Tonsils, and invented by P. S. Physick, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. ii. p. 116, 1828.

Remarks on Enlarged Tonsils, with a new Instrument for Excision, by Abrm. L. Cox, M. D. N. Y.

N. Y. Med. and Phys. Journ., N. S. vol. ii. p. 52, 1830.

New Instrument for Excising Tonsils, by David L. Rogers, M. D. N. Y.

N. Y. Med. and Phys. Journ., N. S. vol. ii. p. 13, 1831.

A new Instrument for Extirpating Tonsils, by J. K. Mitchell, M. D. Philadelphia.

North Am. Med. and Surg. Journ., vol. xi. p. 239, 1831.

An Essay on Excision of the Tonsils with an Instrument, by Geo. Bushe, M. D. N. Y.

Med.-Chirurg. Bulletin, vol. ii. p. 161, 1832.

Description of an Instrument for the Excision of the Tonsils, by Wm. B. Fahnestock, M. D. Penn.

Am. Journ. Med. Sciences, vol. ii. p. 249, 1832.

Instrument for the Excision of Tonsils, by N. R. Smith, M. D. Baltimore.

North Am. Archives, Baltimore, vol. i. p. 90, 1835.

On the Common Induration of the Tonsils, and a Description of an Instrument for their Excision, by John C. Warren, M. D. Boston.

Surg. Obs. on Tumors, with Cases and Operations. Boston, 1839.

Remarks on the Enlargement of the Tonsils, attended by certain Deformities of the Chest. By J. Mason Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. xxiv. p. 523, 1839.

Tonsilotomy—Profuse Hemorrhage—by F. H. Hamilton, M. D. Buffalo.

Buffalo Med. Journ., vol. iv. p. 217, 1849.

ON STAPHYLORAPHY.

Suture of Palate in Infancy, believed to have been successfully performed by Nathan Smith, M. D. Yale College.

From N. Y. Med. and Phys. Journ., vol. v. p. 525, 1826.

Staphyloraphy successfully performed, by A. H. Stevens, M. D. N. Y.

North Am. Med. and Surg. Journ., vol. iii. p. 233, 1827.

Operation in May 1824, for the Cure of Natural Fissure of the Soft Palate (the first in America, and performed without knowledge of the operations of Roux), by J. C. Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. iii. N. S. p. 1, 1828.

Extensive Division of the Soft Palate (from a wound) sewed with Physick's Needle, &c., by Thos. Wells, M. D. Columbia, S. C.

Am. Journ. Med. Sciences, vol. x. p. 21, 1832.

Observations on Staphyloraphy with a new Instrument, by N. R. Smith, M. D. Baltimore.

North Am. Archives, vol. i. p. 27, 1835.

Congenital Fissures of the Palate operated on, by Jas. Deane, M. D. Greenfield, 1837.

Boston Med. and Surg. Journ., vol. xvi. p. 333, 1837.

On Staphyloraphy, by Jno. P. Mettauer, M. D. Va.

Am. Journ. Med. Sciences, vol. xxi. p. 309, 1837.

On the Use of the Interrupted Suture in Cases of Cleft Palate (with a description of a needle for it and hare-lip), by E. H. Dixon, M. D. Boston.

Boston Med. and Surg. Journ., vol. xxv. p. 329, 1841.

Cases of Cleft Palate (treated by Physick's Needle), by Thos. D. Mütter, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. ii. N. S. p. 74, 1841.

On Staphyloraphy, by Jos. Pancoast, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. vi. N. S. p. 66, 1843.

Operations for Fissures of the Soft and Hard Palate, by J. Mason Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. vi. N. S. p. 257, 1843.

Operation for Fissure of the Hard and Soft Palate, with the result of 24 cases, by J. Mason Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. xv. p. 329, 1848.

OPERATIONS ON THE EAR.

Extraction of Foreign Substances from the Ear, (by means of a thread attached to the article by glueing with shell lac,) by Charles Hooker, M. D. New Haven.

Boston Med. and Surg. Journ., vol. x. p. 317, 1833.

Polypi of the Meatus Auditorius Externus removed by Ligature, by E. J. Davenport, M. D. Boston, 1837.

Boston Med. and Surg. Journ., vol. xvii. p. 235, 1837.

Congenital Absence of Meatus Auditorius Externus of both Ears without much impairing the hearing, by R. D. Mussey, M. D. Fairfield, N. Y.

Am. Journ. Med. Sciences, vol. xxi. p. 377, 1837.

On the Extraction of Foreign Bodies from the Meatus Auditorius Externus, by J. Marion Sims, M. D. Alabama.

Am. Journ. Med. Sciences, vol. ix. p. 336, 1845.

Fibrous Tumor removed from the Lobe of the Ear, by Geo. W. Norris, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xx. p. 557, 1850.

Maggots, probably 40, in the Ear (from previous entrance of a fly), removed by F. H. Hamilton, M. D.

Buffalo Med. Journ., vol. vi. p. 10, 1850.

PART III.

PAPERS RELATING TO OPERATIONS ON THE NECK AND TRUNK.

ON EXTIRPATION OF THE PAROTID GLAND.

A Case of successful Extirpation of the Whole of the Parotid Gland for Scirrhus, by George McClellan, M. D. Philadelphia, 1826.

New York Med. and Phys. Journ., vol. v. p. 649, 1826; also *Am. Med. Review and Journal.*

Case of Extirpation of the Right Parotid for Melanotic Enlargement, by George McClellan, M. D. Philadelphia, 1829, being his second case.

New York Med. and Phys. Journ., vol. ii. N. S. p. 309, 1830.

An Account of the Extirpation of the Parotid Gland, by George McClellan, M. D. Philadelphia.

West. Journ. of Med. and Phys. Sciences, vol. iv. p. 465, 1831.

A Case of Extirpation of the Parotid Gland, by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. x. p. 17, 1831.

Three Cases in which the Parotid Gland was successfully removed (December 14th, 1827, September 16th, 1830, and one not dated), by George Bushe, M. D. New York.

Medico-Chirurgical Bulletin, vol. ii. p. 133, 1832.

Extirpation of the Parotid Gland, with other Cases, by Nathan R. Smith, M. D. Baltimore.

Am. Journ. Med. Sciences, vol. xxiii. p. 59, 1839.

A Case of Extirpation of the Parotid Gland, by J. Randolph, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xxiii. p. 517, 1839.

A Case of Extirpation of the Parotid Gland in 1805, by John McClellan, M. D. Franklin County, Pennsylvania.

Am. Journ. Med. Sciences, vol. vii. N. S. p. 499, 1844.

Extirpation of a Scirrhous Parotid Gland, by H. H. Wheeler, M. D. Pennsylvania.

Am. Journ. Med. Sciences, vol. ix. N. S. p. 520, 1845.

ON DEFORMITIES OF THE NECK.

A Case of Deformity from Burns (on the Face and Neck) relieved by an Operation, by T. D. Mütter, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. iv. N. S. p. 66, 1842.

A Case of Division of the Sterno-Cleido-Mastoid Muscle, for Wry Neck, by J. Mason Warren, M. D. Boston.

Boston Med. and Surg. Journ., vol. xxv. p. 121, 1841.

A Case of Torticollis successfully treated by Myotomy and an Apparatus, by John B. Brown, M.D. Boston.

Boston Med. and Surg. Journ., vol. xxvi. p. 58, 1842.

OPERATIONS ON THE ŒSOPHAGUS.

Description of an improved Instrument for extracting Poisons from the Stomach, with Statements assigning the Credit of the Invention of the Stomach Tube to P. S. Physick, M. D., in 1800 (he being then ignorant that Dr. Monroe, of Edinburgh, had done the same thing), by C. B. Matthews, M. D. Philadelphia.

Am. Med. Record., vol. x. p. 322, 1826.

Case in which a Copper Coin remained thirteen years in the Œsophagus, by John Syng Dorsey, M. D. Philadelphia.

New York Med. and Philosoph. Journ., vol. iii. p. 173, 1811; also *Philad. Med. Museum*, vol. i. N. S. p. 125, 1811.

Two Cases in which Poison was removed by the Stomach-Tube, by P. S. Physick, M. D. Philadelphia.

Eclectic Repert. and Analytical Review, vol. v. p. 111, 1813.

A Case of Stricture of the Œsophagus, cured by Caustic, by Charles T. Hildreth, M. D. Haverhill.

New England Journ. of Med. and Surg., vol. x. p. 235, 1821.

Extraction of a Fish-Hook and Line from the Stomach, by slipping a Perforated Bullet over the Line and Point of the Hook, by

ON TRACHEOTOMY.

Tracheotomy for Croup (died), by Dr. Thompson.

New England Journ. Med. and Surg., vol. v. p. 318, 1816.

Case of successful Tracheotomy, for the Extraction of a Foreign Substance (a Bean), by Amasa Trowbridge, M. D., of Jefferson County. New York.

New York Med. Repository, vol. xx. p. 79, 1820.

Bronchotomy successfully performed for the Removal of a Watermelon Seed, by H. G. Jameson, M. D. Baltimore.

Am. Med. Recorder, vol. v. p. 673, 1822.

Memoir on Bronchotomy, by H. G. Jameson, M. D. Baltimore.

Am. Med. Recorder, vol. vi. p. 151, 1823.

Case of a Pebble successfully extracted by Bronchotomy, by H. G. Jameson, M. D. Baltimore.

Med. Recorder, vol. vii. p. 36, 1824.

Three Cases of Bronchotomy, by S. Annan, M. D. Emmetsburg.

Med. Recorder, vol. vii. p. 42, 1824.

Case of Tracheotomy (successful) for the Removal of a Watermelon Seed, by Henry S. Waterhouse, M. D. Franklin County, New York.

Philadelphia Journ. of Med. and Phys. Sciences, vol. viii. p. 391, 1824.

Case of a Bean extracted successfully by Bronchotomy, by Joseph Palmer, M. D.

Med. Recorder, vol. vii. p. 32, 1824.

Two Cases of Bronchotomy (in which one was cured, one died), by Richard Burgess, M. D.

Med. Recorder, vol. vii. p. 111, 1824.

Case of Tracheotomy for the Removal of a Bean (cured), by Calvin Jewett, M. D. Newberg, Vermont.

New England Journ. of Med. and Surg., vol. xiii. p. 237, 1824.

Case of Laryngotomy for a Watermelon Seed (cured), by Samuel A. Cartwright, M. D. Natchez.

New England Journ. Med. and Surg., vol. xiv. p. 135, 1825.

Case of Tracheotomy for the Removal of a Bean (cured), by Peter P. Woodbury, M. D. Bedford, N. H.

New England Journ. of Med. and Surg., vol. xiv. p. 32, 1825.

Two Cases of Foreign Bodies lodged in the Trachea, one of which was removed by Tracheotomy, and the other by introducing the Forceps into the Trachea, by Enos Barnes, M. D., of Yates County, New York.

New York Med. and Phys. Journ., vol. vi. p. 78, 1827.

Operation of Laryngotomy and Tracheotomy (successfully) performed at the same time, on the same Patient, for the Removal of an Extraneous Body (a Grain of Corn) from the Larynx, by Abner Hopton, M. D. North Carolina.

Am. Journ. Med. Sciences, vol. iv. p. 534, 1829.

Case of Tracheotomy for the Removal of a Bean (cured), by Zadok Howe, M. D. Massachusetts.

Am. Journ. Med. Sciences, vol. iii. p. 347, 1829.

Case of Laryngotomy (for the Removal of a Watermelon Seed, cured), by Joseph F. E. Hardy, M. D. North Carolina.

Transylv. Journ. of Med., vol. iii. p. 267, 1830.

An unsuccessful Case of Cynanche Trachealis, in which Tracheotomy was resorted to, by E. Atlee, M. D. Lancaster.

West Journ. of Med. and Phys. Sciences, vol. iv. p. 23, 1831.

Remarkable Instance of a Brass Nail remaining in the Lungs for more than a year, by Amariah Brigham, M. D. Hartford, Conn.

Am. Journ. Med. Sciences, vol. xviii. p. 46, 1836.

Case of Bronchotomy for the Removal of an Iron Nail (1 inch and $\frac{7}{8}$ths long, and weighing 55 grains) from a child three years of age, nine days after it was swallowed, by Calvin Jewett, M. D. St. Johnsburg, Vermont.

Boston Med. and Surg. Journ., vol. xvi. p. 91, 1837.

Foreign Bodies (a Pipe-stem $1\frac{3}{4}$ inches long) in the Trachea removed by Tracheotomy (cured), by Charles Hall, M. D. Vermont.

Am. Journ. Med. Sciences, vol. ix. N. S. p. 357, 1845.

Foreign Bodies in the Air-Passages (four cases, viz., Pin in Larynx, Carpet-Tack, Horse-shoe Nail, and Bean), Tracheotomy used in one case, by J. Mason Warren, M. D. Boston.

Boston Med. and Surg. Journ., vol. xxxvii. p. 389; also *Am. Journ. Med. Sciences*, vol. xv. N. S. p. 315, 1848.

Tracheotomy, successfully performed, for Membranous Croup (by J. Pancoast, M. D.), reported by C. D. Meigs, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xvi. p. 529, 1848.

Case of Membranous Croup of a severe character, and attended with all the symptoms of approaching death, cured without an operation for Tracheotomy, by Isaac Parrish, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xvi. p. 530, 1848.

A Foreign Body (Grain of Corn) in the Trachea, cured by Tracheotomy, by William Davidson, M. D. Madison County, Indiana.

Am. Journ. Med. Sciences, vol. xvi. p. 263, 1848; also *Western Lancet*, May, 1848.

Œdematous Laryngitis successfully treated by Scarification of the Glottis and Epiglottis, by Gurdon Buck, Jr., M. D. New York.

Transact. Amer. Med. Association, vol. i. p. 135, 1848; also *Am. Journ. Med. Sciences*, vol. xvii. N. S. p. 240, 1849.

History of five Cases of Pseudo-Membranous Croup, in which Tracheotomy was performed (three cured, two died, Operation by J. Pancoast, M. D.), with remarks on the Treatment, and on the Operation, by J. Forsyth Meigs, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xvii. p. 307, 1849.

Case of Tracheotomy for Laryngitis (died), by Dr. Townsend. Boston. (Reported by Dr. J. B. S. Jackson.)

Am. Journ. Med. Sciences, vol. xvii. p. 28, 1849.

OPERATIONS FOR TUMORS ON THE NECK.

Case of Bronchocele relieved by taking up one of the Superior Thyroid Arteries, by H. G. Jameson, M. D. Baltimore.

Am. Med. Record., vol. v. p. 116, 1822.

Case of Encysted Meliceris Tumor of the Neck (cured by Puncture and Injection of Wine), by Andrew Park, M. D. Eatonton, Georgia.

Philadelphia Journ. of Med. and Phys. Sciences, vol. vi. p. 130, 1823.

Case of (Adipose Sarcomatous) Tumor (weighing eight pounds) extirpated successfully (from the side of the neck), by David L. Rogers, M. D. New York. Communicated by P. Cadwallader, M. D.

Philadelphia Journ. of Med. and Phys. Sciences, vol. xiii. p. 161, 1826.

Case of a large Encysted Tumor, on the Side of the Neck, successfully removed, by Alexander H. Stevens, M. D. New York.

New York Med. and Phys. Journ., vol. v. p. 311, 1826.

Case of an Operation for the Removal of a formidable Tumor from the Neck (cured), by John C. Warren, M. D. Boston.

Boston Med. and Surg. Journ., vol. i. p. 26, 1828.

Case of the Removal of a Tumor of the Neck, in which the Posterior Jugular Vein was cut off (cured), by John C. Warren, M. D.

Boston Med. and Surg. Journ., vol. i. p. 367, 1828.

Case of a Tumor in the Neck, with an Account of the Operation for its Removal, by G. Hayward, M. D. Boston.

Am. Journ. Med. Sciences, vol. viii. p. 352, 1831.

Case of the Removal of a large Steatomatous Tumor of the Neck, by John C. Brent, M. D. Kentucky.

Western Journ. of Med. and Phys. Sciences, vol. iv. p. 487, 1831.

ON LIGATURE OF THE CAROTID ARTERY, AND ALSO OF THE ARTERIA INNOMINATA.

Case of Ligature of the Carotid Artery (cured), by R. D. Mussey, M. D. Hanover.

New England Journ. of Med. and Surg., vol. xi. p. 369, 1822.

Case of Ligature of the Carotid Artery, for Aneurism (successful), by James Sykes, M. D. Dover, Delaware.

Philadelphia Journ. of Med. and Phys. Sciences, vol. vi. p. 139, 1823.

A new Instrument for tying deep-seated Arteries, by Alexander E. Hosack, M. D. New York.

New York Med. and Phys. Journ., vol. iii. p. 334, 1824.

Case of Fatal Hemorrhage occurring six weeks after the Ligature of the Carotid Artery, by J. W. Cusack, M. D.

Med. Recorder, vol. vii. p. 104, 1824.

Account of a Case, in which both Carotids were tied successfully at the interval of one month after the first Ligature, by Dr. McGill, Maryland. Account furnished by J. Kearney Rodgers, M. D. New York.

New York Med. and Phys. Journ., vol. iv. p. 576, 1825.

A Case of Ligature of the Carotid (died), by Mason F. Cogswell, M. D. Hartford, Connecticut.

New England Journ. of Med. and Surg., vol. xiii. p. 357, 1824.

Three Cases of Ligature of the Carotid Artery, successfully performed on children of five, eleven, and sixteen years of age, by George McClellan, M. D. Philadelphia.

New York Med. and Phys. Journ., vol. v. p. 523, 1826.

Case of an Operation for Carotid Aneurism (cured), by John C. Warren, M. D. Boston.

Boston Med. and Surg. Journ., vol. i. p. 42, 1828.

Case of an Operation for Carotid Aneurism (cured), by Winslow Lewis, M. D. Boston.

Boston Med. and Surg. Journ., vol. ii. p. 371, 1829.

Aneurism of the Arteria Innominata, involving the Subclavian and the Root of the Carotid; successfully treated by Tying the Carotid, by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. v. p. 297, 1829.

Case of Ligature of the Carotid, in 1825, for Fungus of the Antrum (died), by Michael A. Finley, M. D. Williamsport, Maryland.

Maryland Med. Record., vol. i. p. 97, 1829.

Case of Ligature of the Carotid, for Anastomosing Aneurism, in a child three months old (cured), by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. vii. p. 271, 1830; also vol. v. p. 255, *idem*.

Description of the Circulation of the Head and Neck, in a case in which one Carotid had been tied, by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. viii. p. 45, 1831.

Case of Telangiectasis of Cheek, cured by Ligature of the Common Carotid, by George Bushe, M. D. New York.

New York Medico-Chirurgical Bulletin, vol. i. p. 53, 1822.

Case of Ligature of the Common Carotid (in a court-room), for Attempted Suicide, by William E. Horner, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. x. p. 403, 1832.

Case of Aneurism of the Carotid, treated by Puncture with a Cataract-needle, heated to a white heat (in 1826), by George Bushe, M. D. New York.

Medico-Chirurgical Bulletin, vol. ii. p. 209, 1832.

Case of Aneurism of the right Subclavian, in which a Ligature was applied to the Innominata (patient died on the fifth day), by Richard Wilmot Hall, M. D. Baltimore.

Baltimore Med. and Surg. Journ., vol. i. p. 125, 1833.

Ligature of both Carotid Arteries simultaneously (died in twenty-four hours), by Valentine Mott, M. D. New York. Reported by Dr. Vachè.

Amer. Journ. Med. Sciences, vol. xiv. p. 530, 1834.

Case of Ligation of both Carotids (successful), by R. D. Mussey, M. D. Fairfield, New York.

Am. Journ. Med. Sciences, vol. xxi. p. 397, 1837.

Case of Gunshot Wound of the Face and Neck; Ligature of Carotid (cured), by Dr. Twitchell, New Hampshire.

Am. Journ. Med. Sciences, vol. v. N. S. p. 510, 1843; also *New England Quarterly Journal Med. and Surg.*, Oct. 1842.

Case of Subcutaneous Erectile Tumor of Cheek; Ligature of common Carotid Artery (death from phlebitis and pus between meninges of the brain), by A. C. Post, M. D. New York.

Am. Journ. Med. Sciences, vol. x. p. 539, 1845; also *New York Journ. Med.*, Sept., 1845.

Case of Gunshot Wound, Secondary Hemorrhage, Ligature of both Carotids at an interval of four and a half days (cured), by John Ellis, M. D. Michigan.

Am. Journ. Med. Sciences, vol. x. p. 534, 1845; also *New York Journ. Med.*, Sept., 1845.

Case of Ligature of the Principal Carotid (successful), by Paul F. Eve, M. D. Georgia.

Southern Med. and Surg. Journ., vol. vi. p. 210, 1850.

ON LIGATURE OF THE SUBCLAVIAN AND AXILLARY ARTERIES.

Observations relative to the Ligature of the Subclavian Artery, by Joseph Parrish, M. D. Philadelphia.

Eclectic Repert. and Analyt. Review, vol. iii. p. 229, 1813.

Ligature of the Axillary Artery (cured), by Thomas Hubbard, M. D. Pomfret, Connecticut.

New England Journ. of Med. and Surg., vol. iv. p. 211, 1815.

Case of Brachial Aneurism cured by Tying the Subclavian Artery above the Clavicle, by Wright Post, M. D. New York.

Transact. Phys. Med. Society of New York, vol. i. p. 387, 1817.

Remarkable Spontaneous Cure of Aneurism, with Observations on Obliteration of Arteries, by William Darrach, M. D. Philadelphia.

Phil. Med. and Phys. Journ., vol. xiii. p. 115, 1826.

Case of Axillary Aneurism (from the reduction of an old luxation), in which the Subclavian Artery was tied (died), by William Gibson, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. ii. p. 136, 1828.

Case of Axillary Aneurism removed by the application of a Ligature to the Subclavian Artery (cured), by Edward W. Wells, M. D. Communicated by Felix Pascalis, M. D. New York.

Am. Journ. Med. Sciences, vol. iii. p. 28, 1828.

Case of Axillary Aneurism, in which the Subclavian was successfully secured by a Ligature, by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. vii. p. 309, 1830.

Case of Aneurism of the Right Subclavian Artery, in which that vessel was tied within the Scaleni Muscles (died on the eighteenth day), by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. xii. p. 354, 1833.

Case of Ligature of the Left Subclavian (successfully performed), by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. xiv. p. 530, 1834.

Case of successful Ligature of the Subclavian, by G. H. White, M. D. Hudson, N. Y.

Am. Journ. Med. Sciences, vol. xxiii. p. 351, 1839.

Case of Axillary Aneurism—Ligature of the Subclavian (above the Clavicle), death on the thirty-first day, by S. D. Gross, M. D. Louisville.

Am. Journ. Med. Sciences, vol. ii. N. S. p. 517, 1841.

Case of Wound of the Axillary Artery and Plexus of Nerves, Amputation below the Shoulder, Secondary Hemorrhage, Ligature of the Subclavian (successful), by Alfred C. Post, M. D. New York.

Am. Journ. Med. Sciences, N. S. vol. x. p. 263, 1845; also *New York Journ. Med. and Collat. Sciences*, March, 1845.

A Table, showing the Mortality following the Operations of Tying the Subclavian Artery, by G. W. Norris, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. x. N. S. p. 13, 1845.

Case of Ligature of the Subclavian Artery, between the Scaleni, attended with some Peculiar Circumstances (cured), by John C. Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. xi. p. 539, 1846; also *Med. Times*, Dec. 6th, 1845.

Case of Ligature of the Left Subclavian within the Scaleni Muscles (died), by J. Kearney Rodgers, M. D. New York.

Am. Journ. Med. Sciences, vol. xi. p. 541, 1846; also *New York Journ. of Med.*, March, 1846.

Case of Ligature of the Left Subclavian Artery, for Subclavian Aneurism (cured), Ligature remaining Ninety-six Days, with a Remarkable Deviation of the Vessel and Consequent Change of its Relations, by J. Mason Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. xvii. p. 13, 1849.

Notice of the Anatomical Phenomena, in a case of Ligature of the Subclavian Artery, four years subsequent to the Operation (showing collateral circulation, &c.), by F. S. Ainsworth, M. D. Boston.

Am. Journ. Med. Sciences, vol. xix. p. 83, 1850.

ON REMOVAL OF THE CLAVICLE.

An Account of a Case of Osteo-Sarcoma of the Left Clavicle, in which Exsection of that Bone was successfully performed, by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. iii. p. 100, 1828.

Case of Removal of the Clavicle in a State of Osteo-Sarcoma (died on the fourth week), by John C. Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. xiii. p. 17, 1833.

OPERATIONS ON THE BREAST.

On Cancer of the Breast, by Joseph Parrish, M. D. Philadelphia.

North Amer. Med. and Surg. Journ., vol. vi. p. 293, 1828.

History of a Case of Sarcomatous Tumour of the Mamma, extirpated, by N. Hitt, M. D. Vincennes, Indiana.

Transylvania Journ. of Med., vol. iv. p. 508, 1831.

Case of Cancerous Breast, with partial Ossification of that Organ, by John Maclellan, M. D. Greencastle.

Am. Journ. Med. Sciences, vol. xiii. p. 277, 1833.

ON TUMORS OF THE CHEST.

Case of Enormous Steatoma, removed from the Side, by J. M. Foltz, M. D., U. S. N.

Am. Journ. Med. Sciences, vol. xii. p. 358, 1846.

A Case of Congenital Encysted Tumor of the Right Side of the Chest, successfully treated, with the Seton, by S. D. Gross, M. D. Louisville.

Am. Journ. Med. Sciences, vol. xvii. p. 22, 1849.

Statistics of twelve Cases of Fungus Hæmatodes of the Face, Trunk, Mamma, and Extremities, in which seven were operated upon, and five benefited probably, by Paul F. Eve, M. D. Georgia.

Southern Med. and Surg. Journ., vol. vi. p. 577, 1850.

OPERATIONS ON THE CHEST.

Case of Extensive Caries of the Fifth and Sixth Ribs, and Disorganization of the greater part (about two pounds) of the Right Lung, with a Description of the Operation for the same (being its removal, patient living several months subsequently), by Milton Antony, M. D. Augusta, Georgia. (With a Certificate from John Pugsley, M. D., of Jefferson County, Georgia.)

Phila. Journal Med. and Phys. Sciences, vol. vi. p. 108, 1823.

Escape of all the Intestines through a Hole in the Diaphragm into the Right Side of the Thorax, by Edward Cornell, M. D. Coventry, Chenango County, New York.

Med. Record, vol. viii. p. 236, 1825.

On the Pathology of Bones, with a Case of successful Removal of Carious Ribs, by H. McDowall, M. D. Fincastle, Virginia.

Med. Record, vol. xiii. p. 98, 1828.

Operation of the Trephine for the Removal of a portion of Carious Sternum, by Abner Hopton, M. D. North Carolina.

Am. Journ. Med. Sciences, vol. v. p. 545, 1829.

An Account of a successful Operation for the Excision of the Ossified Cartilages, and Anterior Extremities of two Carious Ribs, and the Lower Portion of the Sternum (the patient lived twenty years subsequently), by George McClellan, M. D. Philadelphia.

Western Journ. of the Med. and Phys. Sciences, vol. iv. p. 479, 1831; also *A Report*, by J. H. B. McClellan, M. D., *Med. Examiner*, vol. vi. N. S. p. 75, 1850.

Two Cases of Excision of the Ribs, successful, by John C. Warren, M. D. Boston.

Boston Med. Journ., vol. xvi. p. 201, 1837.

ON EMPYEMA.

Operation for Empyema—Excision of a Piece of the Lung, as large as a Nutmeg (cured), by Isaac Rand, Esq., Vice-President of the Massachusetts Medical Society. May, 1783.

Med. Communications and Dissertations of Mass. Med. Soc., vol. i. p. 69, 1790.

Case of Paracentesis Thoracis (cured), by Charles Hall, M. D., of Swanton, Vermont.

New York Med. Repository, vol. xx. p. 36, 1820.

Case of Paracentesis Thoracis, Life prolonged, by Lemuel W. Briggs, M. D. Bristol, Rhode Island.

New England Journ. of Med. and Surg., vol. ix. p. 223, 1820.

Case of Empyema successfully treated by Paracentesis Thoracis, by Dr. Craven, of Harrisonburg, Virginia.

Med. Record., vol. vii. p. 363, 1824.

Case of Effusion into the Chest, in which Paracentesis Thoracis was performed (died), by Samuel Jackson, M. D. Philadelphia.

Phil. Journ. Med. and Phys. Sciences, vol. x. p. 119, 1825.

Case of Empyema (cured by Paracentesis), by A. S. Sheldon, M. D. Broome County, New York.

Med. Record., vol. ix. p. 273, 1826.

History of a Case of Empyema, from protracted Measles and Pleurisy, in which the Operation of Paracentesis gave immediate Relief, by Samuel Merriwether, M. D. Indiana.

Western Journ. of Med. and Phys. Sciences, vol. iii. p. 65, 1830.

Paracentesis, successfully performed, for Empyema, by Dr. Wolfley. Lancaster, Ohio.

Maryland Med. Record., vol. ii. p. 56, 1832.

Case of Empyema cured by an Operation, by J. Pancoast, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xiii. p. 93, 1833.

Case of Empyema, successfully treated by an Operation (Paracentesis Thoracis), by W. C. Sneed, M. D. Kentucky.

Am. Journ. Med. Sciences, vol. x. N. S. p. 538, 1845.

Case of Gunshot Wound of the Chest, the thick Linen Patch, with which the Ball was enveloped, remaining in the Left Lung twenty years, by M. H. Houston, M. D. Virginia.

Am. Journ. Med. Sciences, vol. ix. N. S. p. 342, 1845.

Case of Empyema in which Paracentesis Thoracis failed from a cause not generally noticed (a membrane, lining the Pleura Costalis, being pushed before the instrument, and not opened), by John A. Swett, M. D. New York.

Am. Journ. Med. Sciences, vol. xiii. p. 518, 1847; also *New York Journ. of Med.*, January, 1847.

ON OPERATIONS ON THE ABDOMEN.

Experiments, to show that the Inflammation which supervenes on the Surface of Wounded Cavities is the Consequence of the Change and Diminution of Temperature caused by the Admission of Air into them, by James Cocke, M. D. (Thesis.) Maryland, 1804.

Amer. Med. Record., vol. ii. p. 489, 1819.

Case of Incision of the Intestines, and Removal of a Silver Teaspoon which had been swallowed (cured), by Samuel White, M. D. Hudson, New York.

New York Med. Repository, vol. x. p. 367, 1807.

A Remarkable Case of Encysted Dropsy and Paracentesis Abdo-

minis (635 pounds being drawn off in eleven months), by Dr. Amos Holbrook. Milton, Massachusetts.

Med. Communications and Dissertations of Mass. Med. Soc., vol. ii. p. 29, Boston, 1813.

Case of Evacuation of Water from the Abdomen by the Umbilicus (with a proposal to tap at that point), by Samuel Agnew, M. D. Harrisburg.

Philadelphia Med. Museum, vol. i. N. S. p. 159, 1811.

Case of a Scirrhous Tumor of the Cæcum, mistaken for an Aneurism of the Right External Iliac Artery, by Theophilus E. Beezley, M. D. Salem, New Jersey.

Phil. Journ. Med. and Phys. Science, vol. vi. p. 350, 1823.

Wound of the Stomach (St. Martin), by Joseph Lovell, Surgeon-General U. S. A.

Med. Record., vol. viii. p. 14, 1825.

Experiments on Digestion (St. Martin), through a Wound in the Stomach, by William Beaumont, M. D. Fort Niagara.

Med. Record., vol. ix. p. 94, 1826.

Case of Excision of a Part of the Spleen (the patient recovered after Peritonitis), by W. B. Powell, M. D. Kentucky.

Am. Journ. Med. Sciences, vol. i. p. 481, 1828.

Case of Penetrating Wound of the Abdomen and Section of the Intestinal Canal, successfully treated on the plan of Ramdohr, with Remarks, by Zina Pitcher, M. D., U. S. A.

Am. Journ. Med. Sciences, vol. x. p. 42, 1832.

Notes of a Case of Fistulous Opening of the Stomach, successfully treated (by Pressure, &c.), by J. H. Cook, M. D.

Am. Journ. Med. Sciences, vol. xiv. p. 271, 1834.

Case of Abscess of the Liver; Operation and Recovery, by Chas. A. Savery, M. D. Hopkinton, N. H.

Boston Med. and Surg. Journ., vol. xvii. p. 56, 1837.

Case of Ascites, cured by the Injection of a Stimulating Fluid into the Peritoneal Cavity, by John B. Sherrerd, M. D. New Jersey.

Am. Journ. Med. Sciences, vol. x. N. S. p. 525, 1845.

Case of Removal of seventeen inches of the Small Intestines, Recovery of the Patient, by A. Brigham, M. D. Utica.

Am. Journ. Med. Sciences, vol. ix. N. S. p. 355, 1845.

Case of Gastrotomy (successful), by J. E. Manlove, M. D. Tennessee.

Am. Journ. Med. Sciences, vol. x. N. S. p. 532; also *Boston Med. and Surg. Journ.*, July, 1845.

Sequel to the Case of Removal of seventeen inches of the Intestines, and Recovery of the Patient, by A. Brigham, M. D. Utica.

Am. Journ. Med. Sciences, vol. xi. N. S. p. 44, 1846.

Case of Ascites, in which the Patient was tapped 186 times in ten years, and had 751¾ gallons of water drawn off, by John H. Griffin, M. D. Virginia.

Am. Journ. Med. Sciences, vol. xix. N. S. p. 401, 1850.

ON HERNIA.

Case of Strangulated Crural Hernia, operated on according to the method of Don Antonio Gimbernat, with some Observations on the Treatment of Hernia, by Jno. C. Warren, M. D. Boston.

Med. Communications Mass. Med. Society, No. 2, Part 2, p. 44, 1790.

Case of Strangulated Femoral Hernia, where the Operation succeeded after the Obstruction had continued ten days, by John Hahn, M. D. Philadelphia.

Philad. Med. Museum, vol. iv. p. 26, 1808.

Case of Strangulated Hernia, with Observations on the Treatment of Mortified Omentum, by Joseph Parrish, M. D. Philadelphia.

Eclectic Repertory and Analytical Review, vol. i. p. 98, 1811.

Practical Elucidation of the Nature of Hernia, &c., with an Explanation of the Cures of certain Instruments, by G. A. Hull, M. D., late President of the Oneida Medical Society. New York.

New York Med. and Phys. Journ., vol. iv. p. 435, 1825.

Case of Strangulated Umbilical Hernia, cured by an Operation, by T. S. Hewson, M. D. Philadelphia.

Med. Record., vol. xi. p. 106, 1827.

Cases of Hernia, in which the Stricture remained at the Mouth of the Sac, after the Intestine was returned by Taxis, by N. Snead, M. D. Virginia.

Transylvania Journ. of Med., vol. ii. p. 525, 1829.

Case of (Inguinal) Hernia (in a man eighty-four years of age), in which there was no Evacuation from the Bowels for seventeen days before the Operation (treated successfully), by John J. Abernethy, M. D. Hartford, Connecticut.

Am. Journ. Med. Sciences, vol. xi. p. 31, 1832.

On Congenital Hernia (cured by an Operation), by Alexander H. Stevens, M. D. New York. Reported by Alfred C. Post, M. D. New York.

New York Medico-Chirurgical Bulletin, vol. i. p. 19, 1832.

A Case of Strangulated Inguinal Hernia successfully treated, by Hunting Sherrill, M. D. Duchess County, New York.

New York Medico-Chirurgical Bulletin, vol. i. p. 20, 1832.

Case of Strangulated Umbilical Hernia with Removal of the Cyst, followed by a Radical Cure, by J. W. Heustis, M. D. Mobile.

Am. Journ. Med. Sciences, vol. xvi. p. 380, 1835.

Case of Strangulated Umbilical Hernia in a child seven years old (died), by P. Fahnestock, M. D. Pennsylvania.

Am. Journ. Med. Sciences, vol. xvii. p. 368, 1835.

Cases of Hernia (with Remarks), by F. H. Hamilton, M. D. Rochester, New York.

Boston Med. and Surg. Journ., vol. xxv. p. 57, 1841.

Of a new Knife for dividing the Stricture in Cases of Strangulated Hernia, by F. Campbell Stewart, M. D. New York.

Am. Journ. Med. Sciences, vol. v. N. S. p. 497, 1843.

Case of successful Operation for Strangulated Femoral Hernia (with two Sacs), by J. Heaton, M. D. Boston.

Boston Med. and Surg. Journ., vol. xxx. p. 35, 1844.

Case of Radical Cure of Hernia, by including the Neck of the Sac and External Ring in a Leaden Ligature, by J. C. Nott, M. D. Mobile.

Am. Journ. Med. Sciences, vol. xiv. N. S. p. 402, 1847.

Case of Strangulated Inguinal Hernia, patient operated on while under the influence of Chloroform (died seven days after the Operation), by James D. Trask, M. D. Whiteplains, New York.

Am. Journ. Med. Sciences, vol. xviii. N. S. p. 90, 1849.

ON ARTIFICIAL ANUS.

Case in which a new and peculiar Operation for Artificial Anus was successfully performed in January 1809, by P. S. Physick, M. D. Drawn up for publication by B. H. Coates, M. D. Philadelphia.

North American Med. and Surg. Journ., vol. ii. p. 269, 1826.

Two Cases illustrative of an Operation for the Cure of Artificial Anus, by John Rhea Barton, M. D. Philadelphia.

Med. Record., vol. vii. p. 356, 1824.

Singular Case of Artificial Anus, successfully treated by George W. Campbell, M.D. Tennessee.

Transylvania Journ. of Med., vol. ii. p. 425, 1829.

Account of a successful Operation for Artificial Anus, accomplished by the Aid of a Novel Instrument, and performed by J. R. Lotz, M. D. New Berlin, Pennsylvania. With Observations on the Apparatus, &c., by Reynell Coates, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xviii. p. 367, 1836.

Case of Artificial Anus (at the Umbilicus), by R. G. Wharton, M. D. Mississippi.

Am. Journ. Med. Sciences, vol. vi. N. S. p. 256, 1843.

Case of Operation for Artificial Anus (cured), by J. M. Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. xvi. N. S. p. 116, 1848.

Amussat's Operation for Artificial Anus, performed by J. M. Bush, M. D. Lexington, Kentucky.

Am. Journ. Med. Sciences, vol. xix. N. S. p. 275, 1850.

ON LIGATURE OF THE ILIAC ARTERIES.

LIGATURE OF THE EXTERNAL ILIAC ARTERY.

Ligature of the External Iliac Artery (cured), by John Syng Dorsey, M. D. Philadelphia, August, 1811. (This was the first successful operation reported in the United States.)

Eclec. Repert. and Analyt. Review, vol. ii. p. 111, 1811; also *New England Journ. of Med. and Surg.*, vol. i. p. 66, 1812.

Case of Aneurism of the Femoral Artery (successful), by David Hosack, M. D. New York.

Amer. Med. and Philosophical Register, vol. ii. p. 49, 1811.

Case of Ligature of the External Iliac (cured), by Alexander H. Stevens, M. D. New York.

New York Med. and Phys. Journ., vol. i. p. 112, 1822.

A Case of Inguinal Aneurism (successful ligature) of the External Iliac (by means of Physick's needle), by Wright Post, M. D. New York.

Am. Med. and Philosophical Register, vol. iv. p. 443, 1814.

Ligature of the External Iliac Artery, by J. B. Whitridge, M. D. Sackett's Harbor.

New England Journ. of Med. and Surg., vol. iv. p. 318, 1815.

Case of Ligature of the External Iliac (cured), by John C. Warren, M. D. Boston.

New England Journ. of Med. and Surg., vol. xii. p. 225, 1823.

ON LIGATURE OF THE COMMON ILIAC ARTERY.

Case of Wound of the Common Iliac Artery, in which that vessel was tied (being the first case known, the patient lived only fifteen days), by William Gibson, M. D. Philadelphia.

Med. Record., vol. iii. p. 185, 1820.

Case of Ligature of the Common Iliac at its origin (cured), by Valentine Mott, M. D.

Philadelphia Journ. of Med. and Phys. Sciences, vol. xiv. p. 176, 1827.

Case of Ligature of Right Common Iliac Artery in a child six weeks old (died), by George Bushe, M. D. New York.

New York Medico-Chirurg. Bulletin, vol. i. p. 55, 1832.

Case of Ligature of the Primitive Iliac (cured). The Ligature came away on the thirty-fifth day, by Edward Peace, M. D. Philadelphia.

Med. Examiner, vol. i. N. S. p. 645, 1842; also *Am. Journ. Med. Sciences*, vol. iv. N. S. p. 250, 1842.

Case of Ligature of the Internal Iliac Artery for a Traumatic Aneurism of the Gluteal (died), by H. J. Bigelow, M. D. Boston.

Am. Journ. Med. Sciences, vol. xvii. N. S. p. 29, 1849.

Case of Ligature of the Internal Iliac Artery (died), by Gilman Kimball, M. D. Lowell, Massachusetts.

Am. Journ. Med. Sciences, vol. xx. N. S. p. 92, 1850.

OPERATIONS ON THE BACK.

Gunshot Wound, ball lodged in the posterior part of the Neck, and subsequently discharged by stool, by William Hening, M. D., late Surgeon U. S. A.

Eclectic Repert. and Analyt. Review, vol. vii. p. 246, 1817.

Case of Steatomatous Tumor, weighing twenty-five pounds, removed from the upper part of the Back, by J. S. Dorsey, M. D.

The circumference of the neck, or narrowest part of the tumor, two feet ten inches.

Thickest part vertically, three feet nine inches.

" " horizontally, three feet one inch and a half.

" " of waist, after removal of tumor, two feet nine inches.

Am. Med. Record., vol. i. p. 400, 1819.

Case of Gunshot Wound, in which Tetanus was controlled by a Caustic Issue to the Spine, by David M. Reese, M. D. Baltimore.

Med. Record., vol. viii. p. 548, 1825.

Case of Fistula in the Lumbar Region, communicating with the Bladder, by L. Proudfoot, M. D.

Am. Journ. Med. Sciences, vol. i. p. 241, 1827.

Case in which portions of three Dorsal Vertebræ were removed with partial success, for the relief of Paralysis from Fracture, by Alban G. Smith, M. D. Danville, Kentucky.

North American Med. and Surg. Journ., vol. viii. p. 94, 1829.

Case of Fractured Spine, with the removal of depressed Spinous Process, by an Operation (patient died), by David L. Rogers, M. D. New York. (Communicated by S. R. Kirby, M. D.)

Am. Journ. Med. Sciences, vol. xvi. p. 91, 1835.

Case of Division of the Spinal Marrow (by a Chisel accidentally driven in opposite the Spinous Process of the lower Dorsal Vertebræ, causing Paralysis), the patient recovered, by Eli Hurd, M. D. Niagara County, New York.

Am. Journ. Med. Sciences, vol. x. N. S. p. 531, 1845; also *New York Journ. Med.*, Sept., 1845.

ON SPINA BIFIDA.

Three Cases of Spina Bifida successfully treated; two of them by means of Wire Ligatures, and the other by the Knife, by Amasa Trowbridge, M. D., of Watertown, New York.

Boston Med. and Surg. Journ., vol. i. p. 753, 1829.

Case of Spina Bifida, with Remarks (punctured seventy times without bad consequences, but died ultimately of diarrhœa), by Charles Skinner, M. D. North Carolina.

Am. Journ. Med. Sciences, vol. xix. p. 109, 1836.

Case of Spina Bifida (cured, by Punctures and Pressure), by P. H. Hurd, M. D. Oswego.

Boston Med. and Surg. Journ., vol. xviii. p. 109, 1838.

Case of Spina Bifida successfully treated by Repeated Puncture, by Alexander Stevens, M. D. New York.

Am. Journ. Med. Sciences, vol. vi. N. S. p. 527, 1843; also *New York Journ. of Med. and Collateral Sciences*, No. 2.

Case of Spina Bifida treated by Injection of Tincture of Iodine, by Daniel Brainard, M. D.

Am. Journ. Med. Sciences, vol. xvi. N. S. p. 262, 1848; also *Ill. and Ind. Med. and Surg. Journ.*, Jan., 1848.

PART IV.

PAPERS ON THE GENITO-URINARY ORGANS AND RECTUM.

OPERATIONS ON THE PENIS.

New Method of performing the Operation of Phymosis, by George Bushe, M. D. New York.

New York Medico-Chirurgical Bulletin, vol. i. p. 224, 1832.

Induration and Enlargement of the Penis, with a new Mode of Amputating that Organ, by Thomas L. Ogier, M. D. Charleston.

Am. Journ. Med. Sciences, vol. xviii. p. 382, 1836.

On Amputation of the Penis, by John P. Mettauer, M. D. Virginia.

Boston Med. and Surg. Journ., vol. xvii. p. 197, 1837.

A Case of Imperforate Prepuce, by D. J. C. Cain, M. D. Charleston.

Am. Journ. Med. Sciences, vol. xiii. N. S. p. 521, 1847; also *Southern Journ. of Med. and Pharmacy*, Jan. 1847.

ON AFFECTIONS OF THE MALE URETHRA.

Fistula in Perineo, attended with considerable loss of substance, cured by Lunar Caustic, by Wm. E. Horner, M. D. Philadelphia.

Philadelphia Journ. of Med. and Phys. Sciences, vol. ix. p. 141, 1824.

Practical Observations on Stricture of the Urethra, by H. G. Jameson, M. D. Baltimore.

Amer. Med. Record., vol. xii. p. 329, 1828.

Description of an Instrument (with a Plate), for dividing Strictures of the Urethra, by E. R. Chew, M. D. Louisiana.

North American Med. and Surg. Journ., vol. v. p. 341, 1828.

Operations for Artificial Urethra (successful), by Jno. C. Warren, M. D. Boston.

Boston Med. and Surg. Journ., vol. ii. p. 321, 1829.

On Hypospadias (with Cases), by George Bushe, M. D. New York.

New York Medico-Chirurgical Bulletin, vol. ii. p. 1, 1832.

Practical Observations on those Malformations of the Male Urethra and Penis, termed Hypospadias and Epispadias, with an anomalous Case, by John P. Mettauer, M. D. Virginia.

Am. Journ. Med. Sciences, vol. iv. N. S. p. 43, 1842.

A Case of Stricture of the Urethra cured by bougies of bark of the slippery-elm tree, by Wm. Waters, M. D., Maryland.

Am. Journ. Med. Sciences, vol. xxv. p. 321, 1839.

Employment of Gutta Percha in the treatment of Strictures, by Henry J. Bigelow, M. D. Boston.

Boston Medical Journal, vol. xl. p. 9, 1849.

OPERATIONS ON THE TESTICLE AND CORD.

New Operation (Ligature of Arteries), for Circocele, cured by H. G. Jameson, M. D. Baltimore.

Am. Med. Record., vol. viii. p. 271, 1825.

Operation for a Tumor of the Scrotum, Omental Hernia (cured), by Jno. C. Warren, M. D. Boston.

Boston Med. and Surg. Journ., vol. i. p. 237, 1828.

Extirpation of the Testes and Penis affected with Cancerous Disease, by J. C. Hall, M. D. Washington.

Am. Journ. Med. Sciences, vol. x. p. 395, 1832.

On Tubercles of the Testis (Castration, &c.), by Henry H. Smith, M. D., Philadelphia.

Phila. Med. Ex., vol. iii. p. 360, 1840.

Varicocele and Extirpation of the Testis, by F. H. Hamilton, M. D. Rochester, New York.

Boston Med. and Surg. Journ., vol. xxv. p. 153, 1841.

Treatment of Diseases of the Testicle, by Compression, in November, 1803, by P. S. Physick, M. D. Reported by Edward Hartshorne, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. iii. N. S. p. 258, 1842.

Practical Observations on the Radical Treatment of Varicocele, by John Watson, M. D. New York.

Am. Journ. Med. Sciences, vol. x. N. S. p. 316, 1845.

New Operation (Incision and Ligature), for the Radical Cure of

Varicocele, performed successfully eight times, by S. D. Gross, M. D. Louisville.

Am. Journ. Med. Sciences, vol. xvi. N. S. p. 327, 1848.

Castration of Enlarged and Irritable Testis, by M. G. Delaney, M. D., U. S. N.

Am. Journ. Med. Sciences, vol. xvi. N. S. p. 292, 1848.

ON HYDROCELE.

Hydrocele treated by Injection, by David Hosack, M. D. New York.

New York Medical Repository, vol. i. p. 419, 1797.
(First *Journal* of its kind in the United States, though the *Transactions of the Mass. Med. Society* preceded it seven years.

Observations on Hydrocele, by B. Winslow Dudley, M. D. Lexington.

Transylvania Journ. of Med., vol. i. p. 268, 1828.

Case of Congenital Hydrocele, tapped by Dr. McComb, with Remarks by George Bushe, M. D. New York.

New York Medico-Chirurgical Bulletin, vol. i. p. 21, 1832.

On Hydrocele, by George Hayward, M. D. Boston.

Boston Med. and Surg. Journ., vol. xix. p. 154, 1839.

Case of Sudden Formation of Hydrocele, unconnected with inflammation of Tunica Vaginalis—(operation—cure), by Henry H. Smith, M. D., Philadelphia.

Am. Journ. of Med. Sciences, vol. xiii. N. S. p. 85, 1847.

OPERATIONS ON THE BLADDER.

Preternatural Retention of Urine in consequence of external injury. Bladder tapped above the Pubis. Cured. By James Thacher, M. D. Plymouth.

Med. Communications and Dissertations of Mass. Med. Society, vol. i. p. 35, 1790.

Laceration of the Urethra from a fall on the perineum; retention of urine (Bladder punctured above the Pubis), died, by Thomas F.

Betton, M. D. Philadelphia. (With Observations by Isaac Hays, M. D.)

Am. Journ. Med. Sciences, vol. xix. p. 389, 1836.

Paracentesis of the Bladder, through the Perineum, by N. R. Smith, M. D. Baltimore.

Am. Journ. Med. Sciences, vol. xxiii. p. 63, 1839.

Closure of the Urethra from an Injury of the Perineum; Urine discharged by an Artificial Opening above the Pubes; the Natural Passage restored by an Operation, by Gurdon Buck, Jr., M. D. New York.

Am. Journ. Med. Sciences, vol. viii. N. S. p. 544, 1844; also *New York Journ. of Med.*, Sept. 1844.

ON LITHOTOMY.

Account of the Successful Application of Cold Water to the Lumbar Region in cases of Calculus, by John Willday, in a Letter to Benjamin Rush, M. D. 1788.

Transactions of the Philadelphia College of Physicians, vol. i. p. 76, 1793.

An Inaugural Dissertation on Stone in the Bladder (recommending the Use of the Bistoury and Staff, with a Drawing), by Henry U. Onderdonk, M. D. New York.

Am. Med. and Philosoph. Register, vol. i. p. 394, 1811.

Extra-Uterine Fœtus incrusted with Calculous Matter, extracted by the Operation of Lithotomy, by Joseph Bossuet, M. D. Hingham, Mass.

New England Journ. Med. and Surg., vol. vi. p. 135, 1817.

Extraction of a Calculus from the Female Bladder, by Dilatation of the Urethra, by Robert Hamilton, M. D.

Am. Med. Record., vol. xi. p. 115, 1827.

Two Cases of Lithotomy (Lateral Operation, both cured), by Lunsford Pitts Yandell, M. D. Lexington.

Transylvania Journ. of Med., vol. i. p. 431, 1828.

Description of a Remarkable Urinary Calculus, by R. D. Mussey, M. D. New Hampshire.

Am. Journ. Med. Sciences, vol. iv. p. 333, 1829.

Case of Lithotomy (Lateral Operation, cured), by Hugh H. Toland, M. D. South Carolina.

Transylvania Journ. Med., vol. iii. p. 139, 1830.

Cases of Lithotomy (Lateral Operation, cured), in which the Stones were dependent on the presence of a spicula of bone in the bladder, by George W. Campbell, M. D. Tennessee.

Transylvania Journ. Med., vol. iii. p. 211, 1830.

Case of Chief-Justice Marshall; Operation of Lithotomy; more than one thousand small Calculi extracted by Philip S. Physick, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. ix. p. 537, 1831.

Case of Stone, in which the Fundus of the Bladder was coated with Calculous Incrustations, successfully operated on by Lithotomy, by Amasa Trowbridge, M. D. Watertown, New York.

Am. Journ. Med. Sciences, vol. xi. p. 27, 1832.

On the Bi-lateral Operation for Stone (with Drawings of Instruments recommended for this Operation), by George Bushe, M. D. New York.

New York Medico-Chirurgical Bulletin, vol. i. p. 1, 1832.

Lithotomy and extraction of a calculus, measuring nearly twelve inches in circumference, and weighing upwards of seventeen ounces avoirdupois (death, fifth day), by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. xiv. p. 530, 1834.

Supplementary Observations on Lithotomy, with a description of the instruments employed, &c., by N. R. Smith, M. D., Baltimore.

Balt. Med. and Surg. Journ., vol. ii. p. 13, 1834.

Case of Lithotomy in which the healing process was interrupted by the supervention of an Eruptive Disease, by Jno. P. Mettauer, M. D. Virginia.

Boston Med. and Surg. Journ., vol. xii. p. 283, 1835.

Observations on the Operation of Lithotomy, illustrated by cases from the practice of Professor B. W. Dudley, by James M. Bush, M. D. Lexington.

Am. Journ. Med. Sciences, vol. xxi. p. 535, 1837; also *Trans. of Med.* vol. x. p. 478, 1837.

Case of Urinary Calculus in a Girl, successfully removed by Lithotomy, by T. D. Mütter, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xxi. p. 260, 1837.

Lectures on Lithotomy, with an Account of the Bi-lateral Operation, by Alexander H. Stevens, M. D. New York.

New York Journ. Med., vol. xi. p. 104, 1838.

Remarks on the Propriety and best manner of breaking and ex-

tracting large calculi in the Lateral Operation, by J. C. Nott, M. D. Mobile.

Am. Journ. Med. Sciences, vol. iv. N. S. p. 328, 1842.

Lithotomy; Bi-lateral Operation, with cases, by Paul F. Eve, M. D. Georgia.

Am. Journ. Med. Sciences, vol. vii. N. S. p. 504, 1844.

On the Bi-lateral Operation for Lithotomy, and on Lithotrity in the Female, by John C. Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. viii. N. S. p. 293, 1844.

On a new Form of Director and Gorget, by John P. Mettauer, M. D. Virginia. (With a Drawing.)

Philad. Med. Examiner, November, vol. i. N. S. p. 648, 1845.

Lithotomy and Lithotrity (with an Account of Dr. Dudley's Operations), by J. M. Bush, M. D. Lexington, Kentucky.

Am. Journ. Med. Sciences, vol. xi. N. S. p. 545, 1846; also *Western Lancet*, January, 1846.

Bi-lateral Operation in Lithotomy, by R. D. Mussey, M. D. Cincinnati.

Am. Journ. Med. Sciences, vol. xi. N. S. p. 264, 1846.

Case of Lithotomy in the Female, with remarks by A. Baker, Jr., M. D. Chenango County, New York.

Transactions of Med. Society, State of New York, vol. vi. p. 133, 1846.

Extraordinary Case of Urinary Calculi, two hundred and twenty-eight in number, by John Kelly, M. D. New York.

Am. Journ. Med. Sciences, vol. xiii. N. S. p. 246, 1847.

Lithotomy in a Child two years and eleven months old; patient under influence of Chloroform (cured), by F. H. Hamilton, M. D.

Buffalo Med. Journ., vol. iv. p. 735, 1849.

Lithotomy in an Adult under the influence of Chloroform (death in two weeks from Purulent Absorption), by F. H. Hamilton, M. D.

Buffalo Med. Journ., vol. iv. p. 736, 1849.

Lithotomy (Bi-lateral Operation), in a Boy ten years old; Calculus weighing ℥xxv; attacked with Dysentery ninth day (died), by Paul F. Eve, M. D.

Southern Med. and Surg. Journ., vol. v. p. 596, 1849.

Case of Lithotomy in a Child (four years old, cut by the Bi-lateral Section), Anæsthesia (Ether), died forty-five hours after the operation, by James R. Wood, M. D. New York.

New York Journ. of Medicine, vol. ii. N. S. p. 326, 1849.

Lithotomy, one hundred and seventeen Calculi, weighing four

and a half ounces, successfully removed by Paul F. Eve, M. D., Georgia.

Am. Journ. Med. Sciences, vol. xvii. N. S. p. 539, 1849; also *Southern Med. and Surg. Journ.*, March, 1849.

Results of fifteen Operations for Lithotomy, by P. C. Spencer, M. D. Petersburgh.

Am. Journ. Med. Sciences, vol. xx. p. 103, 1850.

Stone in the Bladder, weighing eight ounces; unpleasant Anchylosis of the Hip; successful Bi-lateral Operation, by Charles A. Pope, M. D. St. Louis.

St. Louis Med. and Surg. Journ., vol. vii. p. 298, 1850.

ON LITHOTRIPSY.

Lithotripsy, successfully performed by L. Depeyre, M. D., New York. (October, 1830. First successful Case in the United States.)

North American Med. and Surg. Journ., vol. xi. p. 492, 1831.

Successful Lithotrity, by Alban G. Smith, M. D. Danville, Kentucky.

North American Med. and Surg. Journ., vol. xii. p. 256, 1831.

Lithotrity, successfully performed by P. S. Spencer, M. D. Virginia.

Am. Journ. Med. Sciences, vol. xii. p. 554, 1833.

Lithotripsy, successfully performed in six Cases, by J. Randolph, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xv. p. 13, 1834.

Removal of Calculi from the Urethra, by means of a Wire Loop attached to a Silver Bougie, by A. Leander Uttery, M. D. Providence.

Boston Med. and Surg. Journ., vol. xii. p. 237, 1835.

Statistical Account of the Cases of Urinary Calculi treated in the Pennsylvania Hospital, from May 1756 to May 1835, by Reynell Coates, M. D. Philadelphia. (Sixty-one Cases; fifty-two males; seven died.)

Am. Journ. Med. Sciences, vol. xvii. p. 97, 1835.

Case of Urinary Calculus, in which Dr. J. Randolph successfully performed Lithotripsy, by Isaac Hays, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xvii. p. 258, 1835.

Sketch of Lithotripsy, with Cases, by William Gibson, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xviii. p. 338, 1836.

Seven additional Cases of Stone in the Bladder, successfully treated by Lithotripsy, by J. Randolph, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xix. p. 52, 1836.

Report of four additional Cases of Stone in the Bladder, successfully treated by Lithotripsy, by J. Randolph, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xxi. p. 13, 1837.

Report of Cases of Lithotripsy, by N. R. Smith, M. D. Baltimore.

Am. Journ. Med. Sciences, vol. xxi. p. 25, 1837.

Cases of Lithotrity performed by J. Randolph, M. D. Reported by A. E. Stocker, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xii. N. S. p. 263, 1846.

Four Cases of Lithotripsy, performed by J. Randolph, M. D. (Two on Children, aged four years.) Reported by J. M. Wallace, M. D. Philadelphia.

Philadelphia Medical Examiner, vol. v. N. S. p. 288, 1849.

Lithotrity and Lithotomy, with the Use of Ether in those Operations, by J. Mason Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. xviii. p. 47, 1849.

Two Cases of Lithotripsy, by the late George McClellan, M. D., in one of which the male blade of Heurteloup's instrument broke in the Bladder and was subsequently passed by the Urethra. Reported by J. H. B. McClellan, M. D. Philadelphia.

Philadelphia Med. Examiner, vol. v. N. S. p. 513, 1849.

Removal of three inches of a Gum Elastic Catheter by means of Heurteloup's Instrument, by J. H. Dillson, M. D. Pittsburg.

Am. Journ. Med. Sciences, vol. xx. p. 268, 1850.

ON THE EXTERNAL ORGANS OF THE FEMALE.

Case of Fistulous Communication between the Vagina, Bladder, and Rectum, by Charles Byrne, M. D., U. S. Army.

Am. Journ. Med. Sciences, vol. vi. p. 70, 1830.

Observations on Sanguineous Tumors of the Vagina, by Hugh H. Toland, M. D. South Carolina.

Transylvania Journ. Med., vol. vii. p. 204, 1834.

Case of Medullary Sarcoma of the Labia, &c., by A. B. Shipman, M. D. New York.

Am. Journ. Med. Sciences, vol. v. N. S. p. 368, 1843.

On Occlusion of the Vagina (operation by incision and dilatation, relieved), by H. J. Holmes, M. D. Miss.

Ohio Med. and Surg. Journ., vol. ii. p. 540, 1850.

A Case of Imperforate Hymen, by William Shultice, M. D. Virginia.

Am. Journ. Med. Sciences, vol. vii. N. S. p. 243, 1844.

Case of Imperforate Hymen, by John G. Metcalf, M. D. Massachusetts.

Am. Journ. Med. Sciences, vol. xii. N. S. p. 139, 1846.

Vaginal Hysterotomy and subsequent delivery with the Forceps, with safety to both Mother and Child, by G. S. Bedford, M. D. New York.

Am. Journ. Med. Sciences, vol. xv. N. S. p. 348, 1848.

A previous successful Case of the same.

New York Journal of Medicine, March, 1843.

Vaginal Hysterotomy (successful to Mother), by John H. Griffin, M. D. Virginia.

Am. Journ. Med. Sciences, vol. xvii. p. 94, 1849.

OPERATIONS ON THE FEMALE PERINEUM.

Parturient Laceration of the Recto-Vaginal Septum, successfully treated with Metallic Ligatures, by John P. Mettauer, M. D. Virginia.

Am. Journ. Med. Sciences, vol. xiii. p. 113, 1833.

Extirpation of the Os Coccygis for Neuralgia, by J. C. Nott, M. D. Mobile.

Am. Journ. Med. Sciences, vol. viii. p. 544, 1844.

Hints on the Treatment of Lacerated Perineum, by William E. Horner, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xx. p. 329, 1850.

OPERATIONS ON THE VAGINA.

Non-Existence of the Vagina remedied by an Operation, by John C. Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. xiii. p. 79, 1833.

Case of Vesico-Vaginal Fistula, successfully treated by an Operation, by George Hayward, M. D. Boston. (Numerous others since published in Pamphlet form, from *Boston Journal*, 1851.)

Am. Journ. Med. Sciences, vol. xxiv. p. 283, 1839.

Recto-Vaginal Fistula (cured), by J. Rhea Barton, M. D., Phila.

Am. Journ. of Med. Sciences, vol. i. N. S. p. 305, 1840.

On Vesico-Vaginal Fistula, by John P. Mettauer, M. D. Virginia.

Am. Journ. Med. Sciences, vol. xiv. N. S. p. 117, 1847.

Vesico-Vaginal Fistula, treated by the ordinary Hare-lip Operation (relieved), by Henry H. Smith, M. D. Philadelphia.

Philadelphia Med. Examiner, vol. v. N. S. p. 155, 1849.

Case of Imperforate Vagina and Malformation of the Superior Portion. Operation (cure), by A. B. Shipman, M. D. Indiana.

Am. Journ. Med. Sciences, vol. xviii. p. 401, 1849.

OPERATIONS UPON THE UTERUS.

Amputation of the Cervix Uteri for Scirrhus (died), by H. G. Jameson, M. D. Baltimore.

Am. Medical Record, vol. vii. p. 543, 1824.

Case of successful Excision of the Cervix Uteri in a Scirrhous State, by John B. Strachn, M. D. Virginia.

Am. Journ. Med. Sciences, vol. v. p. 307, 1829.

Extirpation of Cancer of the Uterus (died sixth day), by John C. Warren, M. D. Boston.

Am. Journ. Med. Sciences, vol. iv. p. 536, 1829.

Complete Extirpation of the Uterus by Ligature after Chronic Inversion of the Organ (successful), by John M. Esselman, M. D. Nashville.

Am. Journ. Med. Sciences, vol. vii. N. S. p. 254, 1844.

Amputation of the Neck of the Uterus, by N. J. McL. Moore, M. D. New Hampshire.

Boston Med. and Surg. Journ., Dec. vol. xxxvii. p. 397, 1847.

Excision of the Cervix Uteri for Carcinomatous Disease (died), by Washington L. Atlee, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xvi. p. 86, 1848.

Case of Excision of the Uterus (died three months after the operation), by Paul F. Eve, M. D. Georgia.

Am. Journ. Med. Sciences, vol. xx. N. S. p. 395, 1850.

ON POLYPUS UTERI.

Cases of Uterine Polypus treated by Ligatures, by Thomas Chadbourn, M. D. New York.

Boston Med. and Surg. Journ., vol. xxi. p. 289, 1839.

Polypus Uteri, removed by Excision, by C. R. Gilman, M. D. New York.

Am. Journ. Med. Sciences, vol. ii. N. S. p. 519, 1841.

Cases of Uterine Polypus (new Instrument for Ligature), by John V. P. Quackenbush, M. D. Albany.

Am. Journ. Med. Sciences, vol. vii. N. S. p. 241, 1844.

Polypus and Inversion of Uterus; Ligature, Excision of a large portion of the Uterus (recovery), by A. L. Peirson, M. D. Salem, Mass.

Am. Journ. Med. Sciences, vol. xvii. p. 339, 1849.

Case of Polypus Uteri, successfully removed by Ligature, by S. B. Philips, M. D. New York.

New York Journ. Med. and Collateral Sciences, vol. iv. N. S. p. 199, 1850.

OPERATIONS ON THE UTERUS AND OVARY; GASTROTOMY.

Three Cases of Extirpation of the Ovaria, successfully performed, by Ephraim McDowell, M. D. Danville, Kentucky, 1809. (The first time in America, and the second ever performed.)

Eclectic Repert. and Analyt. Review, vol. vii. p. 242, 1817.

Observations and Cases (two), of removal of Ovaria, by Ephraim McDowell, M. D. Danville, Kentucky.

Eclectic Repert., vol. ix. p. 546, 1819.

Case of Ovarian Tumor, successfully removed by an Incision through the Abdomen, by Nathan Smith, M. D. Yale College.

Am. Medical Recorder, vol. v. p. 124, 1822.

Account of a Case of successful removal of a Diseased Ovarium, by Alban G. Smith, M. D. Danville, Kentucky.

North American Med. and Surg. Journ., vol. i. p. 30, 1826.

Case of Ovarian Tumor, successfully extirpated, by David L. Rogers, M. D. New York.

New York Med. and Phys. Journ., vol. ii. N. S. p. 285, 1830; also *Am. Journ. Med. Sciences*, vol. v. p. 549, 1829.

Ovarian Dropsy cured by the long Abdominal Section in 1701, by Robert Houstoun. Glasgow, Scotland. Reported by Washington L. Atlee, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xvii. N. S. p. 534, 1849.

Extra-Uterine Fœtation, Gastrotomy, successfully performed ten years after Conception, by Alexander H. Stevens, M. D. New York.

Am. Journ. Med. Sciences, vol. xii. N. S. p. 279, 1846; also *New York Journ. of Med.*, May, 1846.

Case of Extra-Uterine Pregnancy (cured by Gastrotomy), by Edward Whinery, M. D. Iowa.

Am. Journ. Med. Sciences, vol. xi. N. S. p. 351, 1846.

Removal of an Extra-Uterine Fœtus, fifteen years in cavity of Abdomen (through the Rectum), and complete recovery, by Thomas Yardley, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xi. N. S. p. 348, 1846.

A Sarcomatous Tumor, containing Hair and Stearine, removed from the Womb, by Gunning S. Bedford, M. D. New York.

New York Journ. of Medicine, vol. ii. N. S. p. 30, 1849.

Gastrotomy (for a Uterine Tumor which could not be removed), recovery, by J. Deane, M. D. Greenfield.

Am. Journ. Med. Sciences, vol. xvii. N. S. p. 258, 1849; also *Boston Med. and Surg. Journ.*, vol. xxxix. p. 221, 1848.

Case of successful Extirpation of an Ovarian Tumor by the large Peritoneal Section, by Washington L. Atlee, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xviii. N. S. p. 336, 1849.

An Eclectic Essay on the Non-Pediculated Fibro-Scirrhous Tumors of the Uterus, by Wm. C. Roberts, M. D. New York.

New York Journ. of Medicine, vol. iii. N. S. p. 330, 1849; also *Ibid.*, vol. iv. N. S. p. 31, 1850.

Solid Ovarian Tumor, extending from the Pubis to the Right Hypochondrium, cured by Incision followed by Suppuration, by David Prince, M. D. St. Louis.

Am. Journ. Med. Sciences, vol. xx. N. S. p. 267, 1850.

Account of an Operation for the removal of an Ovarian Tumor, by Alden March, M. D. Albany.

Transactions of New York Med. Society, vol. viii. p. 201, 1850.

Fibrous Tumor of the Left Ovarium successfully removed by the large Abdominal Section, by Wm. H. Van Buren, M. D. New York.

Am. Journ. Med. Sciences, vol. xx. N. S. p. 272, 1850.

Two Cases of Ovariotomy (with Statistics), by Washington L. Atlee, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xix. N. S. p. 318, 1850.

Ovariotomy, three Cases, by P. J. Buckner, M. D. Georgetown, Ohio.

Am. Journ. Med. Sciences, vol. xx. N. S. p. 560, 1850; also *Ohio Med. and Surg. Journ.*, Sept., 1850.

Ovarian Dropsy—removal of the sac (large section) and fatal termination by A. H. Grimshaw, M. D. Delaware.

Phila. Med. Ex., vol. vi. N. S. p. 630, 1850.

ON THE CÆSAREAN OPERATION.

Cæsarean Operation, successfully performed by John L. Richmond, M. D. Ohio. (Done without assistance at 1 A. M. with Instruments from a pocket case.)

Western Journ. of Med. and Phys. Sciences, vol. iii. p. 485, 1830.

Observations on the Cæsarean Operation (accompanied by an Account of the Operation of Dr. Wm. Gibson), in which both Mother and Child were preserved, by Joseph G. Nancrede, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xvi. p. 343, 1835.

Case where the Cæsarean Section was performed with a fatal termination, by A. Brooke, M. D.

Am. Journ. Med. Sciences, vol. xviii. p. 258, 1836.

Account of a Case in which the Cæsarean Section performed by Professor W. Gibson was a second time successful in saving both Mother and Child, by George Fox, M. D.

Am. Journ. Med. Sciences, vol. xxii. p. 13, 1838.

Cæsarean Section on a Dwarf, by Cyrus Falconer, M. D.

Am. Journ. Med. Sciences, vol. vi. N. S. p. 264, 1843; also *Western Journ. of Med. and Surg.*, May, 1843.

Cæsarean Operation (performed unsuccessfully) by A. B. Shipman, M. D. Indiana.

Am. Journ. Med. Sciences, vol. xviii. p. 122, 1849.

Case of Cæsarean Section (successful), by Brodie S. Herndon, M. D. Virginia.

Am. Journ. Med. Sciences, vol. xii. N. S. p. 386, 1846.

ON AFFECTIONS OF THE RECTUM.

Fistula in Ano in an Infant, eight months old, cured by Incision, by Felix Pascalis, M. D. New York.

Philadelphia Med. Museum, vol. vi. p. 197, 1809.

Stricture of Rectum, successfully treated by an operation, by H. G. Jameson, M. D. Baltimore.

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Improved Mode of Operating for Hemorrhoids, by J. C. Rousseau, M. D. Philadelphia.

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Fissure of the Rectum, attended with Constriction of the Anus, cured by division of the Sphincter Ani, by Alexander H. Stevens, M. D.

New York Med. and Phys. Journ., vol. iv. p. 242, 1825.

Case of Prolapsus Ani, in which the entire Rectum was successfully extirpated, by J. W. Brite, M. D. New Castle, Kentucky.

Am. Medical Record, vol. x. p. 311, 1826.

Case of Blind Hemorrhoids, cured by Use of Setons, by Ransom M. Collins, M. D. Louisiana.

Transylvania Med. Journ., vol. ii. p. 139, 1829.

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Callous Stricture of Rectum (died), by Daniel King, M. D. Charlestown, Rhode Island, Sept., 1830.

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Am. Journ. Med. Sciences, vol. xiv. p. 80, 1834.

Remarks on the Pathology and Treatment of Hemorrhoidal Tumors, by N. R. Smith, M. D. Baltimore.

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Description of a new Operation for Hemorrhoids, by Amussat, translated by Henry Selden, M. D. Virginia.

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Extraction of a Glass Goblet from the Rectum, by W. S. W. Ruschenberger, M. D., U. S. N.

Am. Journ. Med. Sciences, vol. xvii. N. S. p. 409, 1849.

PART V.

PAPERS ON OPERATIONS ON THE EXTREMITIES.

GENERAL OPERATIONS ON THE EXTREMITIES.

On the Arrest of the Progress of Whitlow, by means of Caustic, by Dr. Perkins. Philadelphia.

Am. Medical Record, vol. ii. p. 490, 1819.

On the Best Method of Removing Contractions in the Limbs from Burns, by Wm. G. Nice, M. D. Virginia.

Am. Medical Record, vol. iii. p. 341, 1820.

Hydrops Articuli in the Shoulder, by James Kent Platt, M. D. Plattsburg.

Am. Medical Record, vol. iv. p. 209, 1821.

Case in Proof of Efficacy of the Actual Cautery in Deep Sinuses, by N. R. Smith, M. D. Burlington, Vermont.

Philadelphia Journ. Med. and Phys. Sciences, vol. vi. p. 128, 1823.

Removal of a large indolent Tumor on the Thigh, by the Application of Caustic, by H. G. Jameson, M. D. Baltimore.

Am. Med. Record, vol. vi. p. 59, 1823.

An Operation for Inverted Toe-Nail, by John D. Godman, M. D. Philadelphia.

Philadelphia Journ. Med. and Phys. Sciences, vol. iii. p. 338, 1826.

Traumatic Hemorrhage, illustrated by Experiments on Living Animals, by H. G. Jameson, M. D. Baltimore.

Am. Medical Record, vol. xi. p. 3, 1827.

Case of Wounded Nerve from Bleeding in the Forearm just below the Elbow, cured by Division of the Nerve, by T. Nelson, M. D. New York.

New York Med. and Phys. Journ., vol. iii. p. 62, 1824.

Cases of Neuralgia or Painful Affections of the Nerves from Injury, &c., by Jno. C. Warren, M. D. Boston.

Boston Med. and Surg. Journ., vol. ii. p. 98, 1829.

Case of Diseased Sciatic Nerve, in which the Nerve was removed by Excision (death), by Robert Bayard, M. D. St. John's, New Brunswick.

New York Med. and Phys. Journ., vol. ii. N. S. p. 37, 1830.

An Inquiry into the Pathology and Treatment of Secondary Abscesses, &c., resulting from Injuries and Surgical Operations, by Jno. Watson, M. D. New York.

Am. Journ. Med. Sciences, vol. xxi. p. 17, 1837.

Abnormal Elongation of the Tibia consequent on extensive Ulceration of the Leg, by Alexander Baron, M. D. South Carolina.

North American Archives, vol. ii. p. 290, 1834.

Case of Varicose Veins cured by means of Needles passed through the Veins after the Method proposed by Davat, by Henry H. Smith, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xxii. p. 525, 1838.

On the Treatment of Varicose Veins, by Henry H. Smith, M. D. Philadelphia.

Phila. Med. Examiner, vol. ii. p. 821, 1839.

On Enlargement of Bursa over the Patella, by George Hayward, M. D. Boston.

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On the Pathology and Treatment of Varices, by John Watson, M. D., New York.

Am. Journ. of Med. Sciences, vol. v. N. S. p. 36, 1843.

ON CLUB-FOOT.

Report of several Cases of Club-Foot successfully treated by dividing the Tendo-Achillis, by W. Detmold, M. D. New York.

Am. Journ. Med. Sciences, vol. xxii. p. 105, 1838; also *Phil. Med. Examiner*, vol. i. 198, 1838.

On Division of the Tendo-Achillis in Club-Foot, by James H. Dickson, M. D. New York.

Am. Journ. Med. Sciences, vol. xxii. p. 512, 1838.

Congenital Club-Foot, and Division of the Tendo-Achillis, by G. W. Norris, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xxiii. p. 257, 1839.

Division of the Tendo-Achillis in Club-Foot, by N. R. Smith, M. D. Baltimore.

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Case of Talipes Equinus, cured by Stromeyer's Operation, by James H. Dickson, M. D. New York.

Am. Journ. Med. Sciences, vol. xxiii. p. 96, 1839.

Successful Club-Foot Operations (ten), by A. G. Walton, M. D. Pennsylvania.

Am. Journ. Med. Sciences, vol. xxiii. p. 259, 1839.

Club-Foot Division of Tendo-Achillis, by Thomas J. Garden, M. D. Virginia.

Am. Journ. Med. Sciences, vol. xxiv. p. 257, 1839.

Cases of Deformed Feet treated by Mechanical Means alone, with a Description of the Apparatus, by Heber Chase, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. i. N. S. p. 88, 1841.

Club-Foot cured at an Advanced Age, by J. B. Brown, M. D. Boston.

Am. Journ. Med. Sciences, vol. vii. N. S. p. 256, 1844.

ON ANEURISMS AND LIGATURE OF ARTERIES IN THE EXTREMITIES.

Aneurism of the Thigh, cured by an Operation (two Ligatures), and Use of the Limb preserved, by Thomas Kast, A. M. Boston.

Communications and Dissertations of Massachusetts Med. Society, vol. i. p. 96, 1790.

Case of Varicose Aneurism at the Bend of the Arm, cured by Ligature of the Brachial Artery, by P. S. Physick, M. D., Philadelphia.

Philadelphia Med. Museum, vol. i. p. 65, 1805.

Ligature of the Femoral Artery for a Wound, by John C. Warren, M. D. Boston.

Communications and Dissertations of Massachusetts Med. Society, vol. i. p. 40, 1806.

Ligature of the Femoral Artery (cured), by David Hosack, M. D. New York.

New York Med. Repository, vol. xii. p. 105, 1809.

Case of Popliteal Aneurism successfully treated by Ligating the Femoral Artery, by Henry U. Onderdonk, M. D. New York.

Am. Med. and Philosoph. Register, vol. iv. p. 44, 1814.

Successful Ligature of the Femoral Artery for a Wound in the Knee-Joint, by Henry U. Onderdonk, M. D. New York.

Am. Med. and Philosoph. Register, vol. iv. p. 176, 1814.

Case of Brachial Aneurism cured by Tying the Subclavian Artery

above the Clavicle, by Wright Post, M. D. New York. Communicated by J. C. Bliss, M. D.

Transactions of New York Physico-Med. Society, vol. i. p. 367, 1817.

Case of Popliteal Aneurism, &c., by Horatio Gates Jameson, M. D. Baltimore.

Am. Medical Record, vol. iv. p. 94, 1821.

On the Utility of Tying Large Arteries in Preventing Inflammation in Wounds of the principal Joints, with Cases, by David L. Rodgers, M. D. New York.

New York Med. and Phys. Journ., vol. iii. p. 453, 1824.

Case of Aneurism of the Brachial Artery cured by Compression, by W. B. Fahnestock, M. D. Pennsylvania.

Philada. Journ. Med. and Phys. Sciences, vol. ii. N. S. p. 363, 1825.

Spontaneous Cure of Aneurism, with Observations on the Obliteration of Arteries, by W. Darrach, M. D. Philadelphia.

Philada. Journ. Med. and Phys. Sciences, vol. iv. N. S. p. 115, 1826.

Case of Femoral Aneurism of the Left Thigh and Popliteal Aneurism of the Right Leg, successfully treated, by Valentine Mott, M. D. (The Femoral was tied first for Popliteal, and the External Iliac fourteen days subsequently, both successful.)

Am. Journ. Med. Sciences, vol. i. p. 483, 1828.

Case of Aneurism of the Brachial Artery, cured by Compression, by J. W. Heustis, M. D. Alabama.

Am. Journ. Med. Sciences, vol. ix. p. 261, 1831.

Case of Diffused Femoral Aneurism, for which the External Iliac was tied (cured), by Valentine Mott, M. D. New York.

Am. Journ. Med. Sciences, vol. viii. p. 393, 1831.

Pressure applied to the Femoral Artery as a means of Curing Popliteal Aneurism (Dec. 1826), by George Bushe, M. D. New York.

Medico-Chirurgical Bulletin, vol. ii. p. 213, 1832.

Wound of the Ulnar Artery at the Heel of the Hand, successfully treated by Compression after the Ligature had failed, by H. G. Jameson, M. D. Baltimore.

Maryland Med. Record, vol. iii. p. 40, 1832.

Ligature of the Femoral Artery for Popliteal Aneurism, Hemorrhage from the Femoral on the twelfth day; second application of the Ligature above the Profunda, Hemorrhage on the eighth day, arrested by Compression (cured), by N. R. Smith, M. D. Baltimore.

Baltimore Med. and Surg. Journ., vol. ii. p. 61, 1834.

Two Cases of Aneurism (Femoral and Brachial), exhibiting the

Statistics of the Mortality following the Operation of Tying the Femoral Artery, by G. W. Norris, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xviii. N. S. p. 313, 1849.

Successful Ligature of the Femoral Artery for Wound of the Anterior Tibial, by E. P. Bennett, M. D. Connecticut.

Am. Journ. Med. Sciences, vol. xix. N. S. p. 272, 1850; also *New York Journ. Med.*, vol. iv. N. S. p. 199, 1850.

Ligature of the Femoral Artery for Popliteal Aneurism (successful), by Charles A. Pope, M. D. St. Louis.

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ON PSEUDARTHROSIS, &c.

Fracture of the Os Humeri, in which from False Joint the Cure was effected by means of a Seton, by Philip S. Physick, M. D. Philadelphia. (Operation 18th Dec. 1802.)

Medical Repository, vol. vii. p. 122, 1804.

Two Cases of Tardy Union in Fractures, cured by Caustic Issues in Integuments, by Joseph Hartshorne, M. D. Philadelphia.

Eclectic Repert., vol. iii. p. 114, 1813.

Ununited Fracture of the Humerus, cured by Seton, by Robert Thaxter, M. D. Dorchester.

New England Journ. of Med. and Surg., vol. vii. p. 150, 1818.

Case of False Joint, treated by the Seton, by Nicholas Worthington, M. D. District of Columbia.

Philada. Journ. of Med. and Phys. Sciences, vol. ii. p. 317, 1821.

The Seton, successfully applied in Pseudarthrosis of the Forearm, by John Baxter, M. D. New York.

Am. Med. Record, vol. vii. p. 30, 1824.

Application of Caustic, and Cure of Pseudarthrosis, by John Rhea Barton, M. D. Philadelphia.

Am. Med. Record, vol. ix. p. 275, 1826.

Ununited Fracture of the Humerus, successfully treated by Resection after Failure of Seton, by J. Kearney Rogers, M. D. New York.

New York Med. and Phys. Journ., vol. vi. p. 521, 1827.

Mechanism of Preternatural Joints, and Means of Cure, by Thomas T. Hewson, M. D. Philadelphia.

North American Med. and Surg. Journ., vol. v. p. 1, 1828.

Ununited Fracture of the Os Humeri, successfully treated by the Injection of a Stimulating Fluid (sol. cupri sulph.) into the Wound, by Isaac Hulse, M. D., U. S. N.

Am. Journ. Med. Sciences, vol. xiii. p. 374, 1833.

Case of Ununited Fracture, successfully treated by Friction, by Isaac Parrish, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xiv. p. 372, 1834.

Pseudarthrosis of both Bones of the Leg, treated by Excision and Caustic, and again by Resection (failed in both instances from Menorrhagia), by Henry H. Smith, M. D. Philadelphia.

Am. Journ. Med. Sciences, vol. xv. N. S. p. 84, 1848.

Ununited Fracture of the Femur (of one year's standing), successfully treated by Resection, Denudation, and retaining Ends of Bone by means of Wire, by D. Brainard, M. D. Illinois.

Am. Journ. Med. Sciences, vol. xvii. N. S. p. 256, 1849.

ON RESECTION OF THE BONES OF THE EXTREMITIES.

Necrosis, two Cases operated on, by John H. Martin, M. D. Maine.

New England Journ. of Med. and Surg., vol. i. p. 162, 1812.

Case of Wounded Shoulder-Joint, in which the Head of the Humerus was removed successfully, by Henry Hunt, M. D. Washington.

Medical Record, vol. i. p. 365, 1818.

Resection of nearly the whole of the Ulna, successfully, by Robert B. Butt, M. D. Virginia.

Philada. Journ. Med. and Phys. Science, vol. i. N. S. p. 115, 1825.

Successful Extirpation of the Astragalus after Compound Luxation, by Alexander H. Stevens, M. D.

New York Med. and Phys. Journ., vol. v. p. 560, 1826.

Treatment of Anchylosis of the Hip-Joint by the Formation of an Artificial Joint, a new Operation, devised and executed by John Rhea Barton, M. D. Philadelphia.

North American Med. and Surg. Journ., vol. iii. pp. 279, 400, 1827.

Successful Removal of the Astragalus in Compound Dislocation, by Wm. A. Gillespie, M. D. Virginia.

Am. Journ. Med. Sciences, vol. xii. p. 552, 1833.

Removal of a Third of the Head of the Humerus, by N. Pinkney, M. D., U. S. N.

Am. Journ. Med. Sciences, vol. xii. N. S. p. 330, 1846.

Excision of the Elbow-Joint for Caries of the Articular Extremities of the Bones, by Gurdon Buck, Jr., M. D. New York.

Am. Journ. Med. Sciences, vol. xii. N. S. p. 544, 1846.

ON AMPUTATIONS.

Amputation at the Shoulder, by Jno. Warren, M. D. Boston, 1781. (First in the United States.)

Boston Med. and Surg. Journ., vol. xx. p. 210, 1839.

Amputation of the Arm at the Shoulder, together with the Acromion Process of Scapula for Fungus Hematodes after the Ligation of the Subclavian Artery (died), by Dr. Wm. C. Bowen. Providence.

New England Journ. of Med. and Surg., vol. iii. p. 314, 1814.

New Tourniquet, by Francis Moore, M. D. Connecticut.

New England Journ. of Med. and Surg., vol. iv. p. 209, 1815.

Amputation at the Shoulder-Joint (died), by J. B. Whitridge, M. D. South Carolina.

New England Journ. of Med. and Surg., vol. v. p. 21, 1816.

Amputation of part of the Foot (cured), by George Hayward, M. D. Boston.

New England Journ. of Med. and Surg., vol. v. p. 338, 1816.

Report of Extraordinary Cases of Amputation, by Amasa Trowbridge, M. D. Watertown.

New York Med. Repository, vol. xix. p. 20, 1819.

Case of Fungus Hematodes, Amputated, by George McClellan, M. D. Philadelphia.

Am. Med. Record, vol. v. p. 634, 1822.

Remarks on Amputation, by Nathan Smith, M. D., of Yale College.

New York Med. and Phys. Journ., vol. iv. p. 303, 1825.

Successful Amputation at the Hip-Joint, by Valentine Mott, M. D. New York.

Philada. Journ. Med. and Phys. Sciences, vol. v. N. S. p. 101, 1827.

Amputation at the Elbow-Joint (Flap, first in United States), cured, by J. Kearney Rogers, M. D. New York.

New York Med. and Phys. Journ., vol. vii. p. 85, 1828.

Statistics of Amputations in the New York Hospital, from January 1, 1839, to January 1, 1848 (ninety-one cases, twenty-six deaths), by Henry W. Buel, M. D. New York.

Am. Journ. Med. Sciences, vol. xvi. N. S. p. 33, 1848.

Successful Amputation of the Shoulder-Joint, patient under Chloroform, by Paul F. Eve, M. D. Georgia.

Am. Journ. Med. Sciences, vol. xvii. N. S. p. 257, 1849.

Also, *Buffalo Medical Journal*, vol. v. p. 533, 1849.

Amputation of the Leg for Gangrene of the Foot, successfully performed on a Negro at the age of 102 (died of Pleurisy), by Richard Jarrott, M. D.

Charleston Medical Journal, vol. iv. p. 301, 1849.

Case of Secondary Hemorrhage after Amputation at the Shoulder-Joint (cured by Pressure), by Charles S. Tripler, M. D., U. S. A.

New York Journ. of Med., vol. iii. p. 40, 1849.

Amputations and Compound Fractures, with Statistics, by John O. Stone, M. D. New York.

New York Journ. of Med., N. S. vol. iii. p. 298, 1849.

Successful Amputation at the Shoulder-Joint, by Paul F. Eve, M. D. Georgia.

Am. Journ. Med. Sciences, vol. xviii. N. S. p. 549, 1849.

Successful Amputation at the Shoulder-Joint in consequence of an Injury sustained Fifteen Years previously, by Wm. Byrd Page, M. D. Philadelphia.

Philadelphia Med. Examiner, vol. v. N. S. p. 451, 1849.

Amputation of the Thigh, successful.

" Leg, "

" Thigh, cured in two weeks, by Paul F. Eve, M. D. Georgia.

Southern Med. and Surg. Journ., vol. vi. pp. 261, 264, 1850.

ALPHABETICAL LIST

OF

AMERICAN SURGEONS,

WITH THE

TITLES OF THEIR PAPERS AS QUOTED IN THE BIBLIOGRAPHICAL INDEX.

The difference that may be noted in the variety of papers assigned to the Surgeons quoted in the preceding Index must not be regarded as indicating the entire number of their publications, but only the fact that their articles were so published as to be accessible to the Author.

A

B

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S

OPERATIVE SURGERY.

PART I.

GENERAL DUTIES AND ELEMENTARY OPERATIONS.

OPERATIVE SURGERY.

PART I.

GENERAL DUTIES AND ELEMENTARY OPERATIONS.

INTRODUCTION.

Operative Surgery, in the usual acceptation of the term, has been so long regarded as designating that department of medicine in which diseases are treated by means of cutting instruments, that the importance to an operator of other qualifications than those of manual dexterity is liable to be overlooked. Although every medical man is presumed to know that a successful surgeon must necessarily be also a good physician, yet as the absence of reference to this fact may lead the inexperienced to place too much confidence in mere mechanical measures, it seems right, in this portion of the work, to call the attention of the reader to the value of constitutional treatment, in connection with surgical operations of a hazardous kind.

The human system, upon which a surgeon acts mechanically, is a combination of organs, so mutually dependent on each other, that the removal of any portion, or even the partial division of the tegumentary membrane which encases and protects the whole, frequently creates derangement which nothing but judicious medical treatment can remedy. Appropriate constitutional measures are therefore often as essential to the success of an operation as anatomical knowledge is necessary to its performance; and the happiest results will usually be obtained by those who closely attend not only to the local, but also to the general management of the cases on which they operate. For this reason, a successful surgeon must not only be a judicious practitioner of medicine, but also a devoted nurse and careful observer of the varying conditions of the system, under all

circumstances. In every operation he should feel that he is largely indebted to nature; without her aid he can neither anticipate nor obtain success, whilst with it, especially as exhibited in the processes of adhesion, or reproduction of tissue, he possesses a power that seems almost divine.

Admitting the necessity of thus combining medical skill with operative dexterity, there yet remain to be noticed two special duties which are essential to a correct appreciation of the extended qualifications requisite in an operator, to wit, tact in diagnosis and a correct knowledge of surgical pathology.

By diagnosis, the various mental and physical processes which ennoble and augment the value of operative proceedings, are brought into play. In the practice of medicine, the power to diagnosticate disease is universally esteemed a test of skill, but in surgery it is occasionally apparent that its acquisition is deemed easy and of less value, than that assigned it in the kindred branch of the profession. In surgery, it is also often deemed of little difficulty, because the duties of the surgeon being limited to external complaints, their characteristics are regarded as more tangible, and therefore supposed to present peculiarities which can be more readily recognized by the senses. Slight practice will, however, convince those entertaining such an opinion that the mere acquisition of the nice sense of touch, which is essential to the development of this power, is of itself sufficiently difficult, to say nothing of the experience necessary to regulate the mental impressions which touch creates. The consequences of diagnostic error in operative surgery are also such, that heavy and prompt responsibility is connected with its exercise by an operator, as his means of treatment may in a moment destroy life, or produce irreparable mutilation before he recognizes his mistake. A correct diagnosis is, therefore, always presumed to precede every attempt at the use of instruments.

Surgical pathology, as demonstrating the peculiarities of diseased structure, together with the other phenomena of abnormal action, is also a necessary qualification in a surgeon. On the perfection of the knowledge possessed by him in this department rests the necessity of submission by the patient to any operative proceeding. If it is requisite to remove a tumor, he is supposed fully to recognize its characters and probable progress before recommending its extirpation; while his decision as to the propriety of amputation may involve not only the serious question of loss of limb, but also of life

if the operation is unnecessarily delayed. While then for the advantages of methodical arrangement, the ensuing pages are mainly limited to mechanical details, let it be remembered that the author has no intention of giving them any other value than that of being one of the means of treatment occasionally demanded for the relief of disease.

With this explanation, the subject may be divided into two parts: 1st. Minor Operative Surgery, or simply Minor Surgery, in which there is usually but little danger to the life of the patient, from the means employed; and, 2d, Major Surgery, or Operative Surgery proper, where, from the more free use of instruments, risk to life may reasonably be anticipated. To show the various modes of operating, and especially such as are resorted to by surgeons in the United States, is the object of the present volume.

For the exposition of the duties of Minor Surgery, the reader is referred to the various treatises upon the subject, among which may be found the third edition of that published by the author of these pages.*

In the arrangement of the work, five divisions may be advantageously made: 1st. General Duties and Elementary Operations. 2d. Operations on the Head and Face. 3d. Operations on the Neck and Trunk. 4th. Operations on the Genito-Urinary Organs; and, 5th. Operations on the Extremities.

In adopting this order, the author has been guided by the opinion that the natural relation of parts is that in which one desiring information in respect to an operation, would almost intuitively seek it. Thus, the treatment of Hare-Lip would be looked for in connection with operations on the lips, and not among those for malformations of the soft parts, or for disorders of the skin or muscles; while the process of Trephining would properly be sought under injuries of the cranium, and not under that of affections of the bones. With the same views, the details of each subject will be presented in the order in which the operator should attend to them. Thus, before operating, a surgeon naturally thinks of the anatomical relations of the region upon which he is to act; then of the methods of operating; then of the instruments that may be required; then of the dressings; and, lastly, of the adjuvants necessary either to local or general measures of treatment.

* Minor Surgery, or Hints on the Every-day Duties of the Surgeon, 3d edition, Phila. 1850.

CHAPTER I.

OF THE GENERAL DUTIES OF AN OPERATOR.

By the general duties of an operator, are understood all such acts as may be required in connection with his mechanical proceedings. These duties may be classed under three heads: 1st. Attention to the patient; 2d. Preparation of instruments; and 3d. Selection of assistants.

SECTION I.

ATTENTIONS TO THE PATIENT.

The attentions to the patient, as a portion of the general duties of an operator, may be subdivided into three periods: those which are required before the operation; during its proceedings; and subsequent to its performance.

As every operation in surgery is undertaken solely with the view of benefiting the patient, the duties of an operator necessarily commence with the establishment of a correct diagnosis. Certainty, or a cautious examination of the nature of the disorder, should in all instances be a *sine quâ non* to any operation. Without it, every application of the knife becomes barbarous and unjustifiable.

The Prognosis of an operation, or the opinion that the result to the patient will be preferable to his condition before it, should in like manner be firmly settled; but as all men are liable to error, even when caution is largely exercised, it becomes the duty of an operator, in every case where it is possible, to demand a consultation with one or more of his professional brethren, not only in order to render the necessity of the operation certain, but also to secure his own reputation as to its correctness. The propriety of amputations has been subsequently doubted; lithotomy has been performed when a calculus did not exist; whilst the removal of hemorrhoids, the cure of fistula in ano, or the performance of plastic

operations have all left the patient in a worse condition than he was previously. The result, also, is by no means the same, even under apparently similar circumstances. Death has ensued from the operation for piles; a greater deformity been created by operating for strabismus; and new noses have not always proved so handsome as the old. The issue should, therefore, be carefully weighed by every surgeon, before an operation is undertaken, if only on account of his own reputation. But when, after due deliberation, the affair has been decided, let him immediately, with perfect confidence, assume his position as the operator, and give his attention to such general and local measures as will facilitate the accomplishment of his object.

§ 1.—*Duties of a Surgeon before Operating.*

Among the first of the general measures required at this period, may be placed the employment of such means as are occasionally necessary to induce the patient to consent to the performance of the operation. Sometimes it happens that an individual is timid, fearful of pain, and requires strong inducements to lead him to suffer that which is requisite for his cure. Under such circumstances, the surgeon will be obliged to promise largely, or present a lively delineation of the benefits that may result from its performance; but, on the other hand, if his patient is over-bold, or has obtained too exalted an idea of the advantages that will accrue to him from its execution, it may become necessary to diminish his anxiety to submit, and point out the risks to which he will be exposed; lest, anticipating too much, and being disappointed, he throw the blame upon his surgical attendant.

Especially is this requisite in the case of females.

A young girl is annoyed by a squint, and hopes to improve her beauty; or, she has been disfigured by a burn, or deformed from a fracture, and, full of the accounts of friends and neighbors, almost insists upon an operation; and in these cases it is imperatively the duty of the surgeon to display the darker tints of the picture, and limit the anticipations that hope and vanity have so readily created.

In this, which has been termed the moral preparation of the patient, much of the means required must be decided by that indefinite quality of the mind known as "tact;" and the best mode of accomplishing it must consequently be left to the judgment of him who

operates. Nor are these measures only of importance in respect to the comfort of the patient; they are also often closely allied to the result of the case. Fear depresses the vital powers, but hope enlivens and elevates them; and their undue excitement may, therefore, either prove a serious obstacle, or a powerful lever to the attainment of the surgeon's object.* From the extensive sympathies of one organ with another, it also becomes the operator's duty at this stage of his proceedings to look not only at the mental, but also to the general condition of his patient. Let him see that the digestive organs are as far as is possible free from disease, and active in the performance of their functions; that the secretions of the liver and kidneys are not obstructed; that the lungs and heart are in a proper condition for the circulation of the blood, and that the head is free both from mental and physical disorders; in other words, let him satisfy himself before the operation that his patient is possessed of the *mens sana in corpore sano*, or, in other words, that he is, as far as may be, sound both in body and mind.

After fully attending to the general preparation of the patient, the surgeon should next turn his attention to such means as will facilitate his own movements, and save the patient unnecessary suffering. In some few instances, the production of pain, and the development of the patient's sensibility, are the object of the operation, as is seen in the use of stimulants for the cure of hydrocele, or the excitement of vital action in the treatment of un-united fracture. But, in the majority of cases, the creation of pain by any operation can only be regarded, at the present time, as both unnecessary and injurious. The surgeon should therefore prevent it, and endeavor to save his patient the excitement arising from suffering, by resorting to the use of Anæsthetics or of Opiates. Let him, especially before severe operations, blunt the nerves of sensation either by partial or entire Etherization; and as its safety has been widely tested, philanthropy and that desire to ameliorate the sufferings of mankind, which is the true basis of sound practice, demand that neither prejudice nor ignorance of its effects should longer prevent its employment by every operator.

If experience as to its power and mode of administration has not

* For many excellent details on the moral preparation of the patient, see Pathologie Externe, par Vidal du Cassis, tom. 1.; also Velpeau's Surgery, by Drs. Mott & Townsend, vol. i., New York, 1847.

yet been gained, let him at once resort to books, (of which there are many,) or to the schools, or even travel to distant points, until by study and observation he be satisfied fully of its propriety, and enabled yet further to extend the benefits of this admirable agent for the relief of suffering. Five years have now elapsed since its suggestion by Dr. Morton, of Boston, and its application to surgery by Dr. John C. Warren, of the same city, excited the attention of the world. The best surgeons throughout the globe have employed it, and the most ignorant have not hesitated to resort to its influence. Yet, out of the thousands thus indiscriminately exposed, few have suffered from its effects, whilst numbers have passed through the most severe operations without being "conscious of anything more than a pleasant dream."

In my hands, pure ether has been widely administered during the last four years; but for some months past, I have resorted to it mixed with Chloroform in the proportion of one part of the latter to five of the Ether, and I have yet to see the first patient in whom evil has undoubtedly resulted from its use.

But in addition to the individual experience of many of our countrymen,* every surgeon now possesses the firmly grounded evidence of the large European hospitals. In St. Bartholomew's Hospital, in London, upwards of nine thousand cases have been recorded, in not one of which, including young and old, the healthy and the infirm, has the employment of the anæsthetic (chloroform) left the least stain upon its character as an agent for good.† But although this success is very marked, personal experience, and that of many professional friends, have created such doubts of its safety that in this locality ether, or the compound of ether and chloroform before mentioned, is more frequently employed.

In the administration of Anæsthetics, almost any article will answer for the application of the vapor to the mouth of the patient, such as a hollow sponge, towel, or handkerchief. But, as these agents are exceedingly volatile, much is wasted when they are thus employed; in addition to which, I have myself been affected by extreme lassitude from breathing the atmosphere around the patient when administering them in this manner during a prolonged etherization. I prefer, therefore, the use of a tin cone, like Plate II. Fig.

* See Bibliography. † Skey's Op. Surg., Phila. edit., 1851, p. 31.

1, as it prevents this waste, and yet furnishes quite enough fresh air to obviate any inconvenience to the patient.

A simple and good contrivance employed by Dr. Horner, of Philadelphia, is the old-fashioned powder horn, or a nicely-dressed cow's horn; the sponge being placed in its largest extremity, while the smaller end is inserted in the mouth of the patient.

The effects of anæsthetic inhalation have been described by Dr. Warren as follows:—

"On inhaling Ether the respiration is at first short and quick; and apt to be followed by a cough or gasp which induces the patient to refuse the inhalation." When the ether is combined with chloroform in the proportions above mentioned, this temporary irritation is less frequently noticed. "The bronchia becoming accustomed to the vapor, the respiration becomes fuller and slower, till at last the inspiration is taken to the fullest extent, when, as etherization is induced, it becomes slower and comparatively feeble.

"The pulse at first is quickened, but soon begins to diminish in frequency, and ultimately becomes slow, till it counts even as low as forty or fifty in the minute.

"As soon as the pulse begins to diminish in frequency, the inhalation may be checked and the soporific effect of the vapor carefully noted. The face and neck will soon be seen to become flushed and heated, and the action of the heart to be strong and vibrating. The conjunctiva is also apt to become temporarily injected; the eye vacant and listless, and the patient soon loses all control over vision.

"The muscles are often excited at first, and their increased action sometimes makes the patient troublesome until perfect etherization is induced."* But with the mixture referred to above, this muscular excitement is less frequent. In either case, however, a serious operation should not be commenced until this stage has passed, and a slight continuation of the inhalation will soon remove it.

"Dr. Simpson has observed that to produce the full and perfect effects of etherization, certain conditions are necessary. First, the patient ought to be left in a state of absolute quiet and freedom from mental excitement, both during the induction of etherization and during his recovery from it. All talking and questioning should be strictly prohibited. Secondly, the primary stage of exhilaration should be entirely avoided, or at least reduced to the slightest pos-

* Etherization, by John C. Warren, M. D., Boston.

sible limit, by impregnating the respired air as fully with the ether vapor as the patient can bear, and by allowing it to pass into the lungs both by the mouth and nostrils, so as to superinduce rapidly its anæsthetic effect."*

A concordance in the correctness of these views is also another reason why I prefer the use of the cone to the simple sponge, as the current of a very volatile agent is thus more readily circumscribed, whilst the proper amount of atmospheric air is not excluded. As the detailed effects of anæsthetics, and especially its physiological relations, would, however, take more space than can be here accorded them, the reader is referred for further information to the treatises above cited, as well as to several others now generally circulated. To Dr. John C. Warren, to whose judgment in its first trial the world is indebted for the recommendation of it in surgery, I would especially refer for the details of its administration; whilst the treatise of Dr. Simpson will be found to present extended statistics and a special description of its application to obstetrics as well as surgery.

The local arrangements requisite for the performance of the operation should next claim attention—such as the preparation of the parts to be operated on, and the means that may be likely to facilitate its performance. These measures may be summed up in two rules: 1st. To remove everything that can impede the operative proceedings. 2d. To employ such means as will especially facilitate them.

In observing the first rule, the operator must necessarily be directed by the peculiar circumstances of the operation: thus, a contracted pupil will interfere with the operation for cataract; a distended rectum increase the dangers of lithotomy; whilst the presence of hair about the part may render the dressing difficult, cause irritation from discharges, or possibly lead to erysipelas. Under the second head, or the direct efforts proper to facilitate the accomplishment of the operation, may be placed the removal of all unnecessary clothing, and especially of any that is tight at the neck—as close-fitting jackets or shirts; the cleansing of the part from plasters and poultices; and the employment of such means as will tend to secure the safety of adjoining organs, or render those operated on more prominent—as the injection of the bladder in lithotomy and lithotripsy, or the retention of urine in similar cases. Attention to

* Simpson on Anæsthesia, p. 27.

such a position of the part as will tend to drain it of blood, will also occasionally be required—as in large pendulous tumors or diseases of the extremities, where elevation of them often prevents much unnecessary depletion.

§ 2.—*Duties during the Operation.*

The duties of a surgeon during an operation embrace two distinct portions: first, those which are requisite for himself, and which, as he acts solely for the benefit of the patient, may be justly placed in the front rank; and, second, those requisite for the comfort and safety of the individual operated on.

Among the first of the surgeon's duties to himself, during an operation, is certainly a perfect degree of preparation for that which he is to execute.

In addition to his professional acquirements, as a knowledge of structure, or of mechanical skill as an operator, he should also in capital operations, or those of great delicacy, give some attention to the state of his own system. Without a sound condition of his own body, no surgeon can be fully prepared to operate upon that of another. Let him, therefore, at least for some hours previous to an operation, abstain from every act, article of food or drink, that can in any way tend to derange his nervous system. Let him secure a proper amount of sleep on the previous night, and, if he desires to have the most perfect control of his fingers, let him also abstain from anything like violent muscular effort immediately before his appointment. The mere exertion of lifting the patient, or of driving a hard-mouthed horse, will in some persons be quite sufficient to impair the entire command of their muscles, though others of a coarser mould may possibly find such attention to personal details perfectly unnecessary.

It may also, perhaps, be thought useless to refer to the propriety of abstinence by medical men from nervous stimulants, on all occasions; but, as steadiness of hand is peculiarly important to a surgeon, attention to such a point is especially necessary, previous to an important operation.

While operating, the surgeon should endeavor to have his eyes and ears, as well as his hands and brain, fully ready for every event; and so intent will a good operator be upon that which he

has to perform, that it often happens that he is perfectly unaware of the patient's cries, or of the affairs which are passing around him, until he has accomplished his object. In the event of any unexpected change either in the tissues through which he is cutting, or variation in the character of the complaint which he intended to treat, every operator should endeavor to remain perfectly self-possessed. If a large vessel suddenly springs, let him remember that it is only necessary to compress it with his finger until it can be tied with a ligature. If a tumor has deeper attachments than was anticipated, he has only to free it from these parts, instead of those for which he commenced his operation; if it proves to be of a different character from what it was supposed to be, let him think that he can accomplish this as readily as that which was at first proposed. If his hydrocele prove to be a sarcocele, let him, if necessary, at once proceed to the extirpation of the testis; but under no circumstances let him for a moment suppose that anything has occurred which his skill and coolness cannot remedy. If the patient faints, he knows that it is a simple matter, and that lowering the head and stimulants will soon revive him. If convulsions supervene, as in trephining, is it not an additional reason for the more prompt application of his remedial measures? If, unfortunately, air enters into a large vein, will not the prompt pressure of the thumb arrest its progress to the heart, and subsequent manipulation expel it from the vessel, or prevent serious injury?* In fact, let what will occur, the surgeon who undertakes an operation is totally unfit for his duty if he cannot, by these or similar views of serious difficulties, preserve sufficient equanimity to meet them. Although he may not be able to acquire the entire philosophy of the Stoics, some cultivation of it is certainly desirable, and such stoicism is not rashness, nor yet total indifference, but only that state of mind which the French have justly termed "sang froid," a phrase which presents us with a most apt expression of the consummate coolness that always characterizes a good operator. How to gain it, cannot be told. In some men it is intuitive; but it may also be most certainly acquired by practice; and nothing within my experience is more conducive to it than the fact of an operator duly weighing before-

* See case reported by Dr. R. D. Mussey of Cincinnati, in which the effects of the entrance of air into the subclavian vein was relieved by the application of stimulants to the nostril, &c.—*Am. Journ. Med. Science*, vol. xxi. p. 392, Phila. 1837.

hand every accident that can possibly, not probably, happen. When prepared for danger, it loses more than half its paralyzing power; and when a young surgeon is so situated as to be able to avail himself of the lessons furnished by observation of the habits and course of action of his seniors, let him embrace them as hours full of value, and of an importance which naught but subsequent experience will enable him justly to estimate.

Another portion of the surgeon's duties, during the operation, will be found in the various positions and manœuvres he will be required to execute, all of which should be duly settled before he commences. But as these points vary much under different circumstances, the details can be best given under their proper head. The credit attached to certain operators, in reference to the rapidity of their operations, presents another point to which, at this period, attention may well be directed. "If it were done when 'tis done, then 'twere well it were done quickly," is the rule apparently of some who enter the surgical arena, and who think only of that portion of the sentence in which reference is made to time. But though this may suit the spirits of those who, in true Shakspearian style, look upon an operation as a dramatic exhibition, it is certainly not adapted to those of others who, with a more reasonable view of responsibility, regard the interests of the patient as paramount to everything else. Safely at all events, quickly if you can, is the constant motto of a considerate operator; and the slow and sure will very often prove the quickest in the end.

During the operation, the surgeon's duties to the patient are very much limited to those just enumerated in connection with himself. The Assistants must necessarily do much towards relieving the wants of the patient; they should give him drink, and revive or restrain his irritability according to circumstances; but the operator should leave such duties to them, and confine himself strictly to his own acts, or simply encourage his patient by voice and manner as he proceeds.

The duties of assistants will be detailed hereafter.

§ 3.—*Duties after the Operation.*

Notwithstanding the possession of all the qualifications and skill which have been detailed as essential to an operator, the best operations will be likely to fail, unless the surgeon is also equal to the

performance of the duties which ensue upon its completion. The proper application of the dressings; the judicious employment of remedies to counteract the violence necessarily caused by the operation; the arrangement of the bed, the position of the patient, and of the part operated on; the resort to stimulants, the encouragement of sanguine anticipations; the calm of sleep, together with diet, &c., are but a few of the points to which his attention must now be given. To the well educated surgeon, reference to such details may seem to be a work of supererogation. But to the less accomplished or experienced operator, or to practitioners whom circumstances compel to act the part of a surgeon, the recapitulation may not be without its value. As a general rule, most of these duties may be summed up under one direction, to wit: the observance of such a course of treatment as any good physician would naturally direct, even if not possessed of surgical experience. A few of them, however, embracing matters essentially surgical, seem to demand a closer examination, especially the resort to stimulants, diet and exercise.

In respect to stimulants and diet, as all rules must be dependent on the object to be attained by the operation, it becomes difficult or impossible to establish any one law which will be applicable to all cases; and yet a mistake in relation to this most important part of the after-treatment may cause the failure of all previous arrangements. It may, however, be said that, generally, an operator will not err in this part of his duty, if he bears in mind the great principles of all sound practice, viz., Inflammation. Is the wound to heal by the first intention, or by granulation? Is the object of the operation to be attained by exciting inflammation, or will its development destroy the result? Is the action to proceed simply to effusion of lymph, or to suppuration? Is the exercise of the part operated on essential to its cure, as in strabismus, or is its perfect rest necessary to success, as in false joint? These and similar interrogatories will soon settle the doubts of any well-trained medical mind in these details.

As respects the proper diet of a patient after an operation, much will of course depend upon the replies made to the above questions; but in many operations, such as amputations, removal of tumors, and re-sections, where moderate vascular excitement is not likely to result in hemorrhage, a surgeon may err by placing a patient upon a restricted diet, either before or after an operation. In some instances, the change from ordinary food to a strict diet is alone

sufficient to disorder the digestive organs, affect the circulation, and derange the nervous system, even where no other cause is liable to act on the patient's general health. How likely, then, is it to do harm, when, in addition to change of diet, the shock of the operation is conjoined with the other perturbating causes. In most instances, and especially where common prudence does not demand it, the operator should therefore make no other change in the previous diet of the patient than simply to restrict the quantity. Indeed, in many instances even this will do harm, especially if it is combined with purging. An increase both in the quality and quantity of the nutriment often proves not only useful, but absolutely necessary, especially if strict attention is at the same time paid to the regular daily alvine and urinary evacuations. In many instances I have known patients to become feverish, irritable, and with a furred tongue whilst on a diet or purged, who were promptly relieved by quinine, porter, and beefsteak; but much judgment is requisite in this part of the surgeon's duty. A full diet will not answer as a universal rule; but, with attention to the state of the system before the operation, to the wasting effects of the disease or of the wound, and especially to the purely local disorder caused by a certain class of operations, good diet will prove most useful, and the continuance of nutritious food after an operation be more serviceable than the routine practice of depletion before, and low diet for three or five days subsequently.

A routine practice in any complaint is always bad, and in this respect American surgeons have perhaps followed too closely the precepts of their European brethren, forgetful of the different habits of our people, and of the daily developments of science. Meat, and that often in large quantities, is the daily food of all the laboring classes, as well as of many others, in the United States, whilst thin soup, salad, and wine is the diet of most of the same class on the continent. Low diet is, therefore, not so great a change to them as it would be to patients in this country, and the American surgeon may in many instances advantageously pursue a practice more in accordance with his own locality. In recommending a fair or even full diet, that is, a moderate allowance of meat and ordinary food after operations, I do not wish to do more than suggest its value; circumstances must restrict its application, and in some instances do this very rigidly, as after trephining, in cataract and in hernia. But in operating for the removal of tumors in the breast or

extremities, or in the case of patients who whilst in full health are suddenly injured, and especially in operations consequent on chronic diseases, a moderate amount of ordinary animal food for the first three days, and then a tolerably full diet, will often prove most conducive to a successful result, particularly when employed with judgment.

SECTION II.

PREPARATION OF INSTRUMENTS.

ALTHOUGH a good operator can doubtless accomplish his object with any instrument that he can obtain, yet few would, therefore, desire to neglect, or be justified in neglecting, the attentions referred to under this head. A common instrument with a skillful workman will do more than the best one that can be placed under the direction of an ignoramus; but even a skillful workman will obtain a more perfect result by collecting and preserving such as are requisite for his daily wants.

In this division of his general duties, the surgeon's attention should, therefore, be bestowed on the selection, preparation, manipulation, and preservation of his "mechanical therapeia."

§ 1.—*Action and Selection of Instruments.*

In selecting his instruments, every operator must be mainly guided by the wants of his own position. As a general rule, his attention should be first bestowed upon the character of the steel, its temper, finish, and shape. Very many of those who begin life in expectation of devoting themselves to surgery, commit the mistake of purchasing a cheap article instead of a good one, and soon have reason to repent of their bargains. Poor steel cannot be made to keep an edge, and constant sharpening, independently of the difficulty arising from want of skill, soon renders it useless. Good steel is a more costly article at first, but the cheapest in the end, and, like a true friend, never fails in the hour of need. Attention to this fact is the more necessary in the United States from the great number of surgical instruments now hawked over the country, and

which, like Peter Pindar's razors, are only made to sell. Every operator should, therefore, exercise some caution in the selection of his cutler, and even with the best makers, he will find some exercise of judgment necessary in obtaining his instruments. Fashion often perverts the utility of a knife as well as of other articles, and a knowledge of the action requisite in the instrument will, therefore, materially aid in its choice. To assist the decision of this matter, special care has been bestowed on the delineation of those hereafter represented, so that any one, by consulting the plates, can see a specimen of such as are at least capable of performing their duty;* but in selecting all instruments, the observation of the quality of the steel, and not the brilliant appearance of the work, will tend to prevent most errors of this kind.

§ 2.—*Preparation and Sharpening of Instruments.*

Where an operator is so situated as to be able to avail himself of the services of a cutler, this portion of his duty may be advantageously placed in other hands; but, under different circumstances, or where he desires to save expense, he will soon find it an easy matter to accomplish perfectly the sharpening of the greater portion of his own instruments, and especially those which are in most constant use.

Preparatory to attempting the sharpening of any instrument, it is necessary that the principle of its action should be thoroughly understood and that a good stone be obtained, as well as a strop or piece of soft leather.

The action of every knife is beyond doubt the same as that of a saw. No matter how fine the edge of a knife may be, a magnifying glass will show points corresponding with the teeth of a saw; and a saw, to cut well, must be set so as to act chiefly in the reverse direction to that in which it is drawn, seldom cutting both up and down with equal facility. The teeth in the scalpel being intended to cut by being drawn over the tissue in a manner similar to the upward motion

* To add to the value of these drawings, they have generally been made in accordance with the patterns of Mr. Chas. Schively, cutler, of South Eighth Street, Phila., a gentleman long identified with the operative surgery of the country, and to whom many of our most distinguished surgeons are indebted for the means by which they have accomplished their most important operations.

of the saw, their edge should be set forwards in sharpening, or from the heel to the point. In the application of the blade to the stone, such motion must, therefore, be given to it as will draw its cutting surface in this direction, the blade being kept at an angle of from 5° to 15° with the surface of the stone, so as to create the proper edge, and yet preserve the polish of the instrument. Every knife being also more or less wedge-shaped, that is, thick upon its back and tapering to its edge, the sharpness of the wedge will constitute the keenness of the blade. The flatter, therefore, the blade is placed, provided it is not below 5° with the surface of the stone, the more delicate will be the angle produced in the friction of sharpening, whilst the more elevated the back, the greater the pressure on the edge; so that, after this elevation passes an angle of 20°, it will be apt to result in a blunt, rounded or dull surface. When, then, with a good stone (and in the United States there is nothing superior to those of Arkansas or Missouri), the operator wishes to give his scalpel a keen edge, let him proceed as follows:—

Place the blade very nearly flat upon the surface of a stone, which has a smooth and well ground face, after it is lubricated with oil, and, holding the handle with the hand in a state of semi-pronation, push the blade, with its edge forwards, across the stone (Plate I, Fig. 12); then turning the hand into semi-supination, draw it from heel to point with its edge towards the operator, over to the point of departure, bearing on lightly or heavily, according to the amount of grinding to be accomplished (Plate I, Fig. 13). As a general rule, the harder and closer the grain of the stone, the flatter the blade is applied to it, provided it is not below 5°; and the lighter the pressure, the keener and smoother will be the edge. After repeating these movements until an edge is obtained, as may be tested by shaving the thick skin on the palm of the hand, draw the blade upon the strop or leather in the same manner as razors are sharpened for daily use, and in the reverse manner to that employed on the stone —that is, with the back of the blade presenting to the most distant end of the strop.

In sharpening pointed instruments, such as cataract needles, trocars, and gorgets, the same principles hold good, although some extra attention to the shape and character of their cutting surface will be required in order properly to adapt them to the stone. As a trocar acts very much on the principle of the chisel, the mode in which that instrument is sharpened by the carpenter will answer, provided the

PLATE I.

A SIDE VIEW OF SOME OF THE INSTRUMENTS EMPLOYED IN MAKING INCISIONS AND DISSECTIONS, IN THE EXTIRPATION OF TUMORS AND THE LIGATURE OF ARTERIES.

These drawings are from the instruments, and about one-third of the natural size.

Fig. 1. Tumor Forceps. Schively's Pattern.
Fig. 2. Artery Forceps, the blades closed by a spring. " "
Fig. 3. Liston's Forceps or "bull-dog." " "
Fig. 4. Ordinary Dissecting Forceps. " "
Fig. 5. Savigny's Tenaculum for carrying a ligature around deep-seated arteries. " "
Fig. 6. Ordinary Tenaculum for taking up arteries after operations. The curve of this instrument is often incorrectly made, and the present one has therefore been carefully selected.
Fig. 7. A Silver Director. Charriere's Pattern.
The advantage of silver over steel will occasionally be found in its being flexible, and thus adapting itself more readily to tortuous sinuses.
Fig. 8. Operating Scalpel, medium size. Schively's Pattern.
Fig. 9. Operating Scalpel, small size. " "
Fig. 10. Sharp-pointed Straight Bistoury. " "
Fig. 11. Sharp-pointed Curved Bistoury. " "
Fig. 12. Position of the scalpel in the first motion of Sharpening.
Fig. 13. Position of the scalpel in the second motion of Sharpening.

MINOR CASE OF INSTRUMENTS.

A complete and compact case of the instruments required for most operations, exclusive of lithotomy, trephining, cataract, or amputation, may be formed by combining the following: 1 Probe-pointed Curved Bistoury; 1 Sharp-pointed ditto; 2 Scalpels curved on the flat, one of which should have a double edge; 4 Operating Scalpels (1 large, 1 medium, and 2 smaller); 1 Tenaculum; 1 Savigny's Tenaculum; 1 Pair of Dissecting Forceps; 1 Eyed Probe;—all in a movable tray.

1 Physick's Forceps and Needle; 1 Polypus or Shot Forceps; 1 Tumor Forceps; 1 Pair of small Bone Nippers; 2 Curved Spatulæ; 2 coils of Silver Annealed Wire; 3 Straight and 3 Curved Needles of different sizes; 1 dozen wire Hare-Lip Pins;—in the bottom of the case.

1 Pair Straight sharp-pointed Scissors; 1 Director; 1 large Double Canula of Levret, for Polypus; 1 small Canula for Hemorrhoids;—in the top of the box.

These instruments will be sufficient for the operations of Hernia, Polypus, Fistula in Ano, Hemorrhoids, Hare-Lip, Ligature of Arteries, and the Extirpation of Tumors.

Plate 1.


Fig 1.
Fig 2.
Fig 3.
Fig 4.
Fig 5.
Fig 6.
Fig 7.
Fig 8.
Fig 9.
Fig 10.
Fig 11.
Fig 12.
Fig 13.

point is kept flat to the stone—and the same manœuvres will be applicable to cataract needles and gorgets when the edges have become very round: but under other circumstances it will be better to manipulate with them in the manner described in sharpening the scalpel.

When an instrument has acquired a rounded and blunt edge, grinding will generally be found necessary, and, in most instances, this should be confided to the cutler, though the surgeon may approximate the same end, by steadily rubbing the blade upon a coarse stone, and then proceeding to finish its edge by using one that is finer, or even a strop.

§ 3.—*Manipulation of Instruments.*

Few of the qualities of an operator are more quickly noticed by a spectator than the facility or even grace with which his movements are executed. But although this ease in manipulating is highly advantageous to the patient and a valuable accomplishment to an operator, directions in regard to it would be out of place at present, and can be more readily comprehended in connection with each operation.

The principles which should govern the movement of cutting instruments in all operations, may, however, be briefly noticed.

Scalpels, bistouries, and amputating knives, acting simply as saws, will be found to cut with the greatest facility when drawn regularly, and with moderate but steady pressure, over the part to be divided.

When, therefore, in using a scalpel, it is desirable to make a clean and smooth cut, the motion given to the instrument should be one of simple traction, effected by flexing and extending the thumb and fingers in very much the same manner that a pen is moved in writing, any great amount of motion in the wrist being unnecessary. Indeed, as a general rule, the wrist joint should never participate in the motion of a scalpel, except when it is requisite to change the course of an incision, or make it of extraordinary length, and even under these circumstances a neat manipulator will seldom feel the necessity of moving it. If the wrist is permitted to take part in the movement of dissecting, chopping or hacking of the tissue will usually result, or such a division of parts as might be effected by an axe, but not by a saw.

Scissors, being formed of two blades, are designed to act like two scalpels pressed together; consequently, in dividing very dense structures, a slight drawing motion enables them to cut better and with less contusion of tissue, than the exercise of any great amount of force in closing the blades.

Instruments specially required for punctures are fortunately few in number. Like the chisel, they necessarily compress or contuse the parts at their point of entrance, and should, consequently, always possess a keen edge and be introduced gradually. The stabbing motion sometimes given to trocars or gorgets is usually indicative of ignorance of these principles on the part of the operator, and nearly always induces more or less sloughing at the point punctured. A sudden elevation of the operating hand from the surface on which it should be supported is also an error occasionally apparent in operators when using the scalpel, and especially of such as study the art of manipulating with a view to the gracefulness of the movement, rather than as an auxiliary to the perfect action of the instrument. Like a similar motion on the part of pianists, it may be deemed captivating, but as it necessarily draws the knife from the portion on which it is acting, it is worse than useless, and should be avoided. A neat operator may be characterized as a good dissector, who accomplishes his task with certainty and moderate quickness, and the motions of a good dissector are certainly not of the jumping order, but, on the contrary, result from the regular movements of his fingers in flexion and extension. All manipulation of cutting instruments, to be well executed, should therefore be entirely accomplished by these motions of the fingers, or by those of a hand which moves as if balanced at the wrist. The motion of the elbow can never be required in using a scalpel, and seldom with any other instrument, except the saw or amputating knife. Great flexibility of the fingers, and the power of causing three or four of those of the same hand to perform different acts at the same moment, will also add much to the neatness of a surgeon's manipulation. Thus, the thumb, and first and second fingers, may hold the scalpel in dissection; the little finger serve as a point of support; and the third finger be made to stretch a tissue, hold back a flap, or serve as a fulcrum at the same moment—the difference of power possessed by some operators over others being often shown in the facility with which they accomplish these movements. A thick, clumsy, and heavy hand can never make a neat operator, though study of its motions, together with constant

practice, may do much to remedy it. The ability to use the left hand nearly as well as the right is also occasionally not only an accomplishment, but also a most useful qualification in an operator, and a little practice in the daily acts of life, as in carving or dressing, will soon enable any one to acquire it.

In order to facilitate his manipulations, the operator will also find it advantageous to arrange his instruments upon a waiter or tray in the order in which they will be required for service, previous to commencing an operation.

In doing this, he should pass in review the different steps of his operation, so as to note immediately the absence of any one that may be required. By placing a napkin upon the tray, so as to prevent the blades touching any hard substance, he will also do much towards the preservation of their edges, and be prepared to act with them in the most advantageous manner. In hospital service, a board is usually kept prepared for this purpose, and will always be found to answer very well. Upon this the operator should spread a napkin, and then, if about to perform a circular amputation, place upon it his tourniquet and bandage, with a pin and scissors; then the amputating knife; then a scalpel to dissect back the skin; then a small catlin for the interosseous space, if the limb has two bones; next, a retractor to protect the soft parts when sawing the bones; then the saw; next, the bone nippers, and then the tenaculum and ligatures. It is also a good rule to have at least two of all such instruments as are liable to be injured or rendered unfit for service during the operation.

Some surgeons, especially in public institutions, very properly confide the arrangement of their instruments to an assistant; but, when this is done, they should carefully overlook the tray before commencing the operation. Another tray, containing the anæsthetic, the bandages and other portions of the dressings, as sponges, basins, and stimulants, should also be close at hand; and if the room admits of it, one tray may be placed so near the operator that he can help himself to his instruments: but, if this is not desired, a special assistant may hand them to, and receive them from him according to directions which should always be given previously, and no other person should be allowed to touch either board, after the commencement of the operation, lest confusion be created by several persons attempting to reach them at the same moment.

PLATE II.

DRAWINGS OF INSTRUMENTS FOR ARRESTING HEMORRHAGE, EXTRACTING POLYPI, ETC.

Drawn from the instruments, and about one-third the natural size.

Fig. 1. A silver plated or tin Cone for Inhalations.

Fig. 2. A Compressor for deep-seated arteries, or Signoroni's Tourniquet.

Fig. 3. Physick's Artery Forceps and Needle, invented in 1800. Schively's Pattern.

Fig. 4. Straight Needles of different sizes. " "

Fig. 5. Curved " " " " "

Fig. 6. Small Bone Nippers, for excising the ends of the steel hare-lip pins. " "

Fig. 7. A silver Hare-lip Pin with the movable steel point. " "

Figs. 8, 9. Steel Hare-lip Pins, made of wire sharpened at the point. " "

Fig. 10. A side view of a Curved Spatula, made of copper and plated. The two curves are intended for wounds of different depths. This is a most useful instrument for holding back the sides of a wound when operating for the ligature of arteries, or removing deep-seated tumors. Schively's Pattern.

Fig. 11. Levret's Double Canula, with the wire ligature employed by Dr. Physick for the removal of nasal polypi. A smaller canula, which should be only two inches long, was employed by the same surgeon for the strangulation of hemorrhoids. Schively's Pattern.

Fig. 12. Polypus and Shot Forceps. " "

Figs. 13, 14. Cauteries of different shapes, intended for operations on the bones of the face. These cauteries should only be heated to a red heat, and applied very lightly to the bleeding surface, so as to produce shrinking of the vessels, but not a deep eschar.

Plate 2

Fig 1.

Fig 2

Fig 3

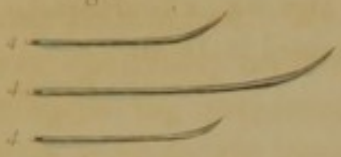


Fig 4

Fig 5

Fig 6

Fig 13

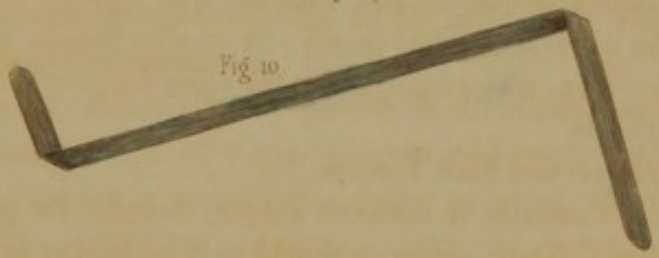


Fig 10

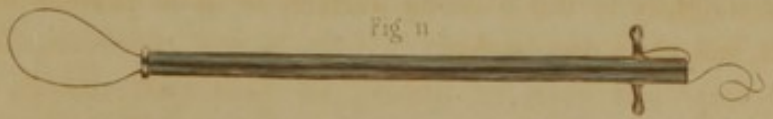


Fig 11

Fig 12

Fig 14

§ 4.—*Preservation of Instruments.*

A few words in relation to this apparently simple portion of an operator's general duties may, perhaps, save the younger surgeon some vexation. No matter how finely polished instruments may be, as received from the cutler, unless an operator is attentive to this minor point, he will soon find them out of order. Thorough cleansing after operating is, of course, essential to their preservation, and every surgeon should, therefore, either wipe and thoroughly dry his instruments himself before putting them away, or examine them closely, if the duty is performed by another.

In keeping instruments ready for use, attention to the place of deposit is also necessary, as sometimes there is a slight dampness in a closet, which will soon tell even when the cases are closed perfectly, and which will be certain to create rust when instruments are put away without a case. Even in a warm and apparently dry room, I have known my eye instruments to be so affected by moisture as to become rusty. A practice which is pursued to some extent in the preservation of instruments, is also one which frequently destroys or impairs their utility, viz., oiling or greasing them when replaced in the case. This custom, as well as that of anointing the blades with mercurial ointment, may serve a good purpose on board ship or near the sea shore if very lightly done; but, under ordinary circumstances, the development of acid in the chemical change of the article, especially when it becomes rancid, will soon do quite as much towards rusting a blade as a damp atmosphere. The most certain preservative in my experience has been, first, to render each instrument perfectly dry; second, to keep it well wrapped in soft paper or cotton; and third, to place it in a close box, and wrap this thoroughly in hardware or thick brown paper. These precautions, however, can only be required by such instruments as are not in constant use.

SECTION III.

THE OPERATOR'S DUTIES TO HIS ASSISTANTS.

In every important operation, the value to the patient of the services rendered by good assistants may be regarded as nearly

equal to those of the operator, the responsibility of the surgeon being much increased, and his labor greatly augmented, when compelled to act by himself. In addition to their ordinary duties, the necessity for one of them taking the principal part occasionally occurs, as in the event of cramp or embarrassment in the operator; and under such circumstances a good assistant is essential to the welfare of the patient.

Every operator should, therefore, thoroughly reflect upon the character and qualifications of those whom he selects to assist him, as well as upon the duty they may have to perform, choosing them not only with reference to the physical, but also to the moral, support that they can furnish him. A doubt may arise as to the character of the tissue operated on, or as to the propriety of continuing the operation, and in all such cases the decision of the question may depend on the skill and judgment of the assistants, if they happen to be medical men.

§ 1.—*Selection and Instruction of Assistants.*

In selecting assistants, every surgeon will of course be guided by his peculiar position; but if he can obtain the services of his professional brethren, and especially of those with whom he is on intimate terms, he will doubtless select them. Where, on the contrary, this is not the case, and he is compelled to resort to strangers, and especially if, in addition, they are to be selected from the friends of the patient, he should be especially cautious in his choice. Many who are very brave before an operation, find their sang-froid fail them after a little blood is lost. Others are sickened by smells or by the flow of blood, and rendered worse than useless, by requiring for themselves the attentions that are due to the patient. Others, again, even among medical men, are so little conversant with the details of operative surgery as to require instruction, or, when this is not necessary, are so clumsy in the use of their fingers as to put them constantly in the wrong place. Very few physicians are able to tie a ligature quickly, simple as it appears to be; and an operator should, under such circumstances, anticipate extraordinary difficulties, and prepare himself to meet them. As, however, it is impossible to give more than general directions on this subject, the surgeon must regulate his action according to the wants of the moment.

One rule may certainly be laid down as applicable to all cases, even where the surgeon is fortunate enough to be aided by the presence of those on whom he can rely, and that is, always to explain to those who are to participate in the operation the method to be pursued, and the special duty that will be assigned to each, before commencing to operate. Few operations in surgery are so limited in their character as to be amenable to any universal law, and the peculiar views of each operator should therefore be distinctly expressed, even to his colleagues, before the operation is commenced. After informing each assistant of his duty, the surgeon should subsequently endeavor so to arrange his own movements as not to encroach upon the parts previously assigned to others. Occasionally, good surgeons err in this manner, and delay their operations by endeavoring to do everything themselves, instead of relying upon their assistants for the performance of the duty previously assigned them. When good assistants are to be obtained, let them by all means be trusted, and the patient will be sure to benefit by the division of labor.

The instructions and special duties required of assistants will be referred to in connection with each operation.

CHAPTER II.

ELEMENTARY OPERATIONS.

Under this head are embraced such general manipulations as constitute the primary portion of every operation, and especially of those necessitating a division of the integuments, such, for example, as Incisions and Dissections, arrest of Hemorrhage, together with the closing of the part and its Dressing. Although every surgeon, in passing through his anatomical studies, necessarily acquires a certain degree of skill in making incisions and dissections, yet a recapitulation of the ordinary rules required for their proper performance may correct such faults, either of carelessness or ignorance, as have been unwittingly acquired. The details of each act, and the varying positions of the knife usually described by French writers, have, however, little of sufficient value to justify their repetition, except that the employment of a numerical system in the position

of the scalpel is advantageous by saving repetition in the description of the same act in different operations.

SECTION I.*

INCISIONS WITH THE SCALPEL OR BISTOURY.

The Scalpel usually employed in operating resembles, in most points, that generally found in the dissecting case. Its function is, indeed, the same in both instances, though there is a difference of opinion as to the best shape of its blade, some surgeons preferring one that is somewhat angular towards the point, and others liking it better when made with a greater degree of convexity. In either case, the blade should be firmly fastened to the handle, and the latter made plain and tolerably smooth, not only because this is more favorable to accuracy of touch, but also because it can be more readily cleansed. On the latter account, the serrated handles sometimes placed on scalpels are objectionable.

The most common positions of the scalpel, in operating, are the six following, as employed by the French surgeons:—

First Position.—Hold the scalpel in the position of a carving knife, that is, with the handle in the palm of the hand and the forefinger pressed upon the back of the blade, and make the incision by bearing firmly on the blade with the forefinger (Plate III, Fig. 1). This position gives the operator an opportunity of exerting considerable force, and is well adapted to the first incisions in dense tissues, as in excising a scirrhous breast, or in the removal of an osseous or fibrous tumor, or in the division of ligaments or tendons and muscles, as in disarticulating joints.

Second Position.—Hold the scalpel with its edge upwards, and, puncturing a fold of the skin, incise it from within outwards, by elevating the point with the thumb and finger, pressing the handle against the palm with the other fingers (Plate III, Fig. 2). Previous to employing the scalpel or bistoury in this position, an assistant should be directed to raise a fold of the skin so as to free it from the subjacent parts. When the integuments are thus divided, there is but little risk of injuring deep seated parts, and also less pain caused to the patient than when the incision is made from without inwards, as in ordinary dissection.

THIRD POSITION.—Hold and move the scalpel very much like a pen, the point and edge being pressed downwards with sufficient firmness to enable them to divide the parts to the desired extent. In commencing an incision, the point of the blade should be inserted into the tissue by a perpendicular pressure of the fingers in an extended position, and then drawn firmly towards the operator by strongly flexing the fore and second fingers (Plate III, Fig. 3), the incision being terminated by a perpendicular pressure of the blade at the point where it is wished to stop, in order to prevent the irregular scratch of the skin, or that mark which the French call "a tail."

FOURTH POSITION.—Hold the knife nearly in the same position as a pen, but with its cutting edge upwards, so as to cut from the operator (Plate III, Fig. 4). Both this and the third positions are constantly required in every operation in which dissection is necessary, as in the removal of tumors, ligature of arteries, &c.

FIFTH POSITION.—Hold the scalpel by placing the thumb on one side of the handle while the four fingers are approximated on the other, like the position of a fiddle-bow (Plate III, Fig. 5). This position is well calculated for incisions requiring delicate touches of the knife, as in the division of tissues over large vessels and other important parts.

SIXTH POSITION.—Hold the scalpel or bistoury with its edge to the palm of the hand, so as to cut towards the operator, the tissue, if near important parts, being raised upon a director (Plate III, Fig. 6).

The multiplication of these positions of the scalpel may be carried to any extent, but those most frequently required will be found to be such as have just been detailed.

In every case where dissection is requisite, it is important that the parts to be divided should be kept upon the stretch, either by holding them with the forceps, or, where the portion is of sufficient size, by seizing them with the thumb and fingers of the hand opposite to that which holds the scalpel.

Wherever, in incising the skin, it is desirable to make a regular and smooth cut, the integuments in the neighborhood should be kept quite smooth or prevented from yielding before the pressure of the scalpel, either by the operator placing his thumb on one side of the line of incision, and his fingers on the other, or by employing the hands of assistants. In limited incisions, the left hand of the operator is sufficient; but in those of greater extent, as in the removal of a breast or large tumor, those of assistants will be

PLATE III.

THE SIX POSITIONS OF THE SCALPEL EMPLOYED IN INCISIONS AND DISSECTIONS.

Modified and drawn from Bernard and Huette.

Fig. 1. First Position. The Scalpel held as a carving knife, and cutting from without inwards. In this position, the thumb and radial side of the second finger should be placed at the rivets in the handle; the ring and little finger shut the back of the handle into the palm of the hand, and the forefinger rest upon the back of the blade. The farther this finger is extended upon the blade, the greater will be the amount of force that can be displayed by the operator.

Fig. 2. Second Position. The reverse of the preceding. In this position, the thumb and forefinger should be placed at the sides of the handle near its junction with the blade, and the middle, ring, and little finger press the belly of the handle against the palm. The blade being thus turned upwards, the surgeon can readily divide the most resisting tissues from within outwards, a fold of the skin having been raised in the fingers of an assistant previous to its puncture.

Fig. 3. Third Position. The Scalpel held as a pen, being the ordinary position of the instrument in dissecting. The tissues to be divided are represented as being stretched by the forceps. Although this position is designated as that of the pen in writing, the scalpel should not be held by its blade, but by its handle, or rather at the line of junction of the two; and the motion of flexion in the fingers is the only one that causes the knife to cut in this position.

Fig. 4. Fourth Position. The Scalpel held as a pen, but cutting from the operator. This position is therefore the reverse of the preceding.

Fig. 5. Fifth Position. The Scalpel held as a fiddle-bow; the pulps of the four fingers being extended in a line along one side of the handle, and the thumb placed on the opposite side so as to correspond with the position of the point of the second finger. This position is a very easy one, and admirably adapted to the execution of light incisions, as in dividing the tissues over important parts.

Fig. 6. Sixth Position. The Scalpel or Straight Bistoury, as employed upon a Director. In this position, the left hand generally holds the director, and the incision results from the joint movement of the two hands, or the left hand is kept stationary and the fingers of the right strongly flexed.

Plate 3

Fig. 1.

Fig. 3.

Fig. 2.

Fig. 4.

Fig. 5.

Fig. 6.

necessary. As the first incision generally causes the flow of blood, one of these assistants may, at the same time, sponge the part so as to facilitate the operator's view of the structure.

Incisions may be made of various shapes, thus: a single line constitutes what has been termed a simple incision, and that formed by two or more lines a compound one. These compound incisions may be modified to any extent, but usually they are formed by the arrangement of straight lines, so as to form cuts like the letters V, L, T, or H, or [, or as a +, or of curved lines, as the crescent ⌣ or ellipse ⬭, or double crescent ⌒⌒ (Plate V, Fig. 1). By these, and similar incisions, the skin may be divided into various flaps, which, being subsequently freed from the subjacent parts by dissection, will enable the operator to act according to his pleasure. An important rule in all these incisions is to make them sufficiently long, or even too free at the first cut, as the skin usually heals readily, and a free primary incision facilitates very much the subsequent dissection. Another useful rule in connection with incisions, especially in parts where the cicatrix will afterwards be apparent, as in the face, or on the neck and shoulders of young females, is to make them so that the scar may come in the course of the contractions of the fibres of the neighboring muscles, by which means the cicatrix will be hid in the natural folds of the skin; thus, on the forehead, the incision in the skin should, if possible, be transverse, so as to correspond with the wrinkles created by the occipito-frontalis; on the cheeks in the line of the levator anguli oris or levator labii superioris alæque nasi; and on the neck in front of, or behind, but in the line of the sterno-cleido-mastoid muscle.

Incisions, or the division of parts by the Scissors, require but a few words, as the necessity for employing them is rarely met with. Whenever scissors are to be used for incising parts concerned in operations, they should be held by placing the last joint of the thumb through one ring, and that of the second or third finger through the other, the index or second finger being placed on the side or above the blades. The preference should, however, be given, in most instances, to incisions made by the scalpel, where there is a sufficient basis of support, as the latter will generally make a cleaner cut, being susceptible of a keener edge than scissors, which, in the United States, are often imperfectly made even by the best cutlers. The incisions of bone by the saw or bone nippers may be classed under

those of the scalpel and scissors, but will be again referred to in connection with the operations on the bones.

SECTION II.

DISSECTIONS.

Dissections, as performed by a surgeon, constitute the greater portion of his operative manœuvres; but, as they do not vary from those employed upon the dead subject, the same general rules are applicable both to them and to the ordinary dissections of the anatomical rooms. 1st. Stretch the part to be divided, and render it perfectly tense. 2d. Incise it by a long steady sweep of the scalpel in the third position, with a motion similar to that made in forming large letters with a pen. 3d. Remove the blade of the knife as seldom as possible from the line of incision; so as to avoid scratching, digging, piercing, jerking, or notching the tissue. 4th. Obtain in the case of tumors a good hold upon them, before commencing their dissection. This may be accomplished either by passing a needle and ligature deeply through the part, and then forming a loop and removing the needle; or by seizing them with the forceps known as Liston's Bull Dog (Plate I, Fig. 3), or with the tumor forceps (Plate I, Fig. 1), or with a tenaculum, or with the ordinary dissecting forceps, according to the size and structure of the portion to be excised. The looped ligature, being the firmest, will in most instances prove the best adapted to this purpose. If, in the course of a surgical dissection, the tissues to be divided involve parts of delicacy and importance, it will be better to employ the director and bistoury, as is shown in the sixth position of the scalpel (Plate III, Fig. 6), for their incision, than to trust to the ordinary motion of the knife, unless the operator is very sure of a steady and light hand. The support of the hand to be obtained by resting the ring and little finger upon surrounding parts, in the third position of the scalpel, will, in these dissections, prove of great service.

When, in the course of an operation, small arteries are divided, it becomes a question whether the operator should stop in order to take them up, or whether he should not proceed rapidly to accomplish his object. In deciding this question, much must depend upon circum-

stances; but, as a general rule, if the part is superficial and the arteries of no great size, as is the case in most operations on the breast, the surgeon may finish his dissection before attending to the hemorrhage, or may direct an assistant to compress or twist the vessels as they spring, or put his finger on them, and often before the termination of the dissection, the contraction and retraction caused by the stimulus of the air, or the effect of the latter on the liquor sanguinis, will be sufficient to arrest the hemorrhage. If, in the dissection of complicated or deep-seated parts, the first assistant can not by sponging keep the part free from blood, or if the patient will not be benefited by the depletion, then the operator had better stop and ligate the vessels before proceeding with his dissection.

SECTION III.

PUNCTURES, OR INCISIONS WITH POINTED INSTRUMENTS.

When tissues are divided by the direct pressure of a pointed instrument, it constitutes a puncture. Punctures may be made with a scalpel, but more frequently they are created by the use of the lancet, sharp-pointed bistoury, or trocar. In making punctures with either of these instruments, the depth may, if requisite, be regulated by seizing the blade near the point, between the forefinger and thumb. On introducing either the lancet or bistoury in making a puncture, the blade may simply be withdrawn by a movement which is the reverse of that which introduced it, or the handle depressed towards the surface, and the point made to cut its way out by incising the structures from within outwards. The trocar should be held with the handle supported against the palm of the hand, and then forcibly pressed through the tissue that it is intended to perforate. As every trocar is usually surrounded by a canula or tube for the evacuation of the fluid, attention should be given to the free motion of this tube upon the blade previous to operating, lest, after its introduction, it be found impossible to separate the trocar from the canula.

CHAPTER III.

MEANS OF ARRESTING HEMORRHAGE.

After every application of the knife in operating, the necessary division of vessels gives rise to hemorrhage, which, when of sufficient amount to debilitate the patient, requires that some means should be employed to arrest it. These means may be classified as those which are proper before commencing the operation or before any incision is made, and those demanded subsequent to or during its performance. Among the first and simplest may be placed such a position of the part as will prevent the afflux of blood (as has been already detailed); second compression, and third the employment of ligatures, cauteries, and styptics.

SECTION I.

COMPRESSION.

The prevention of hemorrhage by means of compression is a purely mechanical result, which may be accomplished either by applying the thumb or fingers over the course of the main artery supplying the part, a mode of compression that, with good assistants or with a skillful surgeon, may be pursued with perfect success; or by the use of tourniquets.

In practicing compression with the hand, the thumb should be placed directly upon the vessel, and pressure made against a bone, by placing the thumb over the artery on one side of the limb whilst the fingers grasp the other; or by placing one thumb on the vessel, and pressing upon it with the other, as seen in Plate IV, Fig. 1. Where the artery is so situated as to render the application of the thumb difficult, as in the subclavian or external iliac, pressure may be applied by means of a common door key, well wrapped around its handle with muslin or flannel, and then placed over the artery, the wards of the key being held in the hand. The advantages claimed

for arterial compression as thus practised, is the non-interruption of the general venous circulation of the part, the course of the blood in the artery being alone obstructed.

The next means of arresting the circulation is by the Garrot or Spanish windlass (Plate IV, Fig. 2), a contrivance which, from its simplicity, has much to recommend it. It may be formed at a moment's notice, by twisting a handkerchief into a cord, tying a knot in its middle, applying the latter over the course of the artery, and then tying the free ends loosely together, introducing a stick into the loop of the handkerchief, and twisting it tight. An additional recommendation of this instrument is, that patients may be taught to employ it themselves, a matter of importance in military surgery. The tourniquet of Petit (Plate IV, Fig. 3), or Bellingham's compressor (Plate IV, Fig. 4), also answer very well when applied to the extremities, and will be again referred to under the head of amputations. At present, the Figures explain themselves sufficiently well. A very simple method of compressing only the arteries of a limb, and one easily practised, will be found in the plan proposed by Dr. Physick, in the case of hemorrhage from the foot. A compress was first applied over the anterior tibial artery, and another over the posterior tibial, about two inches above the ankle; over these a strip of sheet copper (or tin) was passed round the leg, and then a tourniquet applied over the copper. By tightening the tourniquet the arteries were compressed, and the bleeding arrested, whilst the rest of the circulation was not interrupted.*

A special tourniquet or Compressor, as it has been named, has lately been brought forward by some one in the Eastern States, and is a useful instrument for the compression of deep arteries. It is figured in Plate II, Fig. 2, but is evidently a repetition of Signoroni's tourniquet, or of that of Dupuytren. It is especially applicable to the axillary and iliac arteries, or where it is desirable to compress only two points of a limb. It consists of two semicircular sections, jointed at one end, and made to move upon each other by means of a racket piece which is acted on by a key. Pads are attached to the opposite ends of each section, and they are thus made to press directly upon the points to which the instrument is applied. Compression for the arrest of hemorrhage either previous to, or during an opera-

* Elements of Surgery, by John Syng Dorsey, M. D., vol. i. p. 61, Phil. 1823.

PLATE IV.

ARREST OF HEMORRHAGE BY THE COMPRESSION AND LIGATURE OF ARTERIES.

Fig. 1. Compression of a main arterial trunk (femoral) by means of the thumbs of an assistant. Drawn from Nature.

Fig. 2. The Garrot or Spanish Windlass, made by twisting a stick in a pocket handkerchief. Drawn from Nature.

Fig. 3. The application of the Tourniquet of Petit. A pad should be placed on the artery, and a bandage carried over it and around the limb in the course of the strap of the tourniquet, so as to prevent the latter from chafing the integuments; the plates of the tourniquet, closely screwed together, should then be placed over the pad, the strap buckled tight, and the plates separated by turning the screw, the lower plate being thus made to press directly upon the pad, and through it upon the artery. The pad under the buckle is intended to preserve the soft parts from being contused by the latter. As it is directly acted on by the strap, it is liable to be drawn from its position, and the compression from its pad cannot therefore be relied on.
Drawn from Nature.

Fig. 4. A Ring Tourniquet, or Bellingham's Compressor.
Drawn from the Instrument.

Fig. 5. Ligature of an Artery on a Stump. 1. The open mouth of the artery. 2. The point of the tenaculum transfixing it. 3, 3. The two knots of the ligature as passed around the tenaculum: they should both be firmly tied previous to its removal from the vessel. After Bernard and Huette.

Fig. 6. The result of the application of a Ligature. 1. One of the anastomosing arteries enlarging in order to transmit the proper amount of blood. 2. The conical formation of the clot in the vessel, rising to the first anastomosing branch. After Bernard and Huette.

Fig. 7. The effects of a ligature upon the coats of the artery. 1. The ligature as applied. 2, 3. The internal and middle coats ruptured by its application. 4, 5. The external coat which sustains the ligature after the other coats are ruptured, as is seen all round the vessel.
After Bernard and Huette.

Fig. 8. The effects of Torsion. 2, 2. The internal and middle coats of the vessel, lacerated by twisting. 3. The external coat uninjured.
After Bernard and Huette.

Fig. 9. A view of the enlarged condition of the anastomosing arteries, and of the contraction in the main trunk after the application of a ligature. The figure represents the cure of a popliteal aneurism. 1, 1, 1. The main artery below the ligature. 2, 2, 2. The anastomosing branches, enlarging.
After Bernard and Huette.

Plate 4

Fig. 1.

Fig. 2.

Fig. 5.

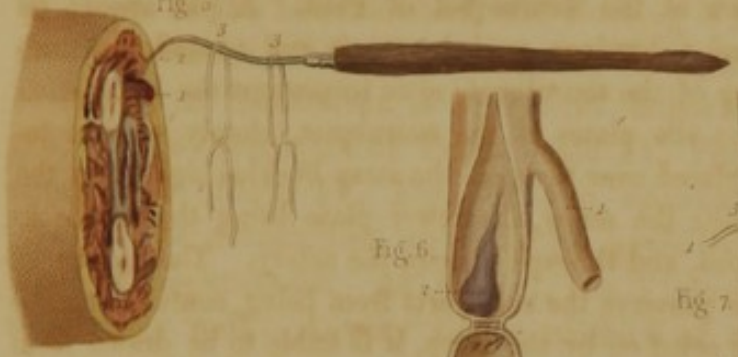


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 3.

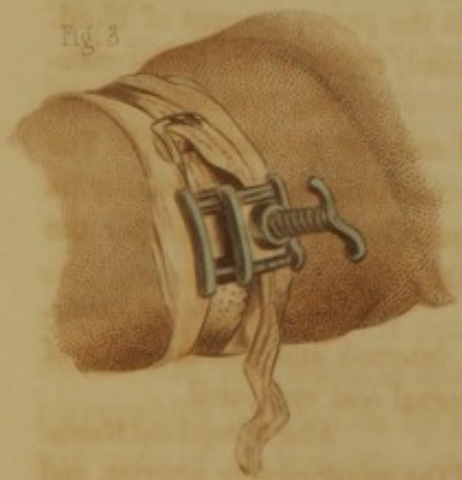


Fig. 4.

tion, should, however, be applied only for a limited time, lest it induce mortification. When more permanent means are necessary, the surgeon should resort to direct applications to the wounded vessels, and employ the ligature or torsion.

SECTION II.

ARREST OF HEMORRHAGE BY LIGATURES.

In no instance, after a severe operation, can a surgeon feel himself secure against the risks of hemorrhage, unless he has taken care to ligate each vessel thoroughly. To accomplish this, it is necessary that he should resort to some means of seizing the bleeding orifice, such as a tenaculum (Plate I, Fig. 6), artery forceps (Plate I, Fig. 2), or curved needle (Plate II, Fig. 5). The tenaculum is intended to hook and draw out the vessel from surrounding parts, and is the instrument most frequently employed in this country. The artery forceps perform the same office, but are not so much valued on this side of the Atlantic, as on the continent of Europe. The curved needle is applied to vessels that shrink in among surrounding parts, or where the bleeding orifice cannot be readily found, or where the portions immediately around the point of hemorrhage must be indiscriminately ligated in order to control the bleeding.

Without entering into the physiological effects of the application of ligatures to arteries, it may suffice to say, that it is necessary, as established by Dr. J. F. D. Jones,* that the ligature should be drawn with sufficient firmness to cut through the internal and middle coat of the vessel (Plate IV, Fig. 7), and that sufficient inflammatory action be established within the artery to glue its sides together, and render the channel impervious. If the artery is diseased, care must be exercised lest the force thus applied cause the ligature to cut through the vessel before adhesion has occurred; and to obviate such an event, it has been advised to employ a broad ligature, or, as Manec suggested, to introduce a piece of bougie into the vessel in order to diminish the pressure upon the coats, or to employ a portion of the adjacent muscle, as has been done by Dr. Mütter, of Philadelphia.

* Treatise on Hemorrhage and the Use of the Ligature, with Observations on Secondary Hemorrhage. London, 1805.

When an artery in the healthy condition is to be tied, the surgeon should proceed as follows: seize the open end of the vessel with a tenaculum, by inserting the point of the instrument into its coats, draw it out of its sheath, and separate it as much as possible from the surrounding tissue, especially from the accompanying nerves. (Plate IV, Fig. 5.) If the latter are included, it may give rise to violent neuralgic pains, or create neuromatous tumors, or, by causing the ligature to remain for a long period in the wound, interfere with the process of cicatrization.

Then let an assistant pass the middle of the ligature beneath the tenaculum, and, bringing its two ends around the vessel, form a loop, and drawing upon the ends with his fingers, tighten the knot with the points of his thumbs, in the same manner that a cobbler draws his ends, taking care that the knot passes below, and not above the point of the tenaculum, and that it is drawn with sufficient firmness to accomplish the division of the arterial coats recommended by Dr. Jones. A second knot being then tied in like manner, one end of the ligature should be cut off within about an eighth of an inch of the knot; the other brought out at an angle of the wound, and the tenaculum removed. Some surgeons remove the tenaculum before the second knot is formed, but it is a dangerous practice, exposing the patient to the risks of secondary hemorrhage from the ligature being imperfectly applied. Subsequently, on closing the wound, all the free ends of the ligatures should be brought out at the lowest point, where they will favor the escape of pus, and thus prevent the formation of abscesses. Various knots have been recommended for tying ligatures, but the ordinary double knot is all that is absolutely necessary in most instances.

The advantage of cutting off one end of the ligature will be found in the diminished amount of foreign matter necessarily left in the wound until the ligatures separate, and is now the general custom of surgeons in the United States. "The practice of removing both ends close to the knot, published by Haire, of England, in 1786, was adopted by Hennen in 1813, at the suggestion of one of his associates, who believed it to have been an American invention;"* but if this were so, it was probably at the period when animal ligatures were used, as the practice revived by Veitch in 1806 has long been the only one employed in this country.

* South's Chelius, vol. i. p. 339, Phila. edition.

The ligature, thus applied, closing the vessel, arrests the passage of the blood beyond it, and a clot is formed (Plate IV, Fig. 6), which, gradually rising as high as the first anastomosing branch above the ligature, causes the blood to pursue a winding course around it, by dilating the collateral branches until at last it enters the main trunk at a distance below the ligature. This clot contracting adhesions to the sides of the artery, its more liquid portions are absorbed, and the vessel closing upon it, is soon converted into a ligamentous cord, the amount of blood formerly transmitted through the artery being now carried by the enlarged anastomosing vessels. (Plate IV, Fig. 9.)

The substance of which the ligature should be made, and its mode of action, were formerly points of great interest to operators, and, under peculiar views, it was deemed necessary that they should be made of chamois skin, kid, buckskin, the tendon of the deer, catgut, parchment, or lead, as suggested by Drs. Physick, Hartshorne, and Dorsey of Philadelphia, and Jameson of Baltimore.* But, of late years, the simple silk or hemp thread has been found to answer every purpose, and is now almost universally resorted to.†

Torsion is effected by seizing the end of the artery in forceps, and twisting it by rotating the instrument between the fingers and thumb, until the internal and middle coats are lacerated. (Plate IV, Fig. 8.) Torsion is a favorite means of arresting hemorrhage among the French surgeons, but much observation has convinced me that it cannot be relied upon except in the case of small arteries.

The credit of suggesting torsion for the arrest of hemorrhage has generally been assigned to Amussat, of Paris, who published his account of it in August, 1829.‡ Dr. Bushe, of New York, has, however, disputed this claim, assigning the origin of it to Guy de Chauliac, and quoting cases of his own where, in December 1826, April 1827, June 1827, and July 1828, he employed torsion "by twisting the cut extremities of the vessels in a square-beaked forceps, furnished with a sliding bar, and two nuts."§ The credit of priority in reviving the operation seems, therefore, to belong to him.

* Dorsey's Surgery, vol. i. p. 53, Philadelphia, 1823.

† For the manufacture of ligatures, see Smith's Minor Surgery, 3d edition, 1850.

‡ Archives Générales, tome xx. p. 606 (quoted from South's Chelius).

§ New York Medico-Chirurgical Bulletin, vol. ii. p. 212.

SECTION III.

STYPTICS, CAUTERIES, AND OTHER MEANS OF ARRESTING HEMORRHAGE.

Among the older surgeons, much confidence was placed in the employment of styptics for arresting hemorrhage; but, at present, American surgeons seldom resort to them, except in cases where the ligature cannot be applied, as in oozing from a general surface, or in bleeding from the cancellated structure of bone.

Among the articles occasionally employed as styptics are the nitrate of silver, sulphate of copper, alum, tannic acid, tinctura ferri chloridi, and matico, either in leaf or tincture, nearly all of which act by constricting the vessel. Hemorrhage may also be arrested by the application of fine sponge, or dry lint, so as to favor the formation of a clot at the end of the vessel, and when combined with pressure occasionally answers a good purpose.

The heated iron, or Actual Cautery, though seldom resorted to, may be demanded in operations upon the bones of the face, or in other positions where the bleeding point cannot be seen. In order to adapt the cautery to these surfaces, a great variety of shapes has been given to it, but those figured in Plate II, Figs. 13, 14, are all that are generally necessary. When a cautery is to be employed, it may be heated either to a white or red heat by fire, or kept plunged in boiling water. White heat will form an eschar which, on separating, is likely to bring on secondary hemorrhage; but the red heat will only produce contraction of the vessels and tend to produce adhesive inflammation. The propriety of using the actual cautery in either of the conditions referred to may, however, be regarded as doubtful. The nitrate of silver, or tincture of iron, or plugging the part with dry lint, is all that is generally found necessary, surgeons generally preferring to apply a ligature, or resort to cold for a temporary arrest of the more serious bleeding, or by leaving the wound exposed to the air for one or two hours, as suggested many years since by Dr. Joseph Parrish, of Philadelphia, to favor the closure of the minute vessels by the effused liquor sanguinis.*

* Elements of Surgery, by John Syng Dorsey, M. D., vol. ii. p. 350, Philadelphia, 1823.

CHAPTER IV.

DUTIES OF A SURGEON IMMEDIATELY AFTER OPERATING.

After accomplishing his object, and arresting the hemorrhage, the subsequent duties of the surgeon may be classed under the general head of the Dressing.

SECTION I.

DRESSINGS.

The object to be attained in operating being very different in each case, it follows that the dressing must also be varied, and special directions may therefore be reserved until the consideration of each operation. Certain general remarks are, however, applicable to every operation requiring division of the skin; thus, attention must be given to the means of cleansing the part, of favoring its cicatrization, and of preventing the recurrence of hemorrhage, in all which, although various opinions exist, yet certain general rules of practice are universally admitted. In this portion of the surgeon's duty even good operators occasionally appear to be deficient, and show a degree of carelessness that is apparently due to the belief that the great object of the operation ceases when they lay aside their instruments. The education also of many of our students is very defective on this point, it being no uncommon event to see a class leave the operating room before the dressing is commenced, with as much indifference as they would show if this stage of the operation really had no value. Any surgeon, however, who has been long engaged in practice will, it is thought, sustain the assertion that the first and subsequent dressings of an operator are the real tests of his surgical skill. In making them he first proves his claims to the high position of a surgeon, and rises above the grade of the "cutter." Before this the surgeon was limited to the mechanical portion of his profession, but in the dressing and after-treatment

he has an opportunity of showing his judgment and the resources of his science. This subject should, therefore, receive special attention from every one.

The dressing after an operation may be divided into two portions: 1st, the cleansing and uniting of the wound, and its protection from external or internal irritation; and 2d, the selection of such means as are requisite to aid in the union.

§ 1.—*Closing of Parts after an Operation.*

The decision of the question of union by the first or second intention, being in a great measure settled in the United States, by the almost universal practice of healing or attempting to heal by the process of adhesion, the first dressing should generally be made with this object; an effort to close the part by granulation being an exception to the rule. In attempting union by the first intention, the removal of all foreign matter is of great consequence. This may be effected either by squeezing a stream of water from a sponge upon the surface to be united, or by the direct application of the sponge itself. Of course it is requisite that the sponge employed in this, or in other instances directly to a wound, should be as soft and free from sand as possible, and the selection of a proper article is, therefore, a measure of some importance. Sponge may usually be rendered entirely free from grit, by pounding it when dry, soaking it in a mixture of muriatic acid and water, and subsequently washing it in a solution of soda; but as the proper preparation and method of employing it belong to Minor Surgery, the reader is referred to the volume on that subject for the details. The mode of uniting parts becomes, therefore, the first point in the dressing.

To close a wound after an operation, resort may be had to strips of adhesive plaster, about a half inch wide; to the application of collodion; to the suture, or simply to the bandage; but in all cases of extensive wounds, before closing the skin by any of these means, it will be found useful to introduce a morsel of lint or linen between its edges, as suggested by Dr. Physick, in order to prevent union of the surface before the deeper parts have adhered, as this would tend to create an abscess. In employing adhesive plaster, the strips should be first warmed by wrapping them around a bottle filled with *boiling* water, taking care to place the unspread side of the strip

next to the bottle. After the plaster is thus softened, one end of a strip should be placed upon the integuments about one or more inches from the edge of the wound, and whilst its sides are approximated by the fingers and thumb of one hand, the strip may be stretched across it with the other so as to draw the two sides together. In this application, the strip should also be applied to the most depending portion first—a short interval being left between each piece, in order to favor the escape of any discharge from the wound. (Plate V, Fig. 2.) In using collodion, strips of muslin should be moistened with it, and then applied in a similar manner. Though occasionally resorted to with satisfaction, as a substitute for adhesive plaster, I do not think it likely to supplant the use of the former article.

SUTURES or stitches are employed to unite such parts as, from their flaccid or movable condition, cannot be accurately held together by other means. For the formation of the suture various needles are employed (see Plate II, Figs. 4, 5), any of which may be selected, according to the taste of the surgeon. The only matter of consequence in their selection is to see that they have good points, keen sides, and sufficient temper to prevent their yielding to the force necessary for their introduction. The sutures at present resorted to for the union of wounds are the Interrupted, the Twisted or Hare-lip, and occasionally the Quilled. The Continued suture and others recommended by the older surgeons, are now seldom employed.

THE INTERRUPTED SUTURE will be found of service whenever it is desirable to approximate large flaps, or those which present angles, as after crucial incisions and others of a similar character.

In making these sutures, the operator should seize the side of the wound nearest to him, or its most depending portion, with the thumb and forefinger of his left hand, so that the latter will be on the inner side of the skin, and then introducing the needle, with its convexity downwards and its point directed upwards, pass it from without inwards through the flap, or side of the wound, and from within outwards through the other part, seizing this portion with the thumb below and the finger above the surface of the skin. Then whilst the two sides are approximated by the fingers of an assistant, let the operator tie the ligature by a double knot, so as to place it on *either side of the line of union*, and cut off both ends of the ligature, close to the wound (Plate V, Fig. 5). When the knots of sutures are permitted to press directly upon the line of union, they are liable to induce such irritation as results in suppuration; whilst

PLATE V.

INCISIONS AND MODES OF UNITING WOUNDS.

Fig. 1. A front view of various incisions, as made upon the abdomen of a subject. Drawn from Nature.

1. The V-shaped incision, to form a simple flap. The first incision being made, the second should commence at the base and terminate like the first.

2. The T-shaped incision, to form double lateral flaps. The horizontal cut being made, the vertical one should commence at the proper distance and terminate at the centre of the former.

3. A modified L incision. A horizontal or perpendicular cut being first made, two others of any length are made to terminate at its ends so as to form one large and broad flap.

4. An incision in the shape of the letter H. The middle cut being first made, the two vertical incisions should be carried across its ends, so as to form two broad flaps.

5. The crucial incision, formed either by making several cuts in V, or by making an incision in T, and then continuing its perpendicular cut.

6. A crescentic incision, made by cutting from left to right, if the right hand is employed, or the reverse direction if made by the left.

7. An elliptical incision, intended to remove superabundant integument. One incision should commence at the proper point, and the other be drawn from the same point to the termination of the first.

Fig. 2. Union of a wound by adhesive strips, with the intervals left for the escape of pus. After Bernard and Huette.

Figs. 3, 4. The Hare-lip or Twisted Suture. " "

1. The pin as introduced, showing the amount of tissue to be included.

2. The ligature twisted around it in the form of a figure 8.

3, 4. The ends of the pins removed, and the integuments protected by adhesive strips placed underneath them.

Fig. 5. Several points of the Interrupted Suture, showing the proper position of the knots, which should always be at the side of the wound. After Bernard and Huette.

Fig. 6. A peculiar form of the Continued Suture, occasionally useful in deep muscular wounds. After Bernard and Huette.

Fig. 7. The Quilled Suture. " "

Plate 5.

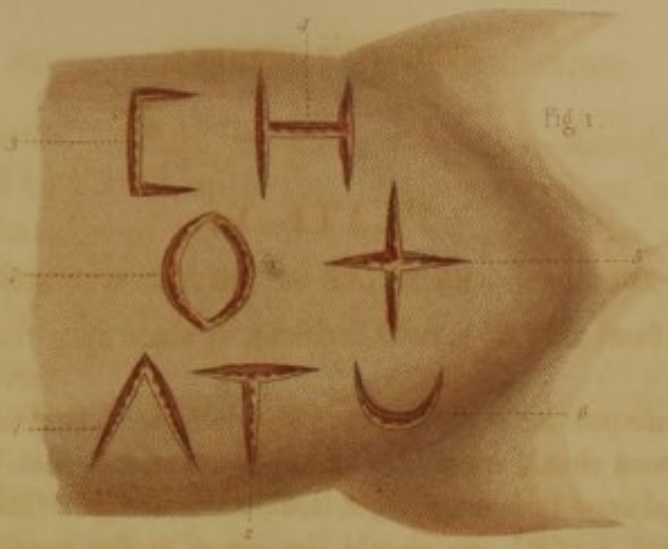


Fig 1.

Fig 2.

Fig 3.

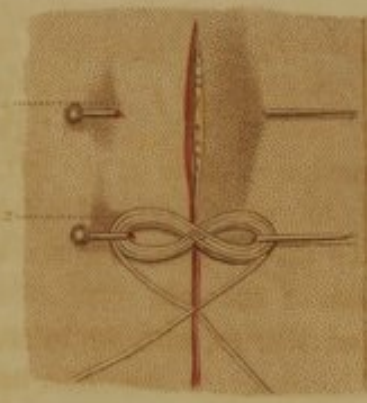


Fig 4.

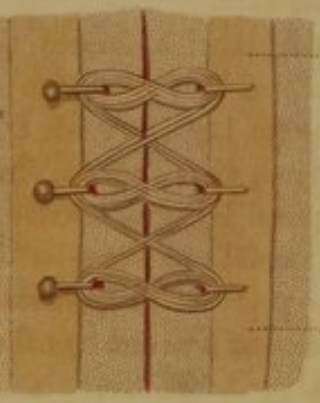


Fig 5.

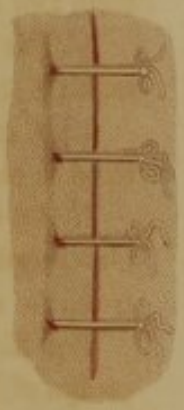


Fig 6.

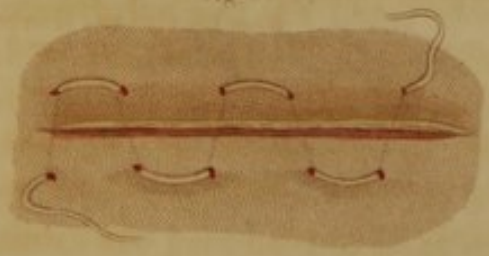
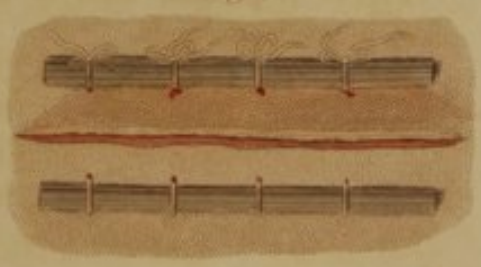


Fig 7.



if tied as directed near either the point of exit or entrance of the needle, they may sometimes be removed without a sign of inflammation.

In making the points of a suture, the operator should remember not to pass the needle deeper than the integuments, if possible; to include enough tissue to sustain any strain that it may have to encounter; to avoid pricking nerves or tendons, and to place the first stitch in the middle of a longitudinal wound, the remainder being closed by as many points as may be requisite, intervals being left between each. In angular wounds the first point of the suture should be made at that part where all the free ends of the flap will come together, and subsequently elsewhere, according to circumstances. These sutures, as well as all others, should be aided by the application of adhesive strips or uniting bandages, in order to diminish the strain upon the thread, and its tendency to create ulceration. In about three days the stitches may be removed by seizing the knot with the dissecting forceps, elevating it slightly from the integuments, cutting the ligature beyond it, and drawing the thread carefully out; but in large deep wounds, or in parts of a loose and movable character, the union should be maintained for several days subsequent to the removal of the thread by the continued use of adhesive strips. If sutures are allowed to remain in a part longer than four days, except where they are passed so deeply as to include a large amount of tissue (as in the perineum), they will generally tend to prevent union by adhesion, and lead to suppuration or ulceration.

THE TWISTED or HARE-LIP SUTURE is especially applicable to operations in which there has been considerable loss of integument, and where the strain upon the thread would probably cause it to tear out of the tissue; or to cases where the parts are very movable, as in the lips, cheeks, &c. In its application, a straight pin or needle should be held between the thumb and right forefinger, and, commencing at the lowest or free edge of the wound, passed as deeply through the tissue as is consistent with safety, on the right side from without in, and on the left from within outwards, the entrance and exit of the pin being favored by sustaining the parts with the thumb or forefinger of the left hand. Then, whilst the wound is well approximated by pressure from the fingers of an assistant, let the operator surround the pin with a thread, and, twisting it around the pin in the shape of the figure 8, tie the ends together over the

line of the wound. After introducing as many other pins as may be necessary (Plate V, Fig. 3), their points should be removed or the surrounding parts protected from injury, either by a strip of plaster (Plate V, Fig. 4), or by a pellet of wax on each end of the pin, and then the whole strengthened, if necessary, by adhesive strips.

Various opinions are entertained by operators as to the best material for the pins employed in this suture. Silver pins with movable steel points were, at one time, much used, and deemed especially suited to this mode of union; but large well silvered pins, or the straight steel needle advised by Heister, or pieces of wire, sharpened at the point, as recommended by Dr. Dorsey, of Philadelphia, or the insect-pins proposed by Dieffenbach, can be more readily obtained, answer quite as well, and, in my opinion, better than those with movable points. Where the solid pins are resorted to, their points should be cut off with the scissors or bone-nippers, in order to protect the soft tissues.

THE QUILLED SUTURE is, at present, seldom employed, being limited to those cases where it is desirable to unite very thick tissues, as in operations, lacerations, &c., of the perineum. In making this suture, several needles should be threaded by passing both ends of the thread through the eye of the needle, so as to form a loop on the middle of the ligature. Then whilst the parts are held as directed in the interrupted suture, let the operator pass the first needle through the left side of the part from without inwards, as deeply as may be necessary, commencing at the middle of the wound and bringing it out on the right side from within outwards. On removing this needle, let him next apply a small piece of waxed bougie, quill, or soft wood, on the left side of the wound, passing it through the loop; then placing a similar piece between the free ends of the ligature on the right side, tie the ends of the thread loosely upon the quill; and on placing two or more stitches at equal distances from the centre and drawing them into firm knots upon the quills, the parts will be thoroughly closed by the pressure thus made upon them. (Plate V, Fig. 7.)

Such modifications of these sutures as may be required in special operations will be referred to under the appropriate head.

§ 2.—*Means employed to favor Union.*

In the second portion of the duties of dressing, or the selection of such means as are requisite to facilitate the efforts of nature in healing the wound, lies the great skill of the operator. Unless the surgeon is well grounded in the principles of surgery, or unless he unites in himself the knowledge requisite for a good physician, he may now mar the whole proceeding, as all his mechanical dexterity or anatomical knowledge will prove of little avail if he is deficient in a knowledge of the great principles of inflammation. Now it is that judgment may be shown, even in apparently neglecting the case, too much anxiety and officiousness preventing the success of the operation nearly as readily as want of skill. The constitutional treatment at this period is also often essential to success; the efforts of nature may require to be restrained or stimulated; rest or motion may prove useful or injurious; loss of blood, or purging, or a full or a low diet after a capital operation, may be the means of saving or destroying the patient, and nothing but a knowledge of the treatment of inflammation, together with the practical tact that experience alone can furnish, will enable an operator to conduct himself correctly in this most important portion of his duty.

In the third portion of the dressing, or that which has for its object the protection of the part from external agents, the subsequent steps usually will consist in the application of spread cerate, or of lint wet with cold water, or of compresses and bandages; but as this portion of the subject belongs to Minor Surgery, the reader is referred to the treatises on this subject for further details.

As connected with the dressing, the operator should next bear in mind the occurrence of secondary hemorrhage, the changes requisite in the articles subsequently employed, as well as the varied constitutional treatment rendered necessary by a change of action. Whenever, in later dressings, he desires to remove ligatures, let him seize the end of the thread between his thumb and forefinger, and make very slight traction upon it. If the ulceration of the vessel is completed, the ligature will readily separate by the least force, but if it is not, it should be left to nature. Occasionally, however, it happens, that it will remain attached to the part an unusual length of time, extending sometimes to fifty or seventy days, either in consequence of the employment of too large or too

flat a ligature, or occasionally from adhesions forming around its course, or from too much of the surrounding tissue having been included with the vessel. Under these, or other circumstances, when the operator is fully satisfied that time is being lost, he may resort to the expedient suggested by Dr. Physick, and twist it slightly from day to day; or pass it over a compress placed at a short distance from the wound, and then fastening the free end to a sound part of the limb, by a portion of adhesive plaster, favor ulceration by the gentle strain thus exercised upon the ligature. If the tension thus exercised is moderate, it will enable the knot to separate from the artery, but if it is sudden or violent, it will be liable to induce hemorrhage; judgment as to its employment is therefore necessary. In fastening the free end of the ligature, the position of the part to which it is attached and its motions should be noted; thus, if a ligature coming from the thigh should be thoughtlessly made fast to the leg whilst flexed, the patient, in extending the limb, would be likely to tear the thread off the vessel; so also in the arm and forearm. The point to which the ligature from an artery in either extremity is attached, should, therefore, always be above the first joint.

OPERATIVE SURGERY.

PART II.

OPERATIONS ON THE HEAD AND FACE.

PART II.

OPERATIONS ON THE HEAD AND FACE.

CHAPTER I.

SURGICAL ANATOMY OF THE HEAD.

THE head, as a Surgical Region, is divided into two parts: one the Cranium, being all that portion of the bony structure which is occupied by the Brain; the other the Face, or the region bounded above by the superciliæ, and below by the base of the inferior maxilla. In the cavity of the cranium, anatomists recognize two distinct portions; one the superior, which is designated as the Vault, the other the inferior, and usually called the Base. With the Base of the cranium an operator has but little to do, it being so situated and connected with vital parts of the nervous system as to forbid the application of instruments to it, except in its lateral and inferior portion, where, in rare cases, it is necessary to perforate the mastoid cells in order to relieve deafness.

The Vault of the cranium is mainly important to the surgeon in consequence of the relations existing between the bones which compose it and the internal parts. The bones forming it are arranged so as to form a cavity which is accurately filled by the brain. Being of the class known as flat bones, they consist of two layers of compact matter with an intermediate diploë or reticulated structure, contain a large number of veins or sinuses, and are covered and nourished by an internal periosteum, being the outer lamina of the dura mater, as well as by an external membrane known as the pericranium.

The Dura Mater or fibrous covering of the brain is attached to the internal table of the bones both by fibrous and vascular adhesions, and may be regarded as necessary to the nourishment of this table of the skull. In its duplicatures are found several large veins

PLATE VI.

INSTRUMENTS EMPLOYED IN OPERATING UPON THE BONES OF THE HEAD.

Fig. 1. A strong Scalpel, for incising the scalp, previous to the application of the saw or trephine. A lever is attached to the end of the handle. Schively's Pattern.

Fig. 2. A Trephine of large size. " "

Fig. 3. A small Trephine, capable of being attached by a screw to the handle of No. 2. 1. The crown. 2. The slide moving the centre pin. " "

Fig. 4. A short stiff Brush to clean the Trephine. " "

Fig. 5. An Elevator, for raising depressed bone. " "

Fig. 6. Hey's Saw; occasionally used in depressed fracture of the cranium instead of the Trephine. " "

Fig. 7. A Raspatory or Scraper, useful in caries. " "

Fig. 8. A Lenticular Knife for the removal of spicula from the opening made by the Trephine. " "

Fig. 9. A Chain Saw, with the needle for passing it around a bone, and the two handles for moving it. Charriere's Pattern.

(Drawn from the Instruments.)

Fig. 10. The Circular Saw of Martin, of Paris. " "

This most useful instrument consists of a shaft, to which circular or mushroom-shaped saws may be adapted by a screw. These saws may be made to revolve rapidly, by means of the brace, Fig. 13. In consequence of the double joint, at the end of the shaft opposite the saw, the latter will be kept in motion, no matter what may be the relative position of the shaft to which the brace is attached, except when the two are directly at right angles. The surgeon holds the heavy handle (1) with both hands, and directs the saw through its shaft, whilst an assistant causes it to revolve by turning the brace, Fig. 13, when attached to it at (2). I have found this saw useful in many cases.

Fig. 11. Another Circular Saw, larger size. Charriere's Pattern.

Fig. 12. A Mushroom-shaped Saw, which cuts like a gouge. (These instruments are now made by Schively.) " "

Fig. 14. Liston's strong Bone-Nippers. " "

Fig. 15. Strong Forceps for cutting fragments of bone. " "

Fig. 16. A steel Hammer or Mallet. " "

Fig. 17. A steel Chisel, with the shaft running through a wooden handle. " "

Fig. 18. A steel Gouge made like the chisel. " "

Fig. 19. Bone Forceps for removing sequestra. After Bernard and Huette.

Plate 6

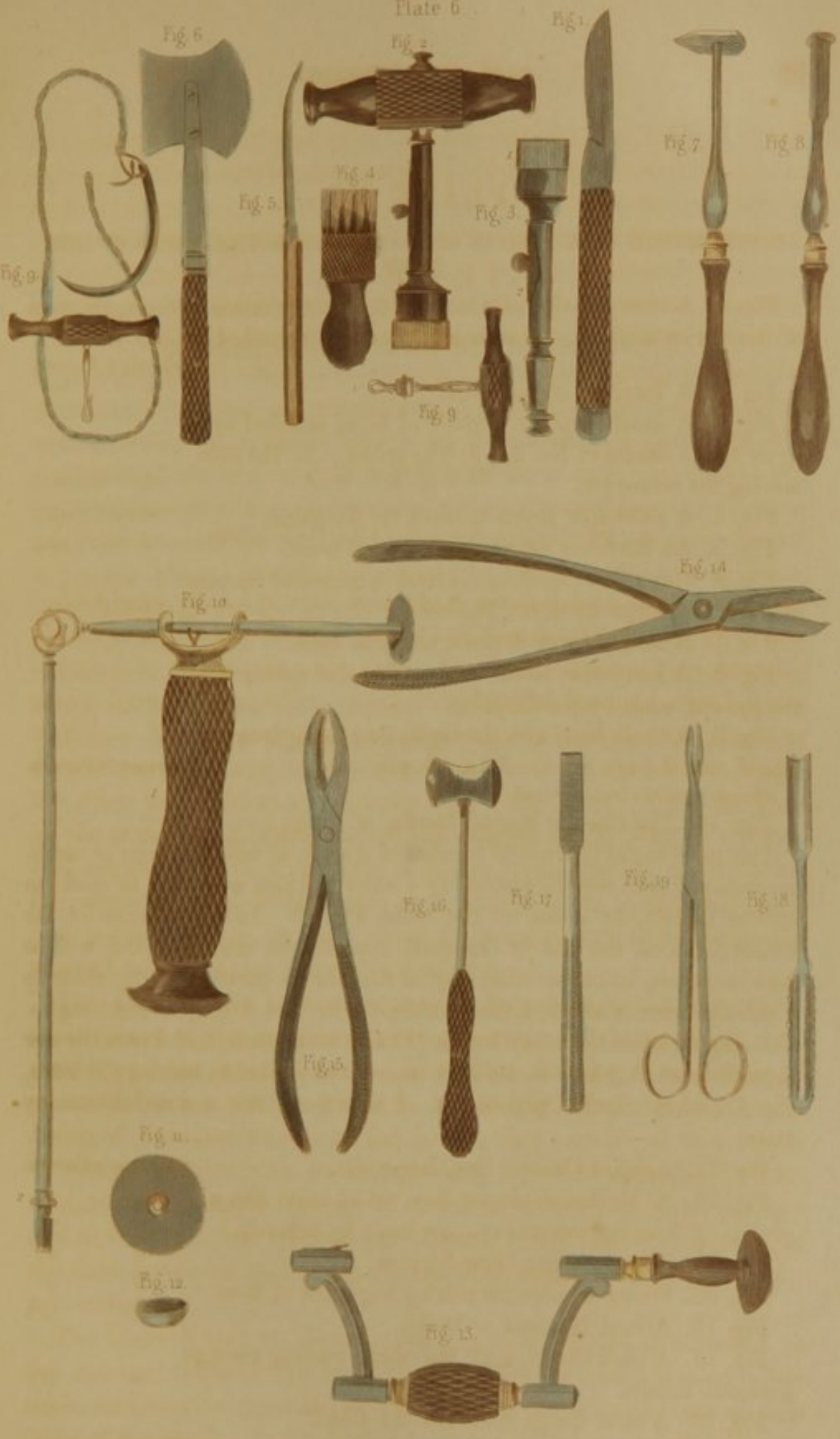


Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10
Fig. 11
Fig. 12
Fig. 13
Fig. 14
Fig. 15
Fig. 16
Fig. 17
Fig. 18
Fig. 19

or sinuses, the principal of which, on its upper part, is the Superior Longitudinal Sinus (Plate VIII, Fig. 1). This sinus runs from before backwards in the median line of the cranium, and is liable to be injured if a trephine is applied in its course. Several arterial branches are also found on the vault of the cranium, outside the dura mater, and often more or less deeply imbedded in the inner table of the skull. Of these arteries the most important to the surgeon is the meningea media or middle artery of the dura mater, which is first noticed within the cranium, near the level of the external angular process of the os frontis, whence it ramifies in numerous anastomosing branches (Plate VIII, Fig. 1). This vessel is also liable to be wounded in the operation of trephining, and from its deep position in the bone is sometimes ligated with difficulty, though cases are recorded in which hemorrhage from it and from the superior longitudinal sinus has been arrested by pressure with lint.* The Pericranium, or proper periosteum of the cranial bones, adheres closely to their external surface, especially at the sutures, and by its vascular connections assists in preserving the vitality of the outer table of the skull.

Outside of the pericranium, upon the summit of the vault, is found the tendon, and at the front and back of the same region the bellies of the occipito-frontalis muscle, the fibres of which run nearly vertically, and the course of which should direct the line of all incisions in this region, a transverse cut being occasionally difficult to heal, from the retraction caused by the action of the muscle. The cellular tissue between the occipito-frontalis tendon and the pericranium is freely developed, and attaches these two parts so loosely together that the tendon and muscle move with great facility upon the pericranium. The cellular substance between the tendon and the integuments is, on the contrary, sparsely developed, uniting the two tissues very closely together. In this layer is found a small amount of fat, as well as the tegumentary blood-vessels and nerves; it is also the seat of most of the tumors found upon the scalp, the flattened and spheroidal shape of which is mainly due to the closeness of the structure and its want of extensibility. This sparse cellular tissue is one cause of the great liability of the scalp to take on erysipelatous inflammation; and the rapidity with which the disease runs on to mortification is owing to the nutritive vessels of the integuments being compressed against the cranium, whenever

* See Trephining.

effusions occur in its dense and unyielding structure. Its character will also be noticed in any attempt to place a ligature upon a divided vessel in the scalp, the difficulty of drawing it out being due to the peculiarity just referred to. The skin immediately above this layer presents the hairs and other appearances known to every one.

In studying the structure of the scalp from the surface to the bones, we have, therefore, 1st, the skin with its hairs and follicles; 2d, a dense cellular structure closely adherent to surrounding parts, and containing the fat, together with most of the blood-vessels and nerves; 3d, the occipito-frontalis muscle and tendon; 4th, a loose cellular substance permitting free motion of the muscle and tendon upon the parts beneath; and 5th, the pericranium closely adherent to all parts of the bones, but especially to the sutures. Wounds of the scalp are very apt to separate the integuments from the pericranium, in consequence of its loose adhesions; but, as the tegumentary vessels usually remain in the flap, it is generally only necessary to replace the latter in its proper position in order to enable the parts to heal. The density of the tissue and the tendency of suppurations to travel in the cellular structure between the tendon of the occipito-frontalis and the pericranium, should always be borne in mind in injuries or operations on this region. Sutures employed to unite these parts should only pass to the tendon, and not beneath it.

The anatomical relations of the Face will be referred to hereafter.

CHAPTER II.

OPERATIONS UPON THE HEAD.

THE operations required for the relief of surgical affections of this region consist of those necessary in disorders of the soft parts, and those demanded by injuries and diseases of the bones or dura mater. In all these cases, the surgeon will find it a useful preliminary measure to shave the part freely before commencing his operation, except in extirpating small encysted tumors, when the presence of the hair will be useful as a means of promoting the adhesion of the incisions.

SECTION I.

OPERATIONS UPON THE SCALP.

Among the diseases of the integuments most frequently requiring surgical interference, are Encysted Tumors, and Nævi, or Vascular Tumors.

§ 1.—ENCYSTED TUMORS.

Encysted tumors are of various kinds, and when found in the scalp are usually situated in some portion of it exterior to the occipito-frontalis tendon.

PATHOLOGY.—The variety called Atheromatous or Melicerous contain cheesy or more liquid matter, and are generally believed to be obstructed and enlarged sebaceous follicles, as suggested by Sir A. Cooper. They are most frequently placed immediately beneath the skin; consist of a perfect sac, having a smooth and shining surface internally, but rougher externally; and are, more or less, filled with cheesy or a similarly unorganized matter. Unless of long standing and of some size, these tumors do not adhere to the pericranium; but, when more fully developed, they sometimes induce such inflammatory action in this membrane as often results in adhesion, and, in some instances, in cartilaginous degeneration of that portion of the pericranium next to the sac. No blood-vessels enter the tumor, the organization of which is low. Occasionally, I have seen these tumors induce direct absorption of the outer table of the skull, so as to create a cup-like cavity, the edge of which was rough and slightly elevated.

ORDINARY OPERATION.—If the tumor is small, the surgeon should pass a sharp-pointed, narrow bistoury, with the back to the cranium, directly through its middle, and cut it open from within outwards. Then, after evacuating the contents, let him reflect the edge of the skin, retain it in one pair of forceps, and, seizing the divided edge of the sac in another pair, draw it out from its cellular attachments. If the adhesions are strong, careful dissection will be necessary to free the tumor from the pericranium, lest the latter membrane be injured and necrosis supervene.

PLATE VII.

OPERATIONS UPON THE SCALP AND BONES OF THE HEAD.

Fig. 1. A front view of a Nævus Maternus upon the forehead of a child, showing a combination of the operations of incision and strangulation, as recommended by Liston. A crucial incision simply through the skin, and without entering the tumor, has enabled the operator to turn back four flaps; two needles armed with double ligatures have been passed at right angles to each other through its base, and the loops of each ligature cut so as to form eight ends, two of which, 1, 2, and 3, 4; 5, 6, and 7, 8, being tied firmly together, strangulate the structure in four sections.

After Liston.

Fig. 2. The removal of a large tuberculated Exostosis from the posterior portion of the left parietal bone, by Hey's saw. The integuments have been divided over the tumor by a crucial incision; the four flaps dissected back from its base; the tumor sawed through vertically, and represented as being removed from the bone in sections by the saw, which is seen cutting through half of its base.

After Bourgery and Jacob.

Fig. 3. The removal of a necrosed portion of the Os Frontis. The integuments have been dissected off from the head, and the necrosed portion of the bone, after being slightly raised by the elevator, is about to be removed by the strong bone forceps.

After Bourgery and Jacob.

Fig. 4. A comminuted fracture of the Cranium; a small fragment has been removed by the forceps, and the elevator is in the act of raising the remainder of the depressed bone to its proper level. When a fracture is thus comminuted, the employment of Hey's saw across an angle of the fracture, or the application of a perforator, forceps, or similar instrument through the fissure, will often enable the surgeon to make room for the entrance of the elevator, without applying the trephine. Whenever the latter instrument can be dispensed with, the danger of injuring the dura mater is much diminished.

After Bourgery and Jacob.

In large tumors, it will sometimes be found necessary to make an elliptical incision through the skin, so as to remove such portions of it as would prove superabundant; then puncturing the sac, proceed as before; but encysted tumors of a size requiring this mode of operating are rare, as any excess of skin usually disappears soon after the removal of the sac, or causes no inconvenience to the patient. To attempt a dissection of the entire cyst is both tedious and useless.

DRESSING.—Cleanse the part thoroughly; see that no portion of the shining sac remains at the bottom of the wound, and tie or twist a few hairs together over the wound in order to close it, or, if the incision has been free, apply a compress and bandage. The hemorrhage seldom requires attention, or may be easily arrested by pressure.

§ 2.—NÆVI MATERNI, OR ERECTILE TUMORS.

PATHOLOGY.—A class of tumors formed chiefly by enlarged capillaries united together by cellular substance, called by Mr. John Bell, Aneurism by Anastomosis, or Mothers' Marks—and by Graeffe, Telangiectasis (τελος, far; αγγειον, a vessel; εκτασις, dilatation)—are sometimes found on the scalp as well as in other portions of the body, and will be now referred to as a class, the operations for their cure being nearly the same wherever they may be developed. In most instances, these tumors only involve the integuments, and are supplied by one or two vessels which, entering near the centre of the structure, have no direct vascular connection with the skin of adjacent parts. Most frequently nævi will be found of small size, though they occasionally attain the dimensions of a small orange. Being composed almost entirely of enlarged capillaries, the hemorrhage from them will be free when the diseased structure is incised, though it is generally amenable to pressure.

OPERATIONS.—When seated in the scalp, various means of treatment may be resorted to, the object of all being to interrupt the supply of blood to the tumor, or to remove it entirely from the surrounding tissues.

In small tumors, the development of moderate inflammation in the diseased part will often suffice to produce obliteration of its circulation, after which, the structure will either slough out or waste away; but in other instances, constriction of the tumor by ligatures

or pressure may be required to accomplish the same object, though the most certain mode of cure will be found in extirpation. In all cases of nævi, it is important to operate at an early period, as their growth is often rapid, and the hemorrhage in proportion to their size.

I. TREATMENT BY EXCITING INFLAMMATION.

Vaccination, as suggested by the Germans, may be performed by introducing the vaccine virus into the tumor, as in the usual operation for protection from small-pox. The resulting inflammation has in some instances been quite severe without resulting in a cure, and the practice is now seldom resorted to.

Heated Needles.—Dr. Bushe, of New York, induced obliteration of the vessels and sloughing of the diseased structure by introducing numerous needles, twenty or thirty, heated to a white heat, through different parts of the base of the tumor.* Dr. Valentine Mott and others have also employed this method with success.

Operation.—The needles being heated to a white heat in the flame of a spirit-lamp, and then passed immediately through the base of the tumor in various directions, should be quickly withdrawn, so as to cauterize the part and prevent any hemorrhage from the numerous punctures. The operation is said to be productive of but little pain, and to avoid the production of a scar.

Caustic Threads.—Dr. Nathan R. Smith, of Baltimore, has frequently cured the disease by the following operation: Soak a thread in a saturated solution of caustic potash, and, after drying it at a fire, pass it through a needle; transfix the base of the tumor, and, leaving the thread in position, remove the needle. Pass several in the same manner, and the tumor will soon waste away without causing any troublesome symptoms.†

Seton.—Dr. A. H. Stevens, of New York, following the suggestion of Fawdington, of Manchester, of introducing a seton, has operated successfully by the following modification of his proceeding: A blunt-pointed needle, armed with several silk threads, being passed from one edge of the swelling, completely beneath it, to the other, the needle is withdrawn, and the silk thread left as a seton in the wound. No hemorrhage usually results, if the threads are suffi-

* See Bibliography, under Nævus Maternus.

† American Journal of Medical Sciences, vol. vi. N. S. p. 260, 1843.

ciently numerous to fill up the track of the needle; but suppuration ensues—and, in one case reported by Dr. John Watson, a cure followed in which the cicatrix was only observable on minute examination.*

Ligatures.—These means have been employed by Liston, Bell, White, Lawrence, and others, both in Europe and the United States, in various ways, so as to cut off the circulation from the base of the tumor by direct action upon its nutritious arteries; but, if applied so as to include the skin, they are liable to excite intense pain and violent inflammation of the surrounding parts, and in children may, therefore, excite convulsions, or severe constitutional disturbance. To obviate these risks, it will be found advisable, either to pass the threads around the base of the tumor by means of needles introduced immediately beneath the skin, or, when the latter is but slightly or not at all affected, to turn it back by a careful dissection, so as not to open the tumor. Then two curved needles, armed with double ligatures, being passed through the base of the tumor, the loops of each thread may be cut, and the eight ends tied together so as to strangulate it, and cause its removal by sloughing. (Plate VII, Fig. 1.)

Dr. J. Rhea Barton, of Philadelphia, has operated successfully with the ligature, by passing two hare-lip pins at right angles to each other, through the base of the tumor, and then, carrying a strong thread around them, and also across the top of the tumor, strangulated all the portions included between the pins and the ligature; the object of the pins being to confine the ligature about the attachment of the nævus, as well as to compress the structure upon them.

Dr. Brainard, of Chicago, has employed *Collodion* in small tumors, and reported cases of cure. As a simple remedy acting by constricting the structure, it may be resorted to in cases of a limited character. It is to be applied to the surface of the skin over the tumor by means of a brush.

II. OPERATION BY EXCISION.

A careful examination of many of these tumors having shown that they are not, in most instances, intimately connected with the

* See Bibliography—Watson on Telangiectasis.

surrounding parts, the practice of excision, as originally recommended by Mr. Bell and Dr. Physick, may be safely pursued when they are of moderate size, provided the incisions are kept in the healthy tissue. In their removal by excision pass a needle and thick ligature through the tumor—tie its ends so as to form a loop, and facilitate its elevation from subjacent parts—then, making an elliptical incision around its base, dissect it out without cutting into its structure. In the scalp, the loss of integument and the hemorrhage will occasionally be an objection to this plan of treatment, especially if the tumor is large, and in these instances the following operation may be useful.

Partial Incisions renewed at intervals.—In a case of congenital nævus which covered nearly the whole of the right side of the head, Dr. Wm. Gibson, of Philadelphia, commenced its removal by making an incision around one-third of the base, taking up all the bleeding vessels as they were divided, and interposing lint between the edges of the wound, so as to prevent the union of the integuments and the tumor at the point of incision; then, after an interval of a few days, he incised another third; secured the vessels; interposed lint in a similar manner, and in a week afterwards removed the tumor.*

Dr. Physick, in a similar case, cut round the tumor, tied up the vessels as they sprung, suffered the parts to remain with lint interposed to prevent immediate union, and the tumor soon afterwards wasted away.† In a few instances, ligature of the carotid arteries has been resorted to, and the tumors subsequently excised.‡

Remarks on the Value of these Methods of Operating.—In cases where the skin is not much involved in the disease, or where the tumor is not larger than a walnut, or where the cicatrix would not create much deformity, excision will, I think, be found preferable to the other operations, the hemorrhage being in most instances, according to my experience, readily controlled by ligature or by pressure, particularly when care is taken to incise only the healthy structure, and not to open the tumor.

Dr. Warren, of Boston, has long favored the operation of excision, especially when the tumor was seated near the eyes, nose, mouth, or other natural apertures.§ In his practice, three cases

* Dorsey's Surgery, vol. ii. p. 272, 1823.
† Dorsey, loc. cit.
‡ See Bibliography, on Nævus.
§ Warren on Tumors, p. 416.

were treated by caustic applied externally so as to cause a slough, eight by ligature, and eighty-five by excision, all successfully.*

Where the tumor is very vascular and large, or so situated as to create deformity by a cicatrix, the seton, as employed by Drs. Stevens and Watson, will be found to answer a good purpose, or cauterization by the heated needles may effect a cure, especially if the needles be made large. Vaccination is hardly worth the trial. If the large size of the tumor should create just apprehensions of the hemorrhage likely to result from its prompt extirpation, the repeated operations of Drs. Physick and Gibson will, it is thought, answer better than the ligature of the carotids. In the cases reported by Drs. Mussey and Warren, the cure of large vascular tumors on the scalp did not ensue upon the ligature of the arteries of the neck.†

§ 3.—Cephalæmatomata.

Cephalæmatomata (κεφαλη, head; αιμα, blood), or the bloody tumors occasionally found on the heads of very young infants, may perhaps require the attention of the surgeon. Generally, nothing more is necessary for their cure than time and cold applications; but when the effusion is large, and likely to elevate the periosteum to any extent, it may become necessary to evacuate it in order to save the bone. Under these circumstances, a puncture which is merely sufficient to give exit to the blood, without admitting the entrance of air beneath the scalp, is all that is requisite.‡

§ 4.—Division of the Supra-orbitar Nerve.

In some cases of injury of the forehead, and especially in contused wounds, the supra-orbitar nerve has become involved in the cicatrix, or given rise to such a neuromatous tumor, as rendered the division of its trunk necessary, in order to relieve the neuralgic pain resulting from the condition referred to. In such cases the object may be easily accomplished by a subcutaneous section.

* Cooper's Surg. Dict.—Appendix by Reese of New York, article Nævus.

† See Bibliography, under Nævus.

‡ See Bibliography, on Cephalæmatomata, by E. Geddings, M. D., of Charleston.

PLATE VIII.

A SIDE VIEW OF THE STRUCTURE OF THE HEAD, AND OF THE OPERATION OF TREPHINING.

Fig. 1. A lateral section of the Head, showing several portions of the scalp and bones, together with the exterior surface of the Dura Mater. 1. The skin of the head after the hair has been shaved off. 2. The tendon of the occipito-frontalis muscle. 3. The divided edge of the bones, showing the outer and inner tables, with the diploic structure. 4. The shining external surface of the dura mater. 5, 5, 5. The great or longitudinal sinus of the dura mater, extending from the crista galli to the torcular Herophili. 6. The middle artery of the dura mater, where it first passes on to the vault of the cranium. 7. Its anterior branch. 8. Its posterior branch. 9, 9. The lateral sinus of the dura mater in its course along the occipital and temporal bones, to empty into the internal jugular vein.

After Bernard and Huette.

Fig. 2. A lateral view of the application of the Trephine to the right parietal bone. The patient is represented as comatose from a depressed fracture, and lies with his head firmly supported and steadied upon a hard pillow, placed well under the neck. The integuments over the depression have been incised, dissected back sufficiently far to expose the fracture; and the surgeon, holding the handle of the trephine firmly against his palm with the forefinger extended upon its shaft, is just commencing to pronate and supinate his hand, so as to work the saw or crown of the instrument, and cause it to excise a portion of the skull, sufficient for the introduction of the elevator, or the evacuation of a clot.

Drawn from Nature.

Fig. 3. After the removal of the disc cut by the trephine, a small spicula left in the opening is about to be removed by the Lenticular, in order to protect the Dura Mater from injury during the pulsations of the brain. 1. The lenticular as applied in the opening, and the position of the hand holding it.

Modified from Bernard and Huette.

Plate 8

Fig. 1

Fig. 3

Fig. 2

Operation.—In order to secure the division of the main trunk of the nerve, which is often superficial at its exit from the supra-orbitar foramen, the surgeon should introduce a sharp-pointed and narrow bistoury, flatwise beneath the integuments, down to the bone, on the external or temporal side of the foramen, passing it a few lines towards its inner side. Then turning its edge towards the integuments and its back to the bone, let him divide all the tissues from behind forwards until sensation is destroyed, taking care not to cut through the skin; then turning the bistoury again flatwise, withdraw it at the point of entrance, closing the orifice immediately with adhesive plaster. Should a return of the disease lead to the suspicion of re-union in the nerve, a dissection and excision of a portion of its trunk may become necessary. Among the most decided cases of relief afforded by this operation, are those reported by Dr. John C. Warren, of Boston.* Dr. Warren† informs me he has divided the three branches of the fifth pair many times with success. He has also operated on other nerves, as will be hereafter referred to.

SECTION II.

OPERATIONS UPON THE BONES OF THE CRANIUM.

The operations included in this section are those required by diseases or injuries of one or both tables of the skull, as, for instance, in caries, necrosis, exostosis, fractures, or bloody or serous effusions within the cavity of the cranium. In the treatment of all of these, the operator will find it advantageous to shave the scalp at the point to be operated on, and to have at hand one or more of the instruments referred to, and shown in Plate VI. In most cases, he will also find it necessary to incise the scalp; the incisions required under such circumstances being either in the +, L, V, or ⌣, and being so arranged, if possible, that the angles, by their dependent position, may favor the escape of subsequent collections of pus.

* Boston Med. and Surg. Journal for 1825. Also Bibliography—Tic Douloureux, &c.

† Dr. Warren in MS.

§ 1.—OPERATIONS FOR CARIES AND NECROSIS OF THE CRANIUM.

In operating upon the skull for either of these diseases, the scalp should be dissected back from the bones to the necessary extent, care being taken to disturb the pericranium as little as possible, and then by means of the raspatory, saw, trephine, or elevator, such portions of the outer table, or of the diploic structure, removed with the forceps (Plate VII, Fig. 3), as the circumstances of the case may require.

In attempting to remove an Exostosis from the cranium, such an incision should be made through the integuments as will freely expose the tumor, and enable the operator to divide it by Hey's saw, either cutting through its centre down to its base (Plate VII, Fig. 2), or by sawing through the base, to free it at once from the skull.

Dressing.—Replace the integuments loosely; apply poultices or the warm water dressing until granulations are abundant, and then favor cicatrization. These dressings may be retained on the part by any of the ordinary bandages for the head.

§ 2.—TREPHINING THE CRANIUM.

The Trephine is a circular saw, which is made to perforate the skull by frequently turning the hand from pronation to supination. The division of the bone by its application constitutes the operation of Trephining. The French surgeons, like those of the time of Hippocrates,* employ a somewhat similar saw, but one which, like the antique instrument, is fitted to a brace, and worked like a brace and bit. This instrument retains the old name of Trepan (τρεπαω, I perforate), and the operation is hence called trepanning. The trephine differs from the trepan chiefly in the shape of the saw, and in its being made to act somewhat like a gimlet. The sawing portion of the trephine is named the *crown*, in the middle of which is the *centre-pin* or point to steady the saw in its first movements. This instrument is alone employed in the United States, whenever it is

* Hippocrates on Wounds of the Head, translated by Riollay, London, 1783.

necessary to perforate the cranium, but is much less resorted to at the present period than it was formerly, when every possible affection of the brain was deemed sufficient cause for its application. In addition to the trephine, the instruments hereafter named will occasionally prove useful in perforating or elevating the bone.

When from a depressed fracture or effusion of blood outside the dura mater the brain is compressed, and the operation demanded, the surgeon should prepare for it as follows:

PREPARATION.—1st. Shave the patient's head and arrange the following instruments upon a board or tray in the order in which they are designated, or in that in which the operator thinks they may be required. 2d. Place the patient so that his head may be readily acted on without the operator stooping too much, and yet take care that the bed or table is not too high, as this may also create difficulty, and fatigue the surgeon in the manipulation of his instruments.

INSTRUMENTS THAT MAY BE REQUIRED FOR THE OPERATION OF TREPHINING.*

1. A large scalpel, to incise the scalp if necessary.
2. A pair of dissecting forceps, to raise the flap.
3. A tenaculum or forceps, to seize the arteries in the scalp.
4. Ligatures and needles.
5. One large or one smaller trephine to perforate the skull, with a brush to clean the teeth of the saw, and a probe or tooth-pick to test the depth of the furrow.
6. A pair of forceps, to remove the disk of bone.
7. A lenticular, to remove splinters in the opening.
8. An elevator.
9. A sharp-pointed bistoury or lancet, if compelled to puncture the dura mater.
10. Hey's saw, to be employed instead of the trephine if a perforation already exists.
11. Sponges and dressings.

ORDINARY OPERATION.—If the scalp is uninjured, and an incision is necessary in order to get at the bone, make it either crescentic,

* See Plate VI.

as advised by Pott and Velpeau, or V-shaped, or crucial +, as recommended by Dr. Physick, and let it extend through the scalp, over the part upon which it is proposed to operate, dissecting the flaps free from the pericranium, but disturbing the latter as little as possible. If a wound already exists, it may be enlarged to the necessary extent. Then taking the trephine in the right hand, with the centre pin projecting, and holding it as seen (Plate VIII, Fig. 2), apply the crown either upon the edge of the depressed bone, or sufficiently near to permit its being raised by the elevator, when inserted through the opening cut by the trephine. Then turning the hand steadily and slowly from pronation to supination, and pressing firmly upon the handle so as to cause the saw to cut itself a track in the outer table, make a few turns; then removing the instrument, draw up or take out the centre pin—test the depth of the track of the saw with a tooth-pick, and re-applying the instrument, renew the sawing until the diploë is reached. This may often be told by the bloody character of the saw-dust, or by the more free action of the saw, though the absence of either is no sign that the trephine has not entered the diploic structure of the skull, as this is often but sparsely developed. After testing again the depth of the track, saw cautiously, examining the state of the furrow from time to time, until the skull is perforated, or nearly so, as may be told by gently acting in the furrow with the forceps or lever, and endeavoring to raise the piece. When the disc is found to be sufficiently free, it may be either pried out with the elevator or removed with the forceps, or it may come away in the crown of the trephine without any special effort being made for its removal. On removing the piece, the dura mater will be seen perfectly exposed, and if the case is a depressed fracture, the operator should introduce the elevator very cautiously between this membrane and the cranium, keeping the point of the instrument close to the latter; then using the thumb, or the sound part of the adjoining bone as a fulcrum, let him elevate the fractured portion to its proper level, moulding it to its former convexity by pressing with the fingers upon the outside of the skull. If, on perforating the bones, blood is found to be effused outside of the dura mater, careful manipulation will enable the operator to turn it out without injuring the membrane, as this is generally depressed and separated from the inner table of the skull by the effusion. If, however, the blood is evidently beneath the membrane, it may be questionable whether the danger

from its puncture is not greater than that which would ensue if the effusion were left to nature. The judgment of the surgeon, based upon the urgent character of the symptoms, can alone decide this point. Patients have recovered when the membrane has been punctured and even considerably lacerated, yet no judicious operator would deem such a result a precedent except in cases of great emergency.

If by the application of the trephine any of the blood-vessels of the dura mater are accidentally cut, the bleeding may be arrested by pressure, or by ligature; Dr. Dorsey, of Philadelphia, having reported the arrest of hemorrhage from a wound in the superior longitudinal sinus by the application of a dossil of lint, as well as the stoppage of that from the middle artery of the dura mater by the use of the ligature, in the hands of Dr. F. Dorsey, of Maryland.*

In the case of an intimate friend, Mr. B——, of Chestnut Street, I also saw hemorrhage from the same artery, which was deeply imbedded in its channel in the bone, arrested by the operator (Dr. Mütter) plugging the vessel in its bony canal with a small piece of soft wood, as recommended by Dr. Physick. Bleeding from the integuments may be readily checked by a needle and ligature, or by the latter applied in the usual manner, with the tenaculum.

Dressing.—After the operation, the parts should be cleansed; the flap loosely applied over the perforation, covered by a poultice, and the case treated as a suppurating wound until the skin has healed; care being taken to secure the free exit of pus from beneath the integuments, and attention given to any signs of meningeal inflammation. In all cases, the strictest diet should be rigidly observed until all risks of inflammation have passed away. After recovery the head may be protected, if the individual is exposed to injury, by using a thick crowned hat for several months, until ligamentous matter closes the perforation in the bone.

Remarks.—The propriety or impropriety of trephining, in cases of injury or other disorders of the head, is a question which at all times has had able advocates on both sides. That the application of the trephine was at one period unnecessarily resorted to, our present knowledge of the structure of the cranium leaves but little doubt, especially as we find it was employed in cases of concussion of the brain under the supposition that blood had been effused at

* Dorsey's Surgery, by Randolph, vol. i. p. 323, 1823.

particular points of the head, merely because the bone was discolored or seemed too vascular, as is recorded by some of the older surgeons. Though the result of such practice has been to throw doubt upon the utility of the operation, there can be no question that evil has also ensued from the opposite extreme, patients having been permitted to sink when the application of the trephine might have saved them. Judgment is therefore necessary in order to prevent the misapplication of this, as of many other useful remedies. To facilitate a decision in cases where the experience of the operator may be limited, the following statistics, collected with care, are presented; and though not perhaps sufficiently numerous to settle definitely the propriety of the operation, they will yet tend to show its value.

STATISTICS.—Out of 77 cases of compound fracture of the head, reported by MM. Laurie and King, 29 were cured and 48 died.

Twenty-six of the seventy-seven were not trephined. Of these 18 were cured and 8 died, that is, more than two-thirds of those not trephined recovered.

Of the remaining fifty-one cases which were trephined, 11 were cured and 40 died, or not quite one-fifth were cured.*

Of forty-two cases of trephining after injuries of the head, that I have collected from various sources, 28 were cured and 14 died, or two-thirds of those trephined were cured.

Of fourteen trephined for epilepsy, 1 died and 13 were cured.

SUMMARY.—Trephined 107—cured 52—died 55, or nearly one-half of those trephined were cured, including epileptic cases, in which disease the use of the trephine appears to have been especially successful.

TREPHINING THE FRONTAL SINUS.

OPERATION.—In the rare cases in which it may be deemed necessary to apply a trephine upon the frontal sinus, the operator should proceed precisely as in the application of the instrument upon the vault of the cranium, recollecting, however, that an opening in the outer table of the skull, which at this point is often quite thin, is all that is necessary.

* Mott's Velpeau, vol. ii. p. 942.

§ 3.—PUNCTURING THE HEAD FOR HYDROCEPHALUS.

An effusion of serum within the brain or its membranes being usually the result of serious organic disease, but little benefit can be anticipated from an operation which simply looks to the removal of the effect, instead of the cause of the difficulty. When, however, medical treatment has failed, or as a last resort, and with a view of prolonging life, tapping the head for the removal of the fluid may be deemed worthy of trial, although the post-mortem examination in most instances leaves but little reason to anticipate the general adoption of this operation. In the United States, it has been performed by Dr. Physick,* by Dr. Glover of Charleston,† by Dr. L. A. Dugas of Georgia, and Dr. J. B. Whitridge of South Carolina.‡ Dr. Dugas tapped his patient seven times, and drew off sixty-three ounces of liquid, the patient living from June 25th to Oct. 18th. When the effect of the heat of summer upon children is recollected, it will doubtless be admitted that life was prolonged in this case beyond what might have been anticipated. In the case of Dr. Whitridge, the child lived from August 31st to October 31st ensuing. An account of a cure effected by tapping, performed by Dr. James Vose, of Liverpool, may also be found in the *Medico-Chirurgical Transactions*, vol. ix.

Operation.—Introduce a needle and canula, or a fine trocar, at any point of the fontanels or other opening in the head, not likely to interfere with the sinuses, and after evacuating the fluid slowly and cautiously, make moderate compression upon the cranium either by the turns of a roller, or by strips of adhesive plaster tightly applied. A proper medical treatment should then be persevered in. The finer the instrument, provided it is capable of evacuating a liquid, the less, of course, will be the irritation from puncturing the membranes.

Among other measures which may be tried in these almost hopeless cases, and especially those which are chronic, is the injection of iodine, as suggested by Velpeau in diseases of the serous cavities generally. Dr. D. Brainard, of Chicago, has recently tried this method, and employed a solution of iodine gr. $\frac{1}{16}$th; iodide of potash gr. $\frac{1}{8}$th; water f℥ss, gradually increased to iodine grs. xii;

* Phil. Medical Journal, vol. iv. p. 316. † Ibid., p. 403.

‡ Am. Journ. Med. Sciences, vol. xx. p. 536, 1837.

PLATE IX.

EYE INSTRUMENTS.

Fig. 1. Adams's Forceps, modified by Charriere. After Bernard and Huette.

Fig. 2. Desmarres's ring Forceps, for holding the upper lid during the removal of tumors. " "

Fig. 3. Desmarres's bifurcated Forceps, for holding the skin during the passage of a suture. " "

Fig. 4. Charriere's rat tooth Forceps. " "

Fig. 5. Fine Forceps for pterygium. " "

Fig. 6. Charriere's Forceps, with curved points. " "

Fig. 7. Horner's modification of Anel's Probe for dilating the lachrymal canals. From the Instrument.

Fig. 8. Anel's Syringe. " "

Figs. 9, 10. Anel's Points adapted to the Syringe, when injecting the puncta. " "

Figs. 11, 12. Front and side views of Ware's Styles. " "

Fig. 13. Spring Speculum. " "

Fig. 14. Strabismus Scissors. " "

Figs. 15, 16, 17, 18. Fine Scissors of different shapes, both sharp and probe pointed, for various operations on the eye. After Bernard and Huette.

Fig. 19. Elevator of Comperat. " "

Fig. 20. Forceps for artificial pupil. From the Instrument.

Fig. 21. Pterygium Scissors. " "

Fig. 22. One form of Strabismus knife. " "

Fig. 23. Hook of Dr. I. Hays, for seizing the muscle in Strabismus; the curve is adapted to the convexity of the eyeball. From the Instrument.

Plate 9

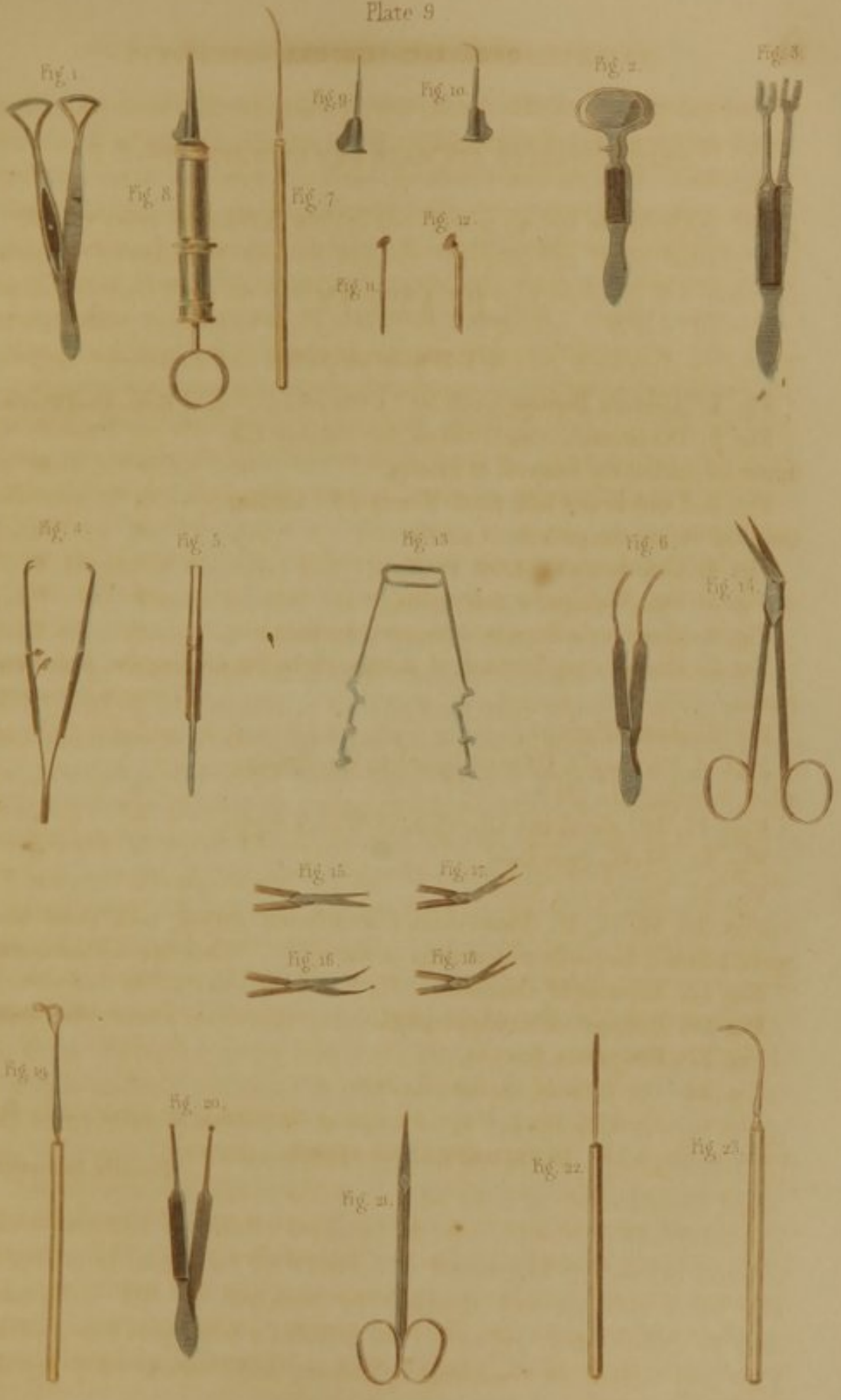


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.
Fig. 15.
Fig. 16.
Fig. 17.
Fig. 18.
Fig. 19.
Fig. 20.
Fig. 21.
Fig. 22.
Fig. 23.

iodid. potas. grs. xxxvi, and water ℥j; all of which was injected, and with apparent benefit at the time of the report.* But further experience in its use is necessary, though analogy seems to present a probability of success.

§ 4.—REMOVAL OF FUNGOID TUMORS OF THE DURA MATER.

The development of fungoid tumors upon the dura mater sometimes leads to absorption of both tables of the skull, and the appearance of the fungous growth directly beneath the integuments. From the nature of the parts involved, and from the observation of the cases, many surgeons have regarded this disease as hopeless; but as successful operations have been performed, and as the result of *post-mortem* examinations have often shown that the disease is frequently limited to the dura mater, or rather does not encroach upon the brain, the propriety of operating under these as in other dangerous circumstances is a question which the operator should decide for himself. Among the cases reported, one out of three of an almost hopeless operation has succeeded, and the surgeon may therefore deem a repetition of it advisable, although his prognosis should be guarded. In a case reported by Dr. J. C. Warren, of Boston,† a lady, 22 years of age, in 1846, had a tumor on the right side of the forehead and right temple, which had shown itself the preceding year. The tumor was smooth, uniform in its appearance, diffused in the surrounding parts, had no distinct boundary, was not discolored, somewhat elastic, not painful nor tender, and never had been. Nothing like a depression could be discovered in the central part. In 1847, the skin became ulcerated, with a fungus about the size of an egg; was of a red color, without sensation to the touch, without pain or intellectual disturbance, bled readily, and a probe penetrated the substance of the tumor to the depth of three inches, yet the patient recovered.

Operation of Dr. John C. Warren.—An incision being made on four sides of the tumor, so as to make four flaps of the skin, the latter were separated from the fungous mass as exactly as possible; the soft and cerebriform mass cut away in detached portions, the disease traced through an irregular opening in the bone to the dura mater, and the actual cautery applied freely to the surface.

* Transact. Am. Med. Assoc. for 1850, p. 371.

† Ibid., p. 403.

The hemorrhage, which was great, was suppressed by two or three ligatures and the cautery, and the subsequent symptoms were of a favorable character. The wound healed slowly, but after some months closed entirely; has remained well ever since, and the patient has had no unpleasant feelings in her head, or any other symptoms of disease. As the case was witnessed by a great number of medical gentlemen, there can be no doubt as to the character of the disease.

In a previous case in which the disease developed itself in a young man, it returned after removal, and caused death.

In the case of a lady operated on in the Massachusetts General Hospital in 1828, the disease also returned, but the patient did not die until two years after the operation.*

Remarks.—Although the character of these fungous tumors of the dura mater has long been well known, having been thoroughly described by Louis,† Abernethy, and others, all of whom entertained the opinion that they originated from the dura mater, or in the bones of the cranium, yet few surgeons have deemed it advisable to recommend an operation for their relief. Velpeau, however, in an able article upon the complaint,‡ states that in his opinion "extirpation is indicated in these cases of fungous tumors of the head as well as in those situated elsewhere, but that they, like other forms of cancer, also present contra-indications." From reviewing the opinion expressed by him, in the article referred to, it may, I think, be said that, if an operation can be thoroughly performed without excessive loss of blood, the chances of the return of the disease and the ultimate cure of the patient may be placed on a par with the operations for cancerous developments in other portions of the body. In four cases which it has fallen to my lot to witness, the *post-mortem* examination of two not operated on satisfied me that the disease had progressed from the outer lamina of the dura mater towards the scalp. In the other two cases, though the tumors were moderately developed, no operation was deemed advisable, and the subsequent result is unknown; but when last seen, one was rapidly progressing to ulceration. It may therefore be doubted, whether the chances of death from the operation would be greater than those from the natural progress of the disease.

* Warren on Tumors, p. 510.

† Mémoires de l'Acad. de Chirurgie, tome vi. p. 361, edit. Fossone, 1837.

‡ Dictionnaire de Médecine, tome 10eme, p. 532, Paris, 1835.

CHAPTER III.

OPERATIONS UPON THE FACE.

THE Face being composed of various parts, the operations required for their relief, when diseased, will be treated of under their special heads after a brief anatomical description of the portion concerned.

SECTION I.

ANATOMY OF THE FACE.

The Face, as a surgical region, is bounded by the superciliary ridges above, by the base of the inferior maxilla below, and is formed by the superior maxillary, inferior maxillary, malar, nasal, palate, and ethmoid bones, together with the vomer, and inferior turbinated. Its external portions are formed by the skin, muscles, vessels, and nerves.

The skin of the face presents nothing of special interest to the surgeon. Its sebaceous follicles, especially upon the nose, are the occasional seat of tumors, which require the ordinary elliptical or crucial incisions for their removal. When tumors upon the face are so situated as to leave a wound in a very movable portion of the integuments, the use of a stitch or two of the interrupted suture will, as a general rule, be found to answer better as a means of uniting its edges than the employment of adhesive plaster.

In all operations upon the integuments of the face, the attention of the surgeon should be especially given to the line of the incision in order that he may bring the cicatrix as much as possible within the folds created by the action of the subjacent muscles, the levatores anguli oris, zygomatici, and buccinators being those which are chiefly interested.

The action of the levator anguli oris and of the buccinator should be especially recollected in the operations for hare-lip, their contraction being the main cause of the difficulty experienced in uniting the edges of the wound after the operation.

The vessels of the face are principally branches of the facial arteries and veins, hemorrhage from which may be easily checked by the ligature or by compression at the point where the artery passes over the jaw. The nerves are branches of the second branch of the fifth pair coming out at the infra-orbitar foramen, or branches of the seventh pair, or portio dura, which, emerging at the stylo-mastoid foramen, are distributed to most of the muscles. The division of the main trunks of either of these nerves, in removing tumors or other operations upon the face, is apt to cause distortion of the features or loss of sensibility. But, in nearly every instance, as any deep incision must necessarily divide some portions of the nerves of the part, the surgeon can do little more than bear in mind the importance of avoiding them, if possible, or at least of not excising their trunks if they should be divided, as union may possibly restore their function.

The Face is subdivided into the regions of the eyes, nose, and mouth, the anatomical details of which may be briefly referred to before mentioning the operations practiced upon them.

§ 2.—ANATOMY OF THE APPENDAGES OF THE EYE.

The appendages of the eye consist of the lids and the lachrymal apparatus.

The lids are composed of a thin delicate skin, in which are numerous horizontal folds; of a loose and very movable cellular tissue, which latter is often the seat of encysted tumors; of a layer of circular muscular fibres, the orbicularis palpebrarum, and on the upper lid of a vertical muscle, the levator palpebræ, which together create the folds of the skin just referred to; and of two tarsal cartilages, which are thick upon the margin of the lids, thinner at the distance of a few lines, intermediate to the muscle and the conjunctiva, and bevelled on their margin so as to secure a gutter for the tears. The cartilages tend to prevent the puckering of the lids, which would otherwise ensue upon the contractions of the orbicularis muscles. The levator muscle is situated in the upper lid between the orbicularis and the cartilage; arising near the optic foramen, it is attached to the edge of the cartilage near its middle. The conjunctiva or mucous coat of the eyeball is the last layer of the lids. It is reflected from the ball over the posterior face of the lids as far as

the edge of the cartilages, and by its character as a mucous membrane favors the motion of the lid upon the eyeball. Between this membrane and the cartilages lie the Meibomian glands, or tortuous canals, which open upon the edge of the cartilage, and lubricate its surface, thus preventing the escape of tears over the lids to the face, and facilitating their passage along the grooved edge of the cartilages to the puncta lachrymalia or openings of the lachrymal ducts, found in the cartilages near the internal canthus of the eye. The cartilages are attached at the internal canthus by the internal palpebral ligament, which is also the point of origin of the fibres of the orbicularis palpebrarum muscle. Rendering this ligament tense by extending the lids towards the external canthus, furnishes a guide for the point of incision in puncturing the lachrymal sac if the swelling is not too great.

§ 3.—ANATOMY OF THE LACHRYMAL APPARATUS.

The lachrymal apparatus consists of the lachrymal gland which secretes the tears, of the puncta lachrymalia which receive them, and of the canals which conduct them into the nose.

The lachrymal gland (Plate XII, Fig. 1) is placed immediately below and within the external angular process of the frontal bone. Its secretion is emptied upon the ball by six or seven ducts which lie between the conjunctiva and the cartilage of the upper lid. It lubricates the part, facilitates the motion of the lids, and washes out small foreign particles, as dust, &c., accidentally introduced between the lid and the ball, or upon the ball. The course of the tears towards the puncta lachrymalia generally carries such matter to the internal canthus.

The puncta lachrymalia, or openings of the canalicula lachrymalia, are found bordering on the internal end of the upper and lower tarsal cartilage, but are distinct from it. The upper punctum looks downwards, and the lower points upwards, and each in the ordinary condition of the part will admit a bristle. The lachrymal canals or ducts are situated immediately beneath the skin at the internal canthus of the eyelids, in their posterior margins and behind the orbicularis muscle. One is found in each eyelid, and is about half an inch long, the lower being rather the longer. In each lid the canals run perpendicularly at first, upward and downward from the free edge

of the lid for about two lines, after which they converge and enter the lachrymal sac behind the internal palpebral ligament. Stretching or elongating the lids outwardly towards the temple will generally remove the angular commencement of the canals, and favor the passage of a fine probe into the saccus lachrymalis.

The lachrymal sac (Plate XII, Fig. 1) is an oblong cylindrical cavity, or enlargement of the ductus ad nasum, situated in the depression of the os unguis and of the upper part of the same depression found in the nasal process of the superior maxillary bone. It is covered in front by the ligamentum palpebrale, as well as by a few fibres of the orbicularis muscle. The course of the sac is first slightly forwards and from above downwards, but from the level of the orbit it passes obliquely backwards at an obtuse angle with its course at first. It decreases as it descends, and below the edge of the tendon constitutes the lining of the bony ductus ad nasum, and is sometimes designated simply as the nasal duct. It is composed of two layers, an external fibrous one, continuous with the periosteum, and an internal mucous membrane which is continued from the puncta or even the conjunctiva, into the Schneiderian membrane. On a line with the floor of the orbit there is a doubling or valve formed in the membrane, and occasionally there is another at the nasal orifice formed by the Schneiderian membrane.*

The position of these folds is certainly an objection to the introduction of sounds, from the nostril, into the ductus ad nasum, as recommended by Laforest. The length of the duct varies in different subjects, being on an average fifteen lines, and its inferior orifice is pretty regularly found beneath the inferior turbinated bone about five lines from its anterior extremity (Plate XVIII, Fig. 1), about seven lines from the bony orifice of the anterior nares, and about eight lines from the posterior inferior corner of the orifice of the nostril in the recent subject.

* Special Anat. and Histology, by Wm. E. Horner, M. D., vol. ii. p. 400, *et sequitur.*

CHAPTER IV.

OPERATIONS ON THE APPENDAGES OF THE EYE.

THE disorders of these parts requiring operations may be divided into such as involve the eyelids, and such as affect the lachrymal apparatus.

SECTION I.

OPERATIONS PRACTICED ON THE EYELIDS.

§ 1.—TUMORS OF THE EYELIDS.

Several of the tumors seen in other portions of the body are sometimes found developed in the eyelids. Most frequently they are varieties of the encysted tumor; seated in the cellular tissue, and readily removed either by incision of the cyst and the introduction of a sharp-pointed pencil of nitrate of silver, so as to create a slough of the sac; or by incising the integuments and sac, and drawing the latter out with fine forceps; or by dissecting them out, if care is taken to avoid cutting an opening entirely through the lids, as this is apt to prove difficult to heal, from the constant escape of tears through the wound. An important rule in removing these tumors is to make the incision parallel to the course of the fibres of the orbicularis muscle, either through the skin from without inwards, or from the inside of the conjunctiva to the skin, according to the depth of the tumor. Usually the tumor is removed from that side on which it seems to be most superficial, though the incision through the conjunctiva is least apt to produce a scar.

DESMARRES, of Paris, employs a pair of forceps with broad ends, with a fenestra in one of the blades (Plate IX, Fig. 2), well calculated to support the lid, and, at the same time, circumscribe the tumor. Most frequently, however, this operation is too simple to require more than closing of the lid, if the external incision is prac-

PLATE X.

OPERATIONS FOR THE RELIEF OF AFFECTIONS OF THE EYELIDS.

Fig. 1. Extirpation of an encysted Tumor from the upper eyelid, by an incision on its external surface. 1. The tumor as exposed by the incision. 2. Desmarres' ring forceps, as applied to the lid. After Bernard and Huette.

Fig. 2. Extirpation of a Tumor from the lower lid, by an incision through its mucous membrane. 1. Desmarres' double pronged forceps holding the lower lid everted over. 2. The handle of a cataract needle. 3. Fine forceps raising the tumor from the lid. 4. Its dissection with a straight bistoury. After Bernard and Huette.

Fig. 3. Operation of Von Ammon for Symblepharon. The portion of the lid which adheres to the eyeball has been included in two incisions, 1, 2, and 3, 2, which, starting from the tarsus cartilage, extend downwards through the lid. After Bernard and Huette.

Fig. 4. The same operation when completed; the edges of the incision through the skin and muscle of the lid have been united by three sutures, so as to leave a triangular fold of the mucous membrane attached on the edge of the tarsus cartilage, but otherwise free from the lid, so as to facilitate the motions of the ball. After Bernard and Huette.

Fig. 5. A view of the ordinary operation for Ptosis. 1. A pair of forceps raising a horizontal fold of 2. The skin of the lid. 3. The scissors excising the raised portion close to the grasp of the forceps. After Bernard and Huette.

Fig. 6. The shape of the wound 1, 2, 3, left by the removal of the flap in Hunt's operation for Ptosis. " "

Fig. 7. The wound united by fine figure of eight sutures, and its effects in exposing the eyeball. " "

Fig. 8. Operation of Von Ammon for the relief of Epicanthus. 1, 2, 3, 4. The elliptical wound resulting from the removal of a fold of the skin at the root of the nose, the cicatrization of which will uncover the inner canthus of the eye. After Bernard and Huette.

Fig. 9. Jones' operation for Blepharoplasty, or the formation of new lower lid, by sliding a flap up from the cheek. The drawing represents the operation as finished. 1, 2, 3. A triangular flap which has been raised and fitted into the deficiency, where it is held by numerous points of the interrupted suture, the threads being all introduced before being tied, so as to favor accuracy of adjustment in the flap. 3, 4. Closure of the wound left by the elevation of the flap from the cheek. After Bernard and Huette.

Fig. 10. Dieffenbach's operation for the relief of a triangular wound resulting from the removal of a Tumor. 2, 3, 4, 5. The triangular flap which is to be inclined inwards to the wound at 1, 2, 3. After Bernard and Huette.

Plate 10

Fig. 1.

Fig. 2.

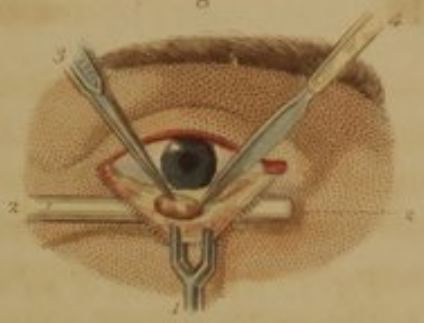


Fig. 3.

Fig. 8.

Fig. 5.

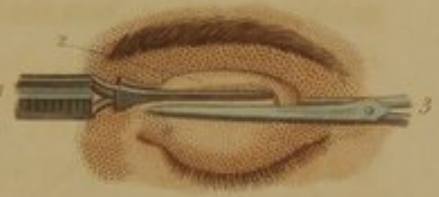


Fig. 4.

Fig. 6.

Fig. 7.

Fig. 9.

Fig. 10.

ticed, or its eversion if the tumor is incised through the conjunctiva, and the seizure of the tumor with fine and small forceps, or a tenaculum, which will be quite sufficient for its removal. The operation of Desmarres, as well as that by eversion of the lid and incision of the conjunctiva, is shown (Plate X, Figs. 1, 2).

Nævi Materni, or vascular tumors of the lids, are occasionally noticed, but unless of unusual size may be treated like the encysted class, by the means just detailed. In large nævi, or those of such size as to promise free hemorrhage, the production of inflammation in the tumor by the introduction of a seton through it, as practiced by Mr. Lawrence, will generally answer a better purpose.*

§ 2.—ENCANTHUS.

This complaint, named from its position (ἐν in, κανθος the angle of the eye), consists in an enlargement or degeneration of the caruncula lachrymalis. When requisite, the tumor may be removed by seizing it with a tenaculum or forceps, and excising it with fine-curved scissors, or with a small scalpel.

§ 3.—EPICANTHUS.

Epicanthus (ἐπι upon, κανθος the angle of the eye) consists in the formation of a fold in the skin at the root of the nose, in consequence of which the internal canthus is, in a measure, concealed. It is a rare complaint, and occasionally requires an operation in order to enable the patient fully to expand the lids. The operation of Von Ammon, of Dresden, consists in pinching up a longitudinal fold of the skin, excising it at the root of the nose of a sufficient width to efface the epicanthus, either with the knife or scissors, and then uniting the elliptical wound thus made by a hare-lip suture. (Plate X, Fig. 8.)†

§ 4.—ANKYLOBLEPHARON.

This disease, so called from the preternatural adhesion of the edges of the lids, is generally the result of inflammation. The union

* Lawrence on the Eye, by Hays, Philadelphia edit., 1847, p. 162.

† Bernard and Huette, p. 115.

may be either partial or total, and is usually found at the external canthus, where, if partial, a director may be passed between the lids and the eyeball, and the adhesions divided either by a probe-pointed bistoury or by probe-pointed scissors. If they are more extensive, and the eye is entirely closed, the lid may be raised in a vertical fold, and a small opening made through it at the external canthus in order to permit the introduction of the director; when the operator, after satisfying himself that the lids do not adhere to the ball (symblepharon), may pass a bistoury along the director, and divide the adhesions at the edges of the cartilages.

After the operation, care must be taken to prevent the reproduction of the complaint by means of cauterization with the nitrate of silver; by separation of the lids by adhesive plaster; by collyria, or by liniments.

§ 5.—SYMBLEPHARON.

Symblepharon (συν with, and βλεφαρον an eyelid) is an adhesion of the lids to the ball of the eye, and generally the consequence of violent inflammation resulting from the introduction into the eye of caustic or other irritating substances, as a drop of oil of vitriol, or a particle of lime, or red-hot iron. Division of the adherent points by probe-pointed pterygium scissors (Plate IX, Fig. 15), or, if slight, their laceration by a probe passed between the lids and the ball, will generally overcome the complaint; but care must be exercised to guard against its reproduction.

As it has sometimes been found very difficult to prevent the renewal of the adhesions, the ingenious operation of Von Ammon may be resorted to (Plate X, Fig. 3). Circumscribe by two incisions, 1, 2, and 3, 2, through the whole thickness of the lid, that portion which is adherent to the eyeball, and the triangular flap thus separated from the remainder of the lids will follow the eye in all its motions. Then, by two or three small pins and the twisted suture, unite the edges of the wound, so as to leave the triangular flap (1, Plate X, Fig. 4) inside, and adherent to the eyeball, until the wound has fully cicatrized, when the flap may be dissected from the ball without any risk of the production of new adhesions.*

* Bernard and Huette, p. 115.

§ 6.—PTOSIS.

Ptosis (πτωσις, a falling) signifies either a total or partial inability to raise the upper lid, and may result either from a congenital excess of integument, or from want of power in the levator palpebræ muscle, or from spasm of the orbicularis palpebrarum, in consequence of which the lid droops upon the eyeball. When such other remedial measures as are adapted to the case have failed in affording relief, an operation may become necessary in order to accomplish the mechanical elevation of the lid, and open the eye sufficiently for the purposes of vision.

OPERATION.—To accomplish this in the ordinary method, raise a transverse fold of the upper lid in a pair of forceps, and either with the scalpel or scissors (Plate X, Fig. 5) cut off the portion thus raised, so as to leave an elliptical wound (which should not, however, include the conjunctiva), and unite the edges of the incision by two or three fine stitches of the interrupted suture. A very important point in the result of the operation is the amount of integument to be included in the fold seized by the forceps: if too much is included, the patient may subsequently suffer from ectropion, or be unable to close the lid; and, if too little, it may become necessary to repeat the operation.

In the operation of Mr. HUNT, of Manchester (Plate X, Fig. 6), the eyebrow is first shaved clean above the point at which a semi-elliptical piece is to be excised—the extent of the flap being calculated according to the amount of the relaxed portion of the lid. This flap may be circumscribed by an elliptical incision of the lid and eyebrow 1, 2, 3, the lower half being made first, and the upper dissected until it exposes the lower fibres of the musculus frontalis. Then, on uniting the wound by three stitches of the twisted suture, the cicatrix will form in the eyebrow, and be subsequently concealed by the hair (Plate X, Fig. 7). The adhesion thus formed between the lid and the frontal muscle will enable the patient to elevate the lid by the contraction of the muscular fibres just referred to.

§ 7.—BLEPHAROPLASTY.

The formation of a new eyelid at the expense of some portion of the adjacent integuments is termed Blepharoplasty (βλεφαρον the eye-

lid, and πλαστικος forming or formative), and may be required for the relief of cicatrices from burns, or for the loss of the substance of the lid resulting from the removal of large tumors, or in order to remedy an error consequent on an extreme miscalculation of the portion of integument removed in the operations for Ptosis just described, or for the cure of Ectropion. Under any of these circumstances, the ordinary rules for plastic operations* must be borne in mind, and especially the necessity of making an apparently excessive flap at first, in order to counteract the contraction which is so apt to follow all plastic operations, but especially those performed to remedy the defects of cicatrices. As the different methods of operating in plastic surgery will be described subsequently, the account at present may be limited to the operations usually resorted to in the formation of the eyelids.

Operation of T. Wharton Jones, of England, or the formation of a flap by stretching the integuments (Plate X, Fig. 9). After having pared the edges of that portion of the lid which is to be renewed, so as to obtain a fresh surface, two incisions in a V, 1, 4, and 2, 4, are to be made near the wound, as upon the forehead, if in the case of the upper lid, or upon the malar or superior maxillary bone, if for the lower; the top of the V-flap, thus formed, being intended for adhesion to the lower portion of the lid. After thus circumscribing the flap, it should then be dissected from the base of the triangle 1, 2 to near the summit 4, and when freed from the subjacent structure, excepting at its summit, it should be gently drawn upon until it fills in the desired space, when it may be retained in its new position by several stitches of the interrupted suture. The gap left in the portion from which it has been drawn may then be closed by approximating the edges and uniting them with the hare-lip suture. The figure represents the flap 1, 2, 3 in its new position, and the union of the sides of the gap 3, 4 by the hare-lip suture, which thus converts a wound of some size into a mere line.

The reader will readily see, by reference to the figure, that the wound at 3 was of the width of 1, 2 previously to its elevation.†

In the operation performed by Dieffenbach, of Berlin, or the formation of a flap by sliding the adjoining skin, a triangular flap, 3, 4, 5 (Plate X, Fig. 10), was raised sufficiently large to fill the gap or wound 1, 2, 3, allowing, as before stated, for subsequent con-

* See Operations on the Nose.

† Bernard and Huette.

traction, which may usually be calculated at about one-third of the whole flap, and dissected free from its attachments, with the exception of its pedicle 3, 5, after which it was slipped into the wound 1, 2, 3. The other gap, 3, 4, 5, from which the flap had been formed, was then left to cicatrize as a simple ulcer.*

In the German operations of GRÆFE and FRICKE, which are modifications of the ancient twisting of the flap as practiced in India, the cicatrix, or diseased portion, was removed so as to leave a fresh surface, 1, 2, 3, 4 (Plate XI, Fig. 1). Then a properly shaped flap, 3, 5, 6, of good dimensions, and at least one-third larger than the wound, was dissected from the adjoining sound skin, and twisted at 3, so as to adapt itself to its position. Being subsequently attached by the interrupted suture to the surrounding portion of the lid, the space caused by its removal was closed by the hare-lip suture, as in 2, 3 (Plate XI, Fig. 2).†

§ 8.—ECTROPIUM.

Eversion of the eyelids, or Ectropium (ἐκτρέπω, to turn out), may result either from adhesion of the external surface of the lids to the surrounding integuments; from a diseased condition of the conjunctiva, or of the tarsus cartilage; or from want of power in the orbicularis muscle.

In the simpler cases of the disease, or those resulting from an hypertrophied condition of the conjunctiva, much may be accomplished by free leeching; astringent collyria; cauterization of the conjunctiva in lines parallel to the fibres of the orbicularis; or by the excision of a fold in the same direction, by raising it with the simple forceps and removing it with fine scissors. But in more obstinate cases, blepharoplasty, or the formation of a new lid, must be resorted to, in order to enable the tarsus cartilage to apply itself properly to the ball.

I. BLEPHAROPLASTIC OPERATION FOR ECTROPIUM.

Dr. HORNER, of Philadelphia, has relieved Ectropium in the right eye by the following plan:—

* Bernard and Huette. † Ibid.

PLATE XI.

OPERATIONS FOR THE RELIEF OF AFFECTIONS OF THE EYELIDS.

Fig. 1. Blepharoplastic operation of Græfe on the upper Lid, effected by twisting the flap. 1, 2, 3, 4. The elliptical wound left in the upper lid by the removal of a tumour, &c. 3, 5, 6. The incision circumscribing a flap upon the skin at the external angle of the orbit, and destined to fill up the wound. After Bernard and Huette.

Fig. 2. A view of the operation as completed: the flap is retained in the lid by the sutures 1, 1, 1, whilst the space 2, 3, left by the removal of the flap, is closed by a fine hare-lip suture. After Bernard and Huette.

Fig. 3. Operation of Sir William Adams for Ectropium. 1. The first incision made through the lid by cutting from within to the tarsus: the edge of the tarsus beyond this incision is then held by 2, the forceps, and a triangular piece of the lid removed by 3, the scissors. After Bernard and Huette

Fig. 4. Dieffenbach's operation for Ectropium. 1, 2. Longitudinal incision through the skin and muscle of the lower lid; the mucous membrane is then seized with 3, the forceps, and a fold excised with 4, the scissors; a suture unites all together, and the cicatrization of the conjunctiva in the wound inverts the edge of the lid. After Bernard and Huette.

Fig. 5. A diagram of Horner's operation for Ectropium in the right eye, resulting from a burn. (A) 1, 2. An incision along the edge of the lower lid to free it from the cheek. 5, 6. A second incision, an inch long, from the middle of the first towards the angle of the jaw. 6, 7. A third incision from the termination of this towards the point of the nose. 3, 4. Two angular flaps formed by these incisions. (B) 1, 2. Lower edge of lid. 3. The lower angular flap raised to the edge of the lid, and fastened at its angle by a pin. 4. The upper angular flap depressed to fill in the gap left by 3. After Horner.

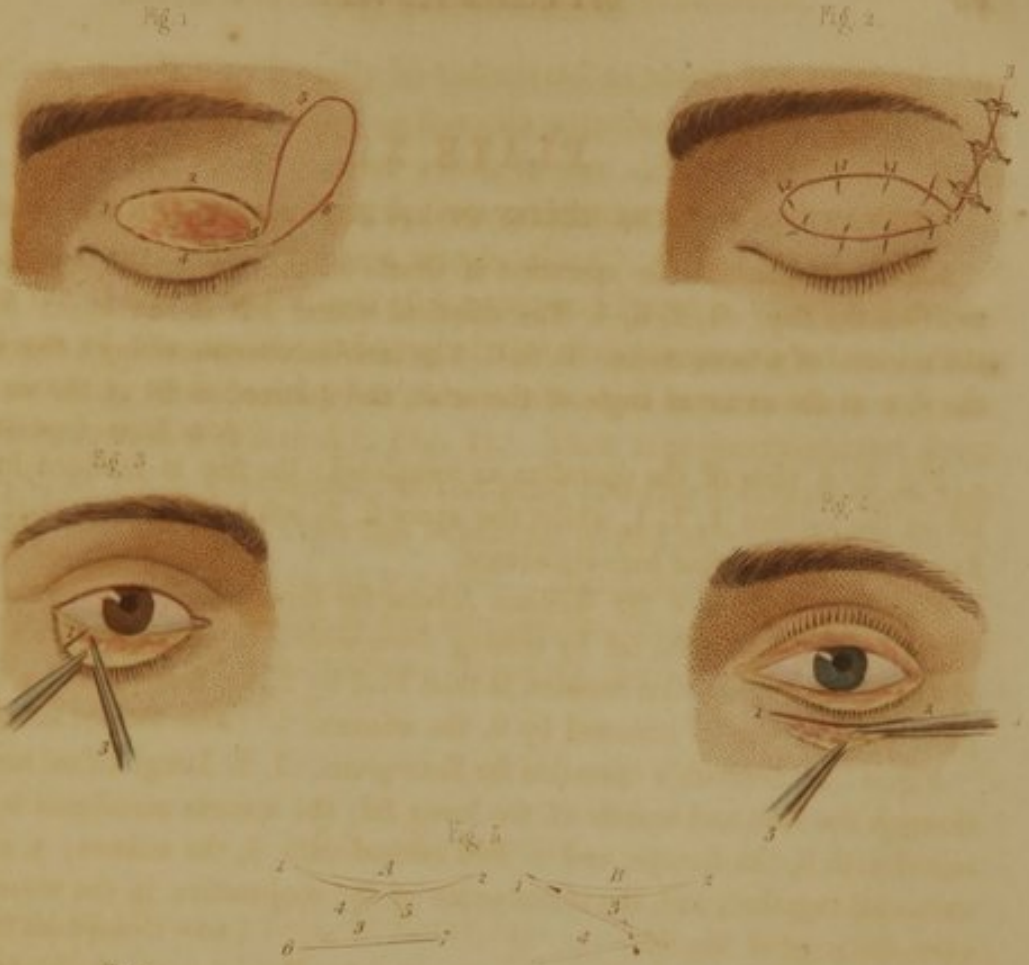
Fig. 6. Desmarres's operation for Ectropium. 1, 2. The first incision at the external canthus. 2, 3. The second incision, which, commencing at 3, terminates at 2. 1, 4, 3, 4. Two incisions, which, starting from the terminations of the first, unite at 4 on a line with the reflection of the conjunctiva from the lid to the ball. After Bernard and Huette.

Fig. 7. The same operation, as completed. " "

Fig. 8. Operation of Janson for Entropium. 1. Adams's forceps raising a fold of the skin of the lid near the internal canthus. 2. Scissors curved on the flat, excising the portion thus raised. 3, 4. The same kind of incision as completed near the external canthus. After Bernard and Huette.

Fig. 9. Brainard's modification of Fricke's operation for Ectropium in the left eye resulting from a burn, the flap being taken from behind the external angle of the eye, and rotated upon its base so as to fill up the space left by detaching the lid from the cheek. After Brainard

Plate II



OPERATION.—An incision (1, 2, Plate XI, Fig. 5 at A) two inches long being made down to the bone parallel with, and at the inferior margin of the orbicularis muscle, the whole thickness of the lid was dissected up from the adjoining bones, and another incision, 5, 6, made an inch in length from about the middle of the first downwards towards the angle of the jaw. From the termination of this, another, 6, 7, was directed towards the point of the nose, the last two incisions defining an angle of integuments 3, which, being dissected up as far as its base, was then turned into the beginning of the first incision.

The angle 3, taken from the cheek, being inserted into the lower eyelid (Plate XI, Fig. 5 at B), and the angle 4 drawn to fill up the gap, pins should be fixed so as to keep the parts in place. An almost immediate correction of the deformity ensues, and common dressings accomplish the cure.*

Dr. BRAINARD, of Chicago, in a very bad case of ectropium of the left eye, resulting from a burn, modified Fricke's operation as follows:—

OPERATION.—The eyelid being first dissected up so as to place it in its natural position, a wound an inch and a half long by three-quarters of an inch broad was left beneath the lid. To fill this, a flap was taken from behind the external angle of the eye, of a corresponding form, but somewhat larger, in order to allow of contraction (Plate XI, Fig. 9). This flap, being turned upon its base, was then brought into the wound left by dissecting up the lid, and retained there by numerous points of the interrupted suture; the wound created by the removal of the flap being subsequently closed by adhesive plaster and simple dressings. In two weeks the patient returned home relieved of the deformity.†

In the operation proposed by Sir WM. ADAMS in 1812 (Plate XI, Fig. 3), which is especially adapted to cases in which the tarsus cartilage is much elongated, the edge of the lid was seized with forceps, and a V-shaped piece, of sufficient width at its base to restore the position of the lid (in some instances equal to four lines), removed with the scissors. The wound, being then united by one or two fine pins and the twisted suture, soon cicatrized.

DIEFFENBACH proposed to diminish the conjunctiva in order to

* Amer. Journ. Med. Sciences, vol. xxi. p. 106, 1837.

† Ibid., vol. x. p. 356, 1845. Also, Hays's Lawrence.

restore the lid to its proper position. To accomplish this, he cut transversely through the skin on the outside of the lid, as at 1, 2 (Plate XI, Fig. 4), and through all the thickness of the other tissues until he reached the conjunctiva. Then, seizing this membrane with the forceps as at 3, he drew a fold of it out through the incision in the integuments, and excised it with fine scissors. Uniting the conjunctiva and the edges of the wound by a few stitches of the interrupted suture, the free edge of the lid was drawn up by the process of cicatrization.*

DESMARRES, in order to avoid the cicatrix which arose from the operation of Sir W. Adams, proceeded as follows: He first made a horizontal incision, 1, 2, through the tarsal cartilage (Plate XI, Fig. 6) at the external canthus; then a second one from 3, at such a distance from the first as corresponded with the size of the piece of the cartilage to be removed, carrying this incision to the termination of the first at 2. Then, uniting these by two others, 1, 4, and 3, 4, he excised this portion of the lid, and, uniting the whole wound by the twisted suture (Plate XI, Fig. 7), caused the cicatrix to be concealed in the wrinkles found at the angle of the eye.

REMARKS.—When Ectropium is very marked, and especially when it is the result of cicatrization from the effects of burns, the plastic operations just referred to offer the best chances of success; yet, even here, if the tissue from which the flap is formed is not perfectly healthy, and indeed even when it has all its natural characters, the operator, according to my experience, may look for disappointment from its subsequent contraction, unless he is liberal in his calculations.

§ 9.—ENTROPIUM.

Entropion (εντρεπω, to turn in) is the reverse of ectropium, and characterized by inversion of the lids, in consequence of which the eyelashes are brought in contact with the ball, and keep up a continual inflammation. In this, as in the former affection, the treatment must be regulated by the cause. In the early stages the use of astringent collyria, or of adhesive strips to draw the lid outwards, or similar simple measures, may accomplish the cure if the deformity is not very great. The production of a slough in the skin by the

* Bernard and Huette.

linear application of a piece of soft wood wet with sulphuric acid, as proposed by Quadri, and the subsequent cicatrization of the ulcer may also answer, though it leaves a scar. But if these means fail, or if the disease is obstinate, an operation consisting in excision of the integuments will be required.

In many instances, the excision of the lid, as recommended in ptosis, will be found to answer a good purpose.

OPERATIONS BY THE EXCISION OF A PART OF THE LID.

JANSON, of Paris, drew the tarsus into its proper position by raising a vertical fold of the integument with broad forceps, as 1 (Plate XI, Fig. 8), and after excising it with the scissors, united the wound by the twisted suture, as at 4, 5, same figure. If the excision of this one fold is not sufficient, two or more may easily be added to it, until the lid is brought by the cicatrices to its proper relations with the eyeball.*

Dr. JOHN SYNG DORSEY, of Philadelphia, reflecting on the nature of the complaint, and without, as he expressly states, any knowledge of Mr. Saunders' operation, thought that half the eyelid might, if requisite, be cut off without much inconvenience, as the natural contractions of the orbicularis palpebrarum, by throwing the skin into folds, rendered it evident that much of the lid might be removed, and yet the eye be entirely closed.

OPERATION.—In July, 1810, he therefore made an incision through the tarsus, and cutting out completely all that portion of the lid from which the cilia proceeded, and uniting the edges of the wound by a suture, cured the patient in a few days, with very little deformity. Encouraged by the success of the case, he twice, in 1810, repeated the operation with a similar result.†

Mr. SAUNDERS, about the same period, operated as follows: Introducing a thin plate of horn or silver with a curvature corresponding to that of the eyelid, the lid was stretched upon it and an incision made through the integuments and the orbicularis muscle immediately behind the roots of the cilia, to the tarsus, from the punctum to the external canthus. Then dissecting off the exterior surface of the tarsus until the orbitar margin was exposed, the conjunctiva was

* Bernard and Huette.

† Dorsey's Elements of Surgery, vol. i. p. 334.

PLATE XII.

OPERATIONS PERFORMED FOR THE OBSTRUCTION OF THE LACHRYMAL PASSAGES.

Fig. 1. A side view of the relative positions of the different portions of the Lachrymal Apparatus of the left Eye. The upper and lower eyelids, with a small portion of the bones and integuments on the side of the nose, have been removed, so as to expose the structure freely. After Bernard and Huette.

1. The lachrymal gland in its natural position at the edge of the orbit, near the external angular process of the os frontis. The conglomerate structure of the gland is well shown.

2. The superior punctum lachrymalis, with the course of its canalicula, to the saccus lachrymalis.

3. The inferior punctum lachrymalis in its course to the sac.

The head, or enlargement of the ductus ad nasum, sometimes designated as the Saccus Lachrymalis, is seen between the lines of 2 and 3.

4. The ductus ad nasum, exposed by removing its anterior parietes. Its course from the puncta down to the inferior turbinated bone, and the direction to be given to instruments introduced into it, can thus be readily understood.

Fig. 2. A three-quarter view of the Face. Anel's probe has been introduced into the upper punctum and carried into the lachrymal sac, whence it may be made to enter the nose. The dotted line shows the course that the instrument would take, and the probe in the nostril indicates the position of instruments when passed into the duct from the nose, as in the plan of Laforest. After Bernard and Huette.

Fig. 3. The position of the operator's fingers, when washing out the lower punctum with Anel's syringe. The mode of holding the syringe so as to prevent undue pressure on the canal, is also shown.

After Bourgery and Jacob.

Fig. 4. Operation of puncturing the Lachrymal Sac of the left Eye in cases of obstruction. The forefinger of an assistant is represented making traction on the lid so as to render the position of the palpebral ligament apparent, if the swelling and inflammation permit it. A straight narrow bistoury has punctured the integuments and anterior face of the sac, and whilst retained in its position, a probe has been passed along the blade of the knife into the duct and thence into the nose. After Bernard and Huette.

Fig. 5. Operation upon the right Eye; the bistoury, after puncturing the sac, has been retained in its position until Ware's style could be introduced.

Modified from Bernard and Huette.

Fig. 6. Fistula Lachrymalis, and the introduction of a bougie into the duct through the fistulous orifice. After Bernard and Huette.

Plate 12

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 5.

Fig. 6.

Fig. 4

cut through by the side of the tarsus, and disengaged at each extremity.* Sutures subsequently united the remainder of the tarsus to the upper edge of the wound, and also left but little deformity.

Remarks on the Value of these Operations.—In estimating the value of the operations just detailed as practiced on the eyelids, so much must depend upon the peculiarities of each case that it is, perhaps, best to leave a decision of their value to the judgment of the moment. In deformities resulting in Ectropium and consequent on burns or ulcers, the tendency to contraction is so great, that, in operating, too much integument can scarcely be obtained. In all such instances, blepharoplasty presents the best chances of success, but even then the operator should be very guarded in his prognosis. In the case of a young lady in whom the upper lid had contracted adhesions to the edge of the orbit, in consequence of a burn, leaving the eyeball exposed to dust and other irritation, I formed a flap from the forehead more than three times as large as the space to be filled in the lid, and, fastening it in position, obtained union by the first intention. Six months subsequently, the cicatrization of the wound from which the flap was taken, and the contraction of the latter, had elevated the lid nearly to the edge of the orbit.

In Entropium, the operation of Dr. Dorsey is preferable to that of Mr. Saunders, from its simplicity, as it only requires that a tenaculum should be passed through the edge of the eyelid, in order to gain a secure hold; and then, seizing the lid in a pair of forceps, that a sufficient portion should be removed by two or three clips of the scissors.

SECTION II.

OPERATIONS ON THE LACHRYMAL APPARATUS.

The principal disorders to which the lachrymal apparatus is exposed are scirrhus, and such other degeneration of the lachrymal gland as may necessitate its removal; or obstruction of the puncta lachrymalia, thickening and stricture of the ductus ad nasum, or suppuration and ulceration of the sac itself. At present, this account may be limited to such operations as are required by disorders of the tear passages; the removal of the lachrymal gland being

* Dorsey's Elements of Surgery, vol. i. p. 334.

usually accomplished by such means as are employed for the extirpation of other tumors, that is, by an incision through the lids, and the dissection of the gland from the surrounding parts. When the gland is removed, the loss of its secretion will be in a measure supplied by the increased action of the conjunctiva as a mucous membrane, the mucus of this being generally sufficient to favor the action of the lid over the ball. In contraction of the puncta lachrymalia, or of the canalicula lachrymalia, it occasionally becomes necessary, after employing antiphlogistic measures, and mild collyria, to dilate them by a probe, or to wash out the sac and ductus ad nasum.

Dilatation of the Puncta.—To one familiar with the anatomical relations of the parts, catheterism of these ducts is a simple affair, and may be accomplished by introducing Anel's probe, or the blunted point of a fine cambric needle, into the punctum, and repeating the operation, from time to time, as it may be required.

To dilate the Canals and Ductus ad Nasum.—Draw the eyelid towards the temple in order to straighten the canalicula, and introduce a fine probe or needle, fastened into a light handle to facilitate its manipulation (Plate IX, Fig. 7), into either punctum by passing it perpendicularly into the orifice; then, carrying the handle towards the temple or nearly parallel with the lids, move it gently towards the inner canthus of the eye. On reaching the sac, elevate the instrument from the horizontal nearly to a perpendicular direction, and on carrying the handle obliquely forwards, the point will pass readily into the nose (Plate XII, Fig. 2). The figure shows the probe when it has reached the sac and is about to pass into the duct, and the dotted line indicates its course downwards. The introduction of a probe from the nostril into the duct, as suggested by Laforest, is also shown in the drawing, but the operation has little to recommend it, being opposed to the anatomical relations of the parts, and the same end being also better accomplished by operating from above.

To wash out the Canals and Sac.—Introduce one of the fine points of Anel's syringe into the lower punctum, holding the instrument with the forefinger upon the piston, as shown in Plate XII, Fig. 3. Then straightening the lid, throw in the fluid by the motion of the forefinger, taking care not to press the point of the syringe into the membrane lining the canals, nor to push a fold of it in advance of the instrument. If the liquid does not pass out

of the syringe as freely as the orifice should permit, withdraw the point a little, and again passing it forwards it will be easy to avoid any duplicature of the membrane. Whilst injecting either punctum, the other should be closed to prevent regurgitation. If the liquid passes freely through the duct, the fact will soon be rendered apparent by its escape either from the nose or throat of the patient, according as the head is held forwards or backwards. The liquid injected may consist either of simple water or of mild or alterative collyria. If the operator can only use his right hand, he must stand either in front of, or behind his patient, according to the eye to be operated on, that is, in front for the left eye, and behind the patient when operating on the right; but if he is ambidexter, his position will be immaterial.

Fistula Lachrymalis.—When inflammation of the lachrymal sac results in suppuration, or when an abscess of this structure ulcerates, and opens upon the integuments, there is usually such a constriction of the ductus ad nasum as requires the introduction of a foreign body to dilate it and restore the patulous condition of its channel.

Introduction of a Bougie or Style, or Canula.—The introduction of any of these instruments requires the formation of an opening through the integuments into the sac, unless the discharge from the abscess has created an orifice by ulceration. The ordinary operation is performed as follows: Endeavor to render the ligamentum palpebrale prominent by drawing the lids outwards, as it is the great point of reference, the sac lying somewhat in front and below it. Sometimes, on account of the swelling and inflammatory thickening of the integuments, the operator cannot feel this ligament, and must therefore be guided in his puncture by the distended sac, or by his knowledge of its proper position, and especially its relation to the edge of the orbit. Having decided on this, let him take a narrow, straight, and sharp-pointed bistoury, and, standing in front of the patient for the left eye, and behind him if the disease is in the right one, puncture the integuments and anterior surface of the sac by pressing the point of the instrument with its back to the nose obliquely downwards and backwards. On entering the sac, bring the handle to a nearly upright position, and carry it forwards, slightly towards the nose, and downwards, so as to make the point pass backwards and obliquely outwards and downwards (Plate XII, Fig. 4). Retaining the bistoury in the duct, pass a probe along the knife as a director until it reaches the nostril, and, withdrawing the bistoury, pass the

style or bougie, or canula, along the course of the probe, and withdrawing the latter, fasten the instrument down by a piece of adhesive plaster, or simply trust to its retaining its position in consequence of the depth to which it has been introduced. Some surgeons, and especially the French, prefer passing the canula of Dupuytren along a groove made in the knife in order to conduct it into the duct with greater certainty; but in the United States, the style of Ware, with the head blackened by a little varnish or sealing-wax, and employed in the manner just directed, is almost universally resorted to. To guard against a change in the relations of the soft parts, consequent on the escape of the pus, when the sac is opened, the resort to a probe passed into the duct before the bistoury is withdrawn, if the style cannot be passed in the first instance, will be found most serviceable; and I have more than once seen surgeons entirely baffled in the introduction of the style in consequence of withdrawing the bistoury before the probe or style was fairly in the orifice made in the sac. From the collapse of the sac after its puncture, there is also, occasionally, risk of the style passing outside of the lining membrane or between it and the bony duct, so as to separate the former entirely from the bone, thus leading to entire obliteration of the cavity as well as to disease in the bone. Whenever, therefore, great difficulty is experienced in introducing the style, caution in reference to this accident becomes necessary. If the duct is obliterated, a perforation may be made through the os unguis from the sac; but if it is only closely strictured, the practice recommended by Dr. Robert W. Haxhall, of Richmond,* will be found serviceable. The plan proposed by Dr. Haxhall is the same as that recommended by Ducamp in stricture of the urethra, viz., first to take a mould of the stricture by a soft bougie, and then apply lunar caustic to the constricted part. The same idea was previously suggested by Dr. Nath. Smith, of Dartmouth College, in 1817, though he employed caustic potash instead of the lunar caustic. His mode of using it is as follows: Render the tendon of the orbicularis (lig. palpebrale) conspicuous, cut into the sac, introduce a probe, and find the obstruction. Then substitute a bougie armed with a morsel of caustic potash, press the alkali upon the opposing membrane, and the obstruction will soon be overcome or the passage dilated.† When the duct is so perfectly obliterated that its patulous character cannot be

* Boston Med. Magazine, p. 147, 1832. † Ibid., p. 403, 1833.

restored, then it may be necessary to make a perforation into the nostril by means of a punch (Plate XIV, Fig. 2), or a fine trocar, or the bone may be punctured and the fragments carefully picked out, in order to guard against the subsequent closure of the wound. To prevent extensive fracture or laceration of the neighboring parts, the puncture must be made with care.

After Treatment.—After the introduction of the style or bougie, they may be fastened in their position by a morsel of adhesive plaster, though, most frequently, the swelling of the integuments will be sufficient to retain them. After the lapse of six or eight days, the style should be removed by seizing its head with a pair of dissecting forceps, and withdrawn by a movement which is the reverse of that employed for its introduction. The point of a syringe being then placed in the canal, the part should be thoroughly washed, and the pervious character of the passage tested by the escape of the water either from the nostril or into the throat of the patient. Then replacing the style, the same means should be resorted to from time to time, until all inflammation has subsided, after which, common cleanliness is all that is requisite; the patient should, however, wear the style for at least six months, or until the permeable character of the ductus ad nasum seems well established. On finally removing it, the orifice will heal readily under the occasional application of the nitrate of silver.

Remarks.—In the early stages of inflammation in the sac or its duct, the antiphlogistic treatment, and the dilatation of the passage by Anel's probe passed through the punctum into the nose, will often suffice for the cure; but when the disease is more advanced, puncture of the sac and the subsequent introduction of a bougie or style in the manner just detailed will be requisite. Puncturing the os unguis is very seldom required when the surgeon is familiar with the relative changes of position necessary for the introduction of an instrument into the nose, and it should only therefore be attempted as a last resort.

CHAPTER V.

OPERATIONS UPON THE EYEBALL.

As the anatomical details of the eyeball are comparatively limited in their relations to operative surgery, they can readily be referred to in connection with the operations practiced upon them. The operations practiced on the eyeball consist in those required by diseases of its tunics, muscles, and humors.

SECTION I.

OPERATIONS ON THE COATS, OR EXTERNAL PORTIONS OF THE EYEBALL.

The conjunctiva covering the eyeball being a reflection of that covering the lid, is liable, like it, to such a degree of inflammation, as may result in thickening, granulation, ulceration, or the development of accidental growths.

When from violent or repeated attacks of ophthalmia, the conjunctiva is left in an hypertrophied or simply œdematous and thickened condition (Chemosis), it is desired to excise one or two of the largest vessels, or a small fold of the conjunctiva, it is only necessary to raise the latter in a pair of fine forceps, and cut it off with scissors, according to the long diameter of the ball.

Granulations, even when exuberant, generally yield to the action of the lunar caustic, or to the sulphate of copper, applied either in solution or in mass. The fungous growths occasionally seen after the operation of strabismus, may also usually be treated in this manner, and if a warty growth be found upon the adnata, as reported by Dr. Physick,* the caustic will readily remove it.

Pterygium.—Pterygium (πτερον, a wing), or a vascular thickening of a portion of the conjunctiva, on either side of the cornea, may be removed simply by seizing the growth with a pair of fine forceps, and excising it with the curved scissors usually known as

* Philadelphia Medical Journal, vol. v. 1827.

pterygium scissors, or by dividing the vessels composing it transversely, and then cauterizing the wound with the nitrate of silver, so as to prevent reunion of the divided vessels.

SECTION II.

OPERATIONS ON THE MUSCLES OF THE EYEBALL.

Strabismus, or squinting (στραβίζω, I squint), is a variation of the eye from the centre of the orbit, in consequence of which the parallelism of the optic axes is destroyed. This affection may result from various causes, but only becomes a fit subject for an operation when positively dependent on spasmodic contraction of the muscles which move the ball. If the eye turns in, the squint is said to be convergent; but if the cornea is turned outwards, it constitutes a divergent squint. In addition to the deformity, this complaint also impairs vision, and it is in the latter case that surgical interference is especially demanded. If judgment is exercised in the investigation of the cause, and it is found that on closing the sound eye the patient with a convergent squint can turn the other eye towards the temple, then the operation may be attempted with confident expectations of success; but if, when the sound eye is closed, that which squints cannot be turned in the opposite direction to the squint, an operation will prove of little benefit to the patient.

§ 1.—ANATOMY OF THE MUSCLES CONCERNED IN SQUINTING.

The eyeball is moved by six muscles, two of which are oblique and four are straight, the internal straight one being mainly concerned in the production of the convergent or most common form of strabismus. The straight muscles all arise from around the optic foramen, and are inserted by broad and thin tendons into the sclerotic coat of the eye about three or four lines from the cornea.

The superior oblique muscle also arises from near the optic foramen, but the inferior oblique takes its origin from the nasal process of the superior maxilla at the side of the os unguis. Both are inserted into the sclerotica, about half way between the cornea and the optic nerve. Between all the muscles and the conjunctiva is found

PLATE XIII.

OPERATIONS FOR STRABISMUS OR SQUINTING.

Fig. 1. A vertical section through the external face of the right Orbit, showing the position of the muscles of the right Eye. 1. The eyeball. 2. The levator palpebræ superioris muscle. 3. The rectus superior muscle. 4. The rectus externus muscle. 5. The rectus inferior. 6. The inferior oblique muscle near its insertion. 7. The point of origin of the recti muscles near the optic foramen. The cavity of the antrum has been exposed on this side, but a considerable portion of the eyelids remain uninjured.

After Bernard and Huette.

Fig. 2. A side view of the sheaths of the muscles of the right eye, and their expansion upon the ball so as to form the Sub-conjunctival Fascia, as described by Malgaigne. 1. The eyeball. 2. Sheath of the levator palpebræ. 3. Sheath of rectus superior. 4. Sheath of rectus externus. 5. Sheath of rectus inferior. 6. Sheath of inferior oblique.

After Bernard and Huette.

Fig. 3. The general arrangement of the Ocular Muscles at their insertion into the Sclerotica, as shown in a front view of the Eyeball when the muscles are stretched from behind forwards. The tendinous expansion upon the ball is well displayed. 1. Superior rectus. 2. Rectus externus. 3. Rectus inferior. 4. Rectus internus. 5. Superior oblique muscle, in its trochlea.

After Bernard and Huette.

Fig. 4. A front view of the first steps in the operation of Strabismus, as practiced by Dr. I. Hays, of Philadelphia, and about to be performed on the left Eye. The sound eye being covered by a handkerchief, the eye to be operated on becomes straight and tolerably steady. The eyelids are then separated by the spring speculum, placed on the outside of the tarsus. The operator, holding the forceps in his right hand, seizes and raises a fold of the conjunctiva near the internal canthus, and divides it vertically by scissors held in the left hand. If not ambidexter, the surgeon may reverse the position of the hands by standing behind the patient; but that shown is the most convenient to many. The muscle is subsequently seized and divided as in Fig. 7.

Drawn from nature.

Fig. 5. The operation of Sedillot, of Paris, for Strabismus. 1. The speculum applied inside the lids. 2. A double hook held by an assistant, so as to evert and steady the ball. 3. Forceps raising a fold of the conjunctiva. 4. Scissors in the act of cutting the fold so as to expose the muscle.

After Bernard and Huette.

Fig. 6. 1. A blunt hook passed under the muscle. 2. The muscle as raised on the hook.

After Bernard and Huette.

Fig. 7. 2. The hook raising the muscle. 2. Curved scissors in the act of dividing it.

After Bernard and Huette.

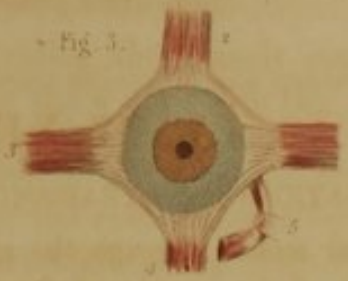


Fig. 3.

Fig. 1.

Fig. 2.

Fig. 4.

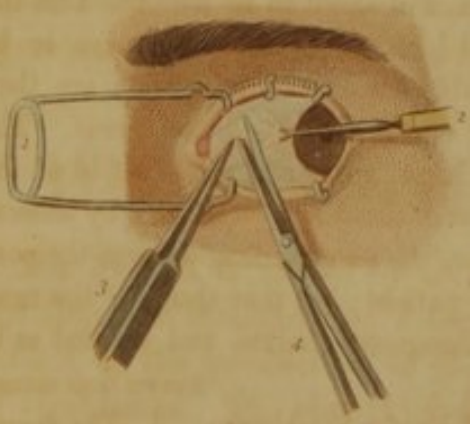


Fig. 5.

Fig. 7.

Fig. 6.

a white fibrous membrane which lines the ocular conjunctiva throughout. This membrane extends from the palpebral ligament in front as far as the cornea, and then turning backwards forms a complete envelope for the sclerotica until it reaches the optic nerve, with the neurilemma of which it appears to be continuous. On the sclerotica it is very movable, and a layer of sero-cellular substance is interposed between them. At the points of insertion of the tendons it is folded around them so as to form a fibrous sheath (Plate XIII, Fig. 2), which degenerates into cellular tissue on the muscle.* This membrane is designated by Malgaigne as the Sub-conjunctival Fascia, and, in most cases of squint, requires to be divided.

In the operation for strabismus, it is, therefore, necessary to incise the conjunctiva and fascia, expose the muscle or its tendon, and divide it entirely, but without removing any portion, lest its subsequent power be entirely destroyed.

§ 2.—OPERATION FOR STRABISMUS.

The credit of suggesting this operation is generally assigned by European writers to Stromeyer, but in the United States it is well known that it was practiced in four cases, with partial success, by Dr. Wm. E. Gibson,† of Baltimore, in 1818, who laid it aside from the recommendation of Dr. Physick, the latter gentleman fearing that the result might be injurious to vision. To Stromeyer, however, is certainly due the credit of having brought the operation into general notice in 1838, and to Dieffenbach belongs the honor of having established its success beyond a doubt. It was subsequently performed in New York by Dr. Willard Parker in 1840, and by Drs. A. C. Post, Gross, Detmold, and Dixon, shortly afterwards, who in several papers called attention to its utility.‡

Various modes of operating have been employed by different surgeons, but all have the same object, and only differ in the means employed.

STROMEYER controlled the movements of the ball by a fine hook inserted into the conjunctiva, elevated a fold of the same membrane

* Malgaigne, Operative Surgery, Phila. edit., p. 288.

† Now Prof. of Surgery in the University of Pennsylvania. See Principles and Practice of Surgery, vol. ii. p. 375, Philad. 1841.

‡ Cooper's Surg. Dict.; Appendix by Reese; article STRABISMUS.

in forceps, incised it with a cataract knife, and, raising the muscle upon a hook, divided it with scissors or a curved knife.

DIEFFENBACH elevated the upper lid with Pellier's speculum, depressed the lower lid by the finger of an assistant, drew the eyeball outwards by a fine hook in the conjunctiva, elevated a fold by another fine hook, incised the conjunctiva between the hooks with curved scissors, elevated the muscle on a curved hook, and divided it with the same scissors.

SEDILLOT separated the lids by a spring speculum, inserted a hook into the sclerotica to steady the eye, elevated a fold of the conjunctiva with forceps, and divided it with curved scissors (Plate XIII, Figs. 5, 6, 7), pursuing in the remainder of his operation the course just detailed.

Dr. JOSEPH PANCOAST, of Philadelphia, operates very much in the same manner.* There is, however, according to my observation, no necessity for a hook to fix the eyeball, and the following plan, which I have frequently practiced with success, and which is the process long pursued at the Wills' Hospital, for the eye, in this city, is much more simple. To Dr. I. Hays, senior surgeon of the hospital, and editor of the *American Journal of the Medical Sciences*, is due its introduction into that institution, where it is now generally resorted to.

OPERATION OF DR. HAYS.—Dr. HAYS closes the eye, generally the soundest one, with a handkerchief or bandage, in consequence of which, the affected eye becomes straight if the case is a proper one for the operation. Then, having separated the lids by a speculum, he seizes a fold of the conjunctiva over the muscle, with a pair of good forceps, elevates it, incises it with a snip of the curved scissors, divides the fascia, if necessary, in the same way, passes a *large* curved hook (Plate IX, Fig. 23) having a convexity at least equal to that of the ball, beneath the muscle from below upwards, and divides it with the same scissors.

Seizing the conjunctiva in this manner is quite sufficient to steady the eye, and the subsequent steps of the operation are equally simple.

AFTER TREATMENT.—A little cold water and a fine sponge usually suffice to check the slight hemorrhage resulting from the incision, when, if the muscle has been thoroughly divided, the patient will generally be able to keep the eye straight. This eye should then

* Operative Surgery—Strabismus.

be left open, bathed frequently with cold water, and the patient directed to use it, while the other is kept closed. The use of a simple collyrium will generally relieve the conjunctival injection in a few days, when both eyes may be used, so as to acquire a proper parallelism of vision; but, occasionally, a little fungous growth results from the incision, and may require excision or to be removed by caustic, though it is not common except where the conjunctiva has been very freely divided.

GUERIN has proposed a sub-conjunctival division of the muscle, but this is necessarily uncertain, and, as the ordinary operation causes little inconvenience, the plan has nothing specially to recommend it.

§ 3.—EXTIRPATION OF THE EYEBALL.

When from malignant disease or other causes, it becomes necessary to remove the entire eyeball, it is of great importance that as much of the upper lid should be preserved as is possible, in order to protect the cavity of the orbit from foreign matter as well as to favor the subsequent use of an artificial eye.

ORDINARY OPERATION.—The patient being either seated or lying down, pass a large curved needle, armed with a strong ligature, through the ball, as far back as possible; remove the needle, and tie the ligature in a loop. This will give the assistant the control of the tumor. The surgeon should then incise the lids at the external commissure, carrying the incision at least as far as the outer edge of the orbit; rapidly dissect the lids from the ball by cutting through the reflexions of the conjunctiva, and, passing the scalpel or straight bistoury along the os planum (internal canthus), carry it around the orbit so as to divide the attachments of the two oblique muscles, and on cutting towards the external canthus remove, if requisite, the lachrymal gland. Then, without drawing too strongly upon the ligature, lest injury be done to the origin of the optic nerve, put the four recti muscles upon the stretch, and, passing the knife to the bottom of the orbit on its external side, free the attachments of the ball and remove it, arresting the hemorrhage by stuffing the orbit with lint. The advantage of the ligature over forceps or a tenaculum, as a means of controlling the tumor, will be found in the firmness of its attachment to the ball, owing to the fibrous character of the sclerotic coat.

§ 4.—TUMORS IN THE ORBIT.

When tumors in the orbit are of such a size as will prevent their extirpation through the lids, it may become necessary to divide the external canthus, and then to unite the wound by a stitch of the interrupted suture; a piece of linen wet with cold water being the only dressing that is generally required. When tumors, and especially those which resemble scirrhus, are found upon the tarsal cartilages, their removal may be accomplished by a V incision, or in a manner similar to that spoken of under the operation for Ectropion.

CHAPTER VI.

OPERATIONS PRACTICED ON THE HUMORS OF THE EYE.

An account of the anatomical relations of the component parts of the eyeball may either be limited to a brief enumeration of the general characters of each portion, or extended into a minute description of the structures concerned. From the importance of the diseases of this organ, the latter course has generally been pursued by surgeons who have devoted themselves especially to this branch of the profession. The general character of the present work, and the necessity of affording to other subjects an equal amount of space, must, however, preclude any attempt at a detailed account of them.

SECTION I.

ANATOMY OF THE EYEBALL.

The eyeball is composed of six coats and three humors.

These coats are the conjunctiva, sclerotica, and cornea, which may be described as external; and the choroid, iris, and retina, which are within the former. The humors are the aqueous, crystalline, and vitreous.

The Conjunctiva, or mucous coat, after lining the lids, is reflected

upon the ball, and covers both the sclerotica and cornea. To the sclerotica it is loosely attached by cellular tissue, in consequence of which it is liable to fluid infiltration as well as to great vascular engorgement, either of which may raise it from the sclerotica. The course of its blood-vessels is tortuous. To the cornea it adheres very closely, furnishing it a thin layer, which is occasionally the starting-point of ulcerative inflammation. The Sclerotica is a dense fibrous coat which has, by some, been considered as an expansion of the dura mater of the brain. As connected with the operations performed upon the eyeball, it may be described as extending from the optic nerve as far forwards as the circumference of the cornea, the two being closely adapted to each other by a bevelled surface. The resisting character of the sclerotica renders it necessary to press an instrument against it perpendicularly and with some little force, in order to perforate it readily. The vessels of the sclerotica are generally arranged in straight lines; hence their engorgement is readily distinguishable from that of the conjunctiva. The muscles of the eyeball are inserted into the sclerotica, and are consequently surrounded by the loose cellular tissue between it and the conjunctiva. The Cornea is a firm and resisting coat, seated at the front of the ball; it is composed of numerous laminæ, separated from each other by a thin pellucid fluid in the healthy condition, but liable to become opaque from inflammation. The section of the cornea, owing to its density, and the arrangement of its layer, requires that the instruments employed should be of the best quality, and also that some caution be exercised by the operator, lest he separate its layers instead of passing the knife entirely through or behind them. The cornea possesses no vessels capable of carrying red blood in the healthy condition, though in inflammation its capillaries will admit it. In health, it possesses little sensibility; but, in disease, it is occasionally exceedingly sensitive, its incision having caused fainting, as occurred in the practice of Dr. Physick. Dr. Horner also reports the same fact.

The Choroid is a vascular coat placed immediately within the sclerotica, and of equal extent with it, being closely fastened at its anterior margin to the corresponding portion of the latter, by a ring called the ciliary ligament. The Iris is set in the front margin of this ligament, so that the cornea and sclerotica may be peeled off without impairing its continuity with the choroid coat.* The arteries

* Horner's Anatomy, vol. ii. p. 414.

PLATE XIV.

EYE INSTRUMENTS.

Fig. 1. A side view of a narrow, straight, sharp-pointed Bistoury for puncturing the Sac in Fistula Lachrymalis.

Drawn from the Instrument.

Fig. 2. Laugier's Trocar for perforating the Os Unguis, or the bony Ductus ad Nasum, when the ordinary communication with the nose cannot be rendered pervious. After Bernard and Huette.

Fig. 3. Benjamin Bell's Speculum. " "

Fig. 4. Self-acting Speculum of Drs. Goddard and Ruschenberger. The lower bar moves upon the shaft, and is capable of resisting the contraction of the eyelids to any extent, in consequence of the friction at the shaft; with this instrument no assistant is necessary. Drawn from the Instrument.

Fig. 5. Physick's Forceps for Artificial Pupil; one end is made like a saddler's punch, and the other, which is flat and solid, supports the iris.

Drawn from the Instrument.

Fig. 6. A modification of Wardrop's Forceps for stretching the free edge of the eyelids in excising the tarsus cartilages. After Bernard and Huette.

Fig. 7. A front view of Dupuytren's Cataract-Needle. " "

Fig. 8. A side " " " " " "

Fig. 9. A side " Scarpa's " " " "

Fig. 10. A side " Walther's " " " "

Fig. 11. Beer's Knife for enlarging the incision in the cornea in extracting Cataract. " "

Fig. 12. A front view of Scarpa's Needle. " "

Figs. 13, 14. Side and front views of Adams's Needle. " "

Fig. 15. Beer's triangular Cataract Knife. " "

Fig. 16. Richter's Knife, slightly differing in the width of the blade from that of Beer. " "

Fig. 17. Wenzel's Cataract-Knife. " "

Fig. 18. Beer's Lancet-shaped Knife. " "

Fig. 19. Curved Knife of Cheselden, for incising the capsule, or enlarging the incision in the cornea, in the operation of extraction. Daviel's scoop or spoon is attached at the other end of the handle. " "

Fig. 20. Beer's Hook for extracting the Capsule. " "

Fig. 21. Bellocque's Canula for tamponing the nostrils, as shown with the spring expanded. " "

Fig. 22. The same, as introduced into the nostril with the spring closed. " "

Plate 14.

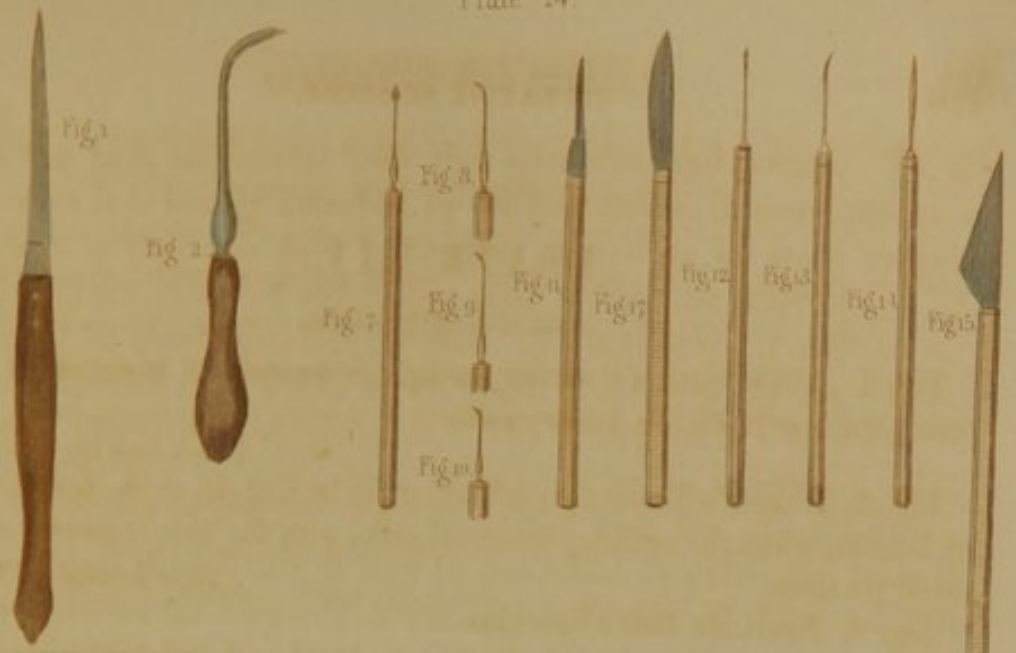


Fig. 1
Fig. 2
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Fig. 15

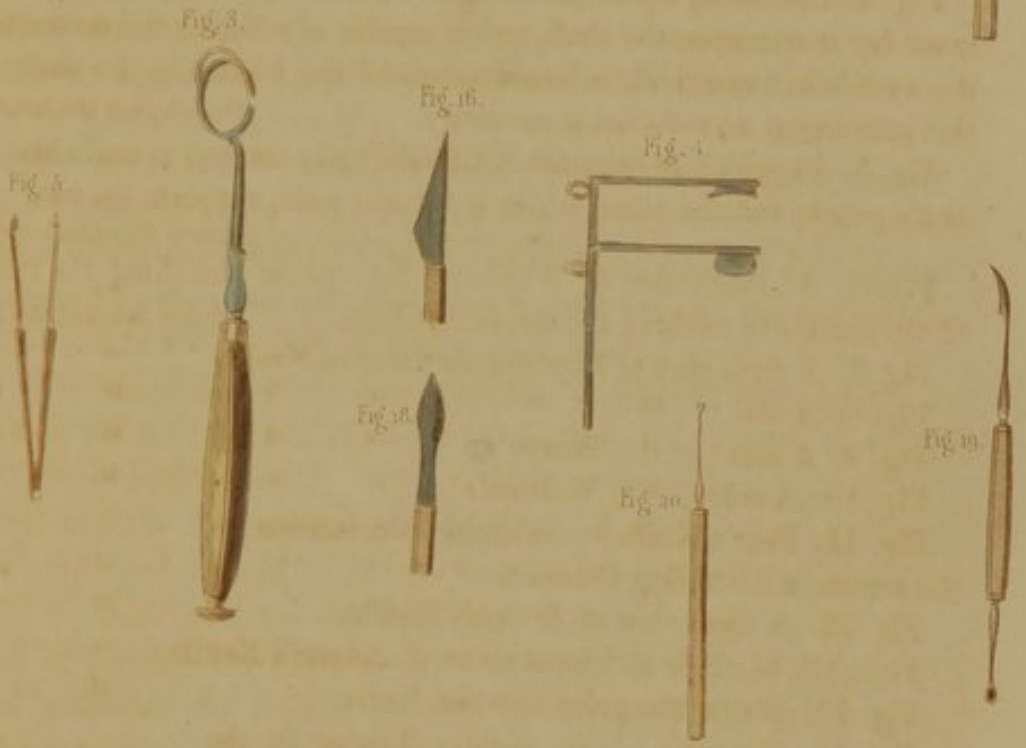


Fig. 3.
Fig. 5.
Fig. 16.
Fig. 18.
Fig. 4.
Fig. 20.
Fig. 19.

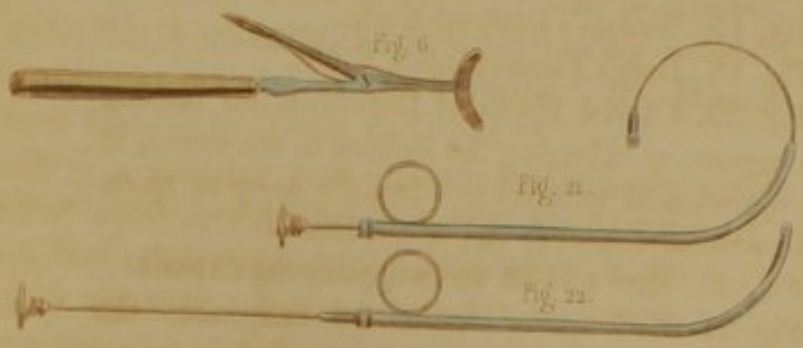


Fig. 6.
Fig. 21.
Fig. 22.

of the choroid coat are the two long and the short ciliary arteries. The long ciliary arteries pass one on either side, externally and internally, between the choroid and the sclerotica in the middle line of the eye. They are consequently liable to be wounded in the operations of absorption or depression of cataract, unless the needle is made to transfix the sclerotica a line or two above or below the plane of its transverse diameter.

The Iris is placed as a diaphragm behind the cornea on a line with the ciliary ligament, and has the power of contracting and expanding, but this power may be best referred to under the operations for cataract. The Retina has so little connection with operations on the eye as to require no special notice. Between the posterior surface of the cornea and the anterior face of the iris is the Anterior Chamber of the eye; and between the posterior surface of the iris and the front of the lens is the Posterior Chamber, the two communicating through the pupil, and being occupied by the aqueous humor.

The Crystaline humor is a double convex lens, of which the posterior convexity is the greater. It is invested by a capsule, which is separated from it by the liquor Morgagni. In consequence of the adhesion of the capsule to the hyaloid membrane, and the contact of the ciliary processes, the lens is readily maintained in its position; all the operations upon it consequently destroy these attachments. The Vitreous humor fills up the great bulk of the eye, and is directly behind the lens, the latter being received into a depression upon its anterior face. It is surrounded by the hyaloid membrane, which is strong enough to sustain it, and also prevent the depression of cataract, unless its cells are previously lacerated with the needle.

SECTION II.

OPERATIONS FOR CATARACT.

In the healthy condition of the humors and of the transparent cornea, the rays of light are so transmitted as to make the proper impression upon the retina. Any change in the transparency of the media through which these rays pass necessarily impairs vision, and when the change results in opacity and is seated in any portion of the lens, it takes the name of Cataract. Various minute

divisions of cataract have been made by ophthalmic surgeons, such as true and false, or black, white and green, to which it is unnecessary here to refer; the three grand divisions of the disease, according to the structure involved, into capsular, lenticular, and capsulo-lenticular, comprising all that it is necessary to mention in connection with operative surgery. In membranous cataract, the opacity is supposed to be limited to the capsule; in lenticular, it is either in the proper structure of the lens, or in it and the liquor Morgagni, the latter being very rare; whilst the term capsulo-lenticular cataract designates both varieties, and is the most common, the affection of the capsule alone seldom existing, except in a limited degree, without the early development of a similar complaint in the lens. Cataract has also been divided, according to its density, into hard, soft, milky, and cheesy, all of which may usually be recognized by the color.

Hard cataracts are generally of a brownish or amber color, are generally confined to adults, and are the kind especially adapted to the operation of extraction, although depression may relieve them.

Capsular cataracts are usually soft, of a brighter and lighter color than the preceding, and often met with in children.

Milky or cheesy lenticular cataract is usually of a bluish or yellowish gray, or white color, mottled, and with streaks in various directions through the structure.

Soft cataracts bulge forward, as a general rule, and, consequently, are apparently more superficial than the hard class; hard cataracts, on the contrary, are deeper seated and further from the pupil. All varieties commence with very much the same symptoms, such as dimness of vision, and an inability to see anything distinctly directly in the axis of the eye, the opacity most frequently commencing in the centre of the pupil.

Diagnosis.—The distinction of the various kinds of cataract, or an accurate diagnosis, is of much importance, not only in order to decide on the propriety of an operation, but also to assist the surgeon in the selection of the kind of operation to be performed. No means, within my knowledge, will prove more conducive to this object than the application of the catoptric test of Sanson. To accomplish this, dilate the pupil freely by means of belladonna, placing the patient in a dark room on a low seat, and passing a lighted candle transversely and vertically across the axis of vision. If the cornea, capsule, and lens are clear, three reflections of the flame will be seen, one large, upright, and superficial, formed by the front of the

cornea; one deep, pale, small, and inverted image, formed by the posterior segment of the lens; and one deeper and upright figure, formed by the anterior portion of the lens and its capsule, a little brighter than the inverted image, but not so bright as the first. The absence of either of these images, or their absence at any point, will indicate the character of the disease and the portion affected.*

§ 1. PRELIMINARY TREATMENT.

As the result of the operations for cataract depend, in a great measure, on the absence of inflammatory action, attention to the adjuvants of the operation is essential to its favorable termination. In every instance, strict attention should be given to the healthy condition of the patient's system; let the surgeon see that there is no sign of fever, and yet that there is sufficient strength of pulse to insure adhesion of the flap in the cornea, if extraction is to be practiced. Let him also see to a thorough evacuation of the bowels; as well as to the fact that there is no diarrhœa. As a general rule, a strict antiphlogistic diet should be observed several days before and after the operation; but if the patient is advanced in life, and the pulse becomes irritable, good diet and tonics may possibly prove beneficial. A very general rule, given in most of the works on ophthalmic surgery, is, "Never to operate on a patient with a foul tongue." Yet it has occasionally occurred to me to see patients who, from always having the tongue more or less furred, even in ordinary health, did very well when operated on under these circumstances. Indeed, no rule of general treatment can here be given that will not be found to have some exception to its universal observance. Caution and judgment in this, as in other operations, can alone properly prepare the patient's constitution.

The local treatment, previous to operating for cataract, consists in the employment of such collyria as will reduce the vascularity of the various coats of the eye and diminish the risks of their inflammation.

Another important step in the preliminary local treatment of cataract is the production of such a dilatation of the pupil as will

* See Lawrence on the Eye, by Hays, Phila. edit., 1847, p. 90, also Smith's Minor Surgery, for fuller details of the catoptric test.

enable the operator to obtain a good view of the lens, diminish the risk of wounding the iris, and admit the free access of the aqueous humor, if the operation of absorption is selected.

§ 2.—DILATATION OF THE PUPIL.

Dilatation of the pupil may be accomplished by smearing the lids, eyebrow, and temple with the extract of belladonna or stramonium diluted with water to the consistence of thick cream, and applied every ten minutes for an hour previous to operating; or by dropping into the eye a solution of the extract: or their active principles (daturia or atropia) may be dissolved in water in the proportion of one grain to the fluidrachm of water, and a few drops be inserted about ten minutes before operating. The latter mode is the quickest and cleanest, but not quite so certain in all patients as the extracts.

I have occasionally employed the following formula, and found it very prompt, and not so irritating as the extract:—

℞.—Atropiæ gr. iss;
Acid. nitric. gtt. ss;
Aquæ ʒij.

Of this, a few drops may be introduced between the lids, and then a rag wet with the solution applied externally. The dilatation, in two instances, was prompt, and in one continued for three days after the operation, leaving the iris like a fine ring near the circumference of the cornea.

The credit of suggesting the employment of narcotic agents for dilating the pupil has been long assigned to Himley, of Gottingen, who recommended the use of the extract of belladonna in 1801;* but, four years prior to this period, a similar suggestion had been made, and published in Philadelphia, by Dr. Samuel Cooper, a graduate of the University of Pennsylvania, who, in an inaugural essay, published in 1797,† reported numerous experiments on the effects of the datura stramonium on the system generally, as well as on the pupil of the eye.‡ I have also been informed by Dr. Benjamin H.

* Lawrence on the Eye, by Hays, p. 366. † Littell on the Eye, p. 262.

‡ A Dissertation on the Properties and Effects of the Datura Stramonium, or the Common Thorn-Apple, and on its Uses in Medicine, by Samuel Cooper, M. D., 8vo. Philadelphia, 1797, p. 16, experiment 15.

Coates, of Philadelphia, that Drs. Rush and Physick both taught this in their lectures, and that the latter always resorted to the formula of Dr. Cooper for its preparation.*

Another step in the treatment of cataract, previous to operating, consists in the application of a bandage on the opposite eye to that which is to be operated upon, as advised by Celsus, as it tends very materially to steady the eye, especially in children.

The position of the patient, of the operator, and of the assistant, together with the period at which the operation should be performed, and the kind of operation to be selected, may also be placed under the same head, and be briefly referred to at present.

The position of the patient and the surgeon depends very much upon the kind of operation to be performed. For extraction, the recumbent posture of the patient adds to his safety, by diminishing the tendency in the humors of the eye to escape through the opening in the cornea; but, in the operations of depression or absorption, it will generally be found more convenient to place the patient on a moderately low chair, with a side light, and let the operator sit directly before him on a higher stool or chair without arms, so as to be at perfect liberty in his movements. Some operators prefer following the advice of Scarpa, and employ a stool on which they place the foot, of the same side as the operating hand, resting the elbow on the knee thus raised. Such a position is, however, purely a matter of convenience, and one which, to many, would prove exceedingly embarrassing. If the surgeon's hand requires such a support to steady it, prudence should suggest that he had better lay aside his instruments.

The position of the assistant should be behind the patient, with one hand placed under the chin so as to steady the patient's head against his own breast; whilst the index and second or ring finger of his other hand should be brought to the same length, and to the same level, so as to raise the lid by drawing the tarsus cartilage towards the superciliary ridge, where it should be retained until the surgeon directs its release. If the eyelid is moist and difficult to hold, the assistant should dry it thoroughly, or touch the points of his fingers in a little flour or other dry powder, previous to seizing the lid. A speculum, or the elevator of Pellier, may be resorted to

* Several copies of the Dissertation may be found in the Library of the Pennsylvania Hospital, Philadelphia.

if the orbit is deep, but, as a general rule, the eyelid may be best kept in position by the fingers placed as just described.

The period at which cataract should be operated on was once deemed a matter of importance, both as respects the season of the year, and the age, ripeness, or perfection of the opacity in the lens; but any season, with fine clear weather, will answer, whilst the best period, in reference to the maturation of the cataract, is that when its presence in both eyes is well ascertained. The existence of opacity being once well settled, every week is liable to increase the density and toughness of the diseased structure, and, consequently, add to the difficulty and risks of the operation.

Three kinds of operations are performed for the removal of cataract, to wit, extraction, absorption, and depression, the selection of either being decided by the following facts:—

1st. Absorption, depression, or reclination are attended with but little risk of the loss of the eye, and may be repeated as often as is necessary; but they are only well adapted to soft cataracts, or to those in which the anterior chamber of the eye and the eye itself are small. Depression of a hard cataract is also liable to produce amaurosis by paralyzing the retina; and not unfrequently the lens, when depressed, will rise again into the axis of vision.

2d. Extraction is especially calculated for hard and firm cataract, but requires considerable dexterity on the part of the surgeon and his assistant, as well as a large prominent eye, with a full anterior chamber, on the part of the patient. Of the two operations, extraction is the more prompt and brilliant; absorption, depression, or reclination the safer. Drs. Physick and McClellan in Philadelphia, and Roux in Paris, favored extraction, but the majority of surgeons, except in cases of hard cataract, prefer the other operations.

In order to operate upon both eyes, it becomes necessary for the surgeon to change his position unless he is ambidexter, as he must operate upon the left eye with his right hand, whilst in front of the patient, and on the right eye with his left hand, if in front, on account of the prominence of the nose. If he wishes to employ the right hand in both eyes, he will be compelled to place himself behind the patient. Having considerable facility in using the left hand, a change of position has never been necessary in my case, and as this facility can be readily acquired by daily exercise, an operator will ultimately find it more satisfactory to attempt it, and practice with the left as well as with his right hand in order to be able to retain

his position in front of the patient, as this offers many facilities in manipulating as well as in sight.

§ 3.—OPERATIONS.

The operations for cataract are, as stated, divided into three kinds—absorption, or that in which the lens is dissolved by the action of the aqueous humor; depression, in which it is pushed below the axis of vision, and lies buried in the vitreous humor; and extraction, in which it is promptly removed from the eye. Reclination is a modification of depression.

I. OPERATION BY ABSORPTION.

The success of this operation being due to the power possessed by the aqueous humor of dissolving the lens, the object of the operator should be to lacerate it and its capsule, and throw them forwards into the anterior chamber of the eye. The preliminary steps in all the operations are very much the same; it being, however, of more consequence in absorption to obtain a full dilatation of the pupil, not only in order to admit the free action of the aqueous humor upon the lens, but also to protect the iris from injury, and enable the operator to see exactly what he is doing. The needles required for cutting up the lens and its capsule are very varied (Plate XIV, Figs. 7, 9, 12), and seem to have been selected very much at the fancy of each operator, that of Saunders or of Scarpa being most frequently resorted to. All that is really essential is that they should have a sharp double edge.

Ordinary Operation.—The capsule and lens being acted on by means of a needle introduced through the sclerotica, the operation has hence been called *scleroticonyxis*. The pupil being dilated, one eye bandaged, and the head supported against the breast of the assistant, or else the patient lying down, the surgeon should depress the lower lid with the index and second finger of the hand corresponding with the eye to be operated on, and the assistant, at the same time, elevate the upper lid as directed in extraction; or, if the operator is dexterous, he may sustain both lids himself.

Then, seizing the handle of the needle between the thumb, fore,

and second finger of the hand opposite to that of the eye to be operated on, and holding the instrument like a pen with the fingers strongly flexed, and the little and ring finger resting against the cheek bone, present the point of the needle perpendicularly to the sclerotica, with its convexity upwards and its edges transverse, one or two lines behind the circumference of the cornea, and about half a line above or below the median line of the ball, so as to avoid the long ciliary artery. Being satisfied with its position, and whilst the patient is looking towards his nose, puncture the sclerotica, and, rotating the handle of the instrument between the fingers, turn the concavity of its point, if Scarpa's, or the breadth of the blade, if that of Saunders, backwards, passing it towards the centre of the eye, and depressing the handle towards the temple. When the point, dexterously managed, has reached the centre of the pupil, turn the cutting edge of the needle to the cataract, and cut the capsule and lens into several fragments, throwing them forwards into the anterior chamber, where they will subsequently disappear by dissolution.

If the cataract is soft and milky, one operation will generally suffice, but if the lens or its capsule is more resisting, it may become necessary to repeat the operation several times, at intervals of a few weeks.

After treatment.—The eye being closed and protected from the light, cold cloths may be applied, and the same treatment pursued as is directed in extraction. The pupil should, however, be kept dilated for several days after the operation, and it is not requisite to enjoin such absolute rest as is then directed. Should inflammation of the eye supervene, it should be treated on the general antiphlogistic plan.

When the capsule remains thickened, or when fragments do not disappear, a repetition of the operation will generally be required.

Keratonyxis, or the operation of absorption by a needle introduced through the cornea, was suggested by Conradi, but introduced into practice to a considerable extent by Mr. Saunders, and is hence sometimes designated as his operation. It consists in introducing the needle through the cornea, and lacerating the capsule in front; but, as it is liable to give exit to the aqueous humor, induce prolapse of the iris, and leave a scar in the cornea, the operation through the sclerotica is preferable in the majority of instances.

II. OPERATION BY DEPRESSION OR COUCHING.

The preliminary steps of this operation being precisely the same as those required in absorption, a repetition of them is unnecessary.

Ordinary Operation.—The position of the patient and of the surgeon being that of the preceding operation, the needle should be introduced into the sclerotica about two lines behind the cornea, and passed directly to the centre of the pupil between the iris and the capsule (Plate XV, Fig. 2). Then depressing the handle, cause the point of the instrument to apply itself on the top of the lens, and depress it backwards and downwards, by elevating the handle and carrying it slightly forwards (Plate XV, Figs. 3, 4). After placing the lens in the vitreous humor below the axis of vision, retain it there a few seconds, and withdraw the needle by reverse movements through the sclerotica, with its convexity forwards. The different positions of the needle during the operation are shown in Plate XV, Fig. 5.

If the lens rises before the needle is removed, it must be again depressed, and if it escape into the anterior chamber, and cannot be drawn back, it may be removed by the section of the cornea, as in the operation for extraction.

In Reclination, the lens is turned on its axis so as to be placed horizontally instead of being depressed perpendicularly (Plate XV, Fig. 6).

Operation of Malgaigne.—M. Malgaigne being of the opinion that the rising of the lens, when depressed with its capsule, was due to the attachments of the latter being rarely totally destroyed, and to the fact that its capsule resisted absorption, and was liable to rise a long time after the operation, proceeds as follows:—

The patient lying down or being seated, and the surgeon placed either before or behind him so that he can always use his right hand, the needle is introduced (as before directed) so as to pierce the posterior and inferior part of the lens; the capsule divided, and then the needle being passed above the lens with its concavity looking downwards, a simple movement of depression suffices to cause the descent of the lens, whence it will not rise again, as the walls of its capsule collapse immediately. This proceeding M. Malgaigne prefers, especially when the lens is hard.* Bretonneau and Velpeau lacerate

* Malgaigne's Operative Surgery, Phila. edit. p. 301.

PLATE XV.

OPERATION OF COUCHING CATARACT.

Fig. 1. A vertical section of the Eyeball, to show its component parts. 1. The cornea. 2. The sclerotica. 3. The choroid coat. 4. The retina. 5. The iris. 6. The anterior chamber. 7. The lens. 8. The vitreous humor. 9. The optic nerve.

After Bernard and Huette.

Fig. 2. Couching of Cataract in the right eye. 1, 1. The first and second fingers of an assistant raising the upper lid. 2, 2. The first and second fingers of the operator depressing the lower lid. 3. The cataract needle held like a pen in the left hand, the little and ring finger supported on the cheek bone, and puncturing the sclerotica about two lines behind the cornea, and a little above the transverse diameter of the ball, so as to avoid the long ciliary artery. After Bernard and Huette.

Fig. 3. The same operation after the needle has entered the posterior chamber. 1. The relative position of the handle of the instrument to the axis of the eye at this period. The needle, having passed between the iris and the lens, is seen, with its concavity, resting on the top of the lens, previous to couching it. After Bernard and Huette.

Fig. 4. The same operation, as the lens leaves the axis of the pupil: the handle of the instrument being moved alternately from 1 to 2, and the reverse, the point of the needle will carry the lens downwards and backwards, until imbedded in the vitreous humor. After Bernard and Huette.

Fig. 5. The operation of Couching, as performed upon the left eye. 1. The needle is now held in the right hand like a pen, the hand supported by the little finger resting on the cheek-bone; the needle is also represented puncturing the sclerotica about two lines behind the cornea, but below the transverse diameter of the eyeball. 2. The second position of the needle in the operation, or the same as that shown in Fig. 3. 3. The elevation of the handle necessary for the entire couching of the lens, or the third position of the needle in this operation.

Fig. 6. Reclination of the Lens, as shown by a vertical section of the eye. 1. The natural position of the lens. 2. Its reclination in the vitreous humor.

Plate 15

Fig. 1.

Fig. 2.

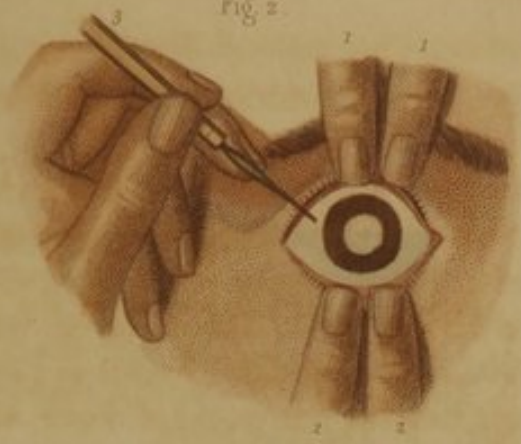


Fig. 3.

Fig. 4.

Fig. 5.

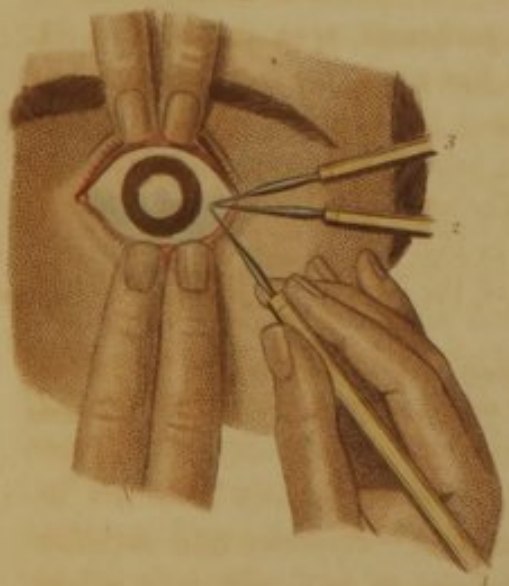


Fig. 6

freely the cells of the hyaloid membrane before depressing the lens, in order to prepare a way for its descent into the vitreous humor, and have found it often successful.

III. EXTRACTION.

The operation of Extraction is especially suited to the cases of hard cataract in adults with prominent eyes, and to operators who possess a perfect control of their fingers. The assistant must also be one perfectly familiar with his duty. He should place himself behind the patient, and elevate the upper lid either with his fingers placed as before directed, or by introducing Pellier's speculum beneath the lid, drawing it directly upwards, making himself sure that the lid cannot escape from his grasp, and yet holding it so as to avoid pressure upon the eyeball, after the section of the cornea. On one occasion, in 1839, I saw an assistant of Velpeau's evacuate the entire contents of the eye, in consequence of pressing upon the ball. Occasionally, and especially in timid patients, the surgeon may find it necessary to restrain the rolling of the eye by pressure on the ball with his fore and second or third finger, whilst depressing the lower lid; but it can rarely become necessary for the assistant to make any pressure upon the eye, and, as a general rule, it should be strictly avoided. Various shaped knives have been recommended for this operation, and are known as those of Beer, Wenzel, Richter, and Ware,* but most surgeons resort to the triangular knife of Beer in preference to the others, except under peculiar circumstances. The other instrument consists in Daviel's scoop and Cheselden's knife, together with small scissors and forceps (Plate XIV, Figs. 11, 15, 16, 17, 18, 19). The operation consists in three parts, incision of the cornea, laceration of the capsule and extraction of the lens, although occasionally the first two are performed at the same time. The incision of the cornea may be performed either at the superior, exterior, or inferior portion of its circumference (Plate XVI, Figs. 1, 5, 6). Mr. Lawrence deems the superior section the best, the exterior next, and the inferior the most objectionable, although the easiest to perform, as it exposes the patient to a rapid escape of the aqueous humor, to prolapse and

* See Plate XIV.

wound of the iris, as well as to trouble in the adjustment of the corneal flap, from the action of the edge of the lower lid.*

Ordinary Operation.—The pupil being fully dilated, and the preliminary measures completed, the operation may be performed as follows, varying the line of the incision according as it is the wish of the operator to perform the superior, exterior, or inferior section. The latter, being the simplest, may be taken as the type.

The surgeon, either sitting or standing, according to the position of the patient, should depress the lower lid by the index and second finger of his left hand, separating them and pressing their pulps against the sides of the eyeball, if it is necessary to steady it. Then holding the knife by its handle, with the thumb and fingers flexed, as in the downward motion of a pen, and resting the ring and little finger upon the cheek bone, if desirable, to support the hand, let him insert the point of the knife perpendicularly into the cornea on its temporal side, about half a line from its circumference, or line of junction with the sclerotica, and, making sure that the point of the instrument penetrates the entire thickness of the cornea, and enters the anterior chamber of the eye, and that it has not passed between its lamina, pass it parallel and in front of the iris, in the line of the transverse diameter of the eye, over to the internal side of the cornea at a point corresponding with that at which it entered (Plate XVI, Figs. 1, 2). If this is steadily and quickly done, the entire section of the cornea will be readily accomplished, simply by the width of the knife.

The assistant should now be directed to allow the lids to close. After a few seconds' rest, they may be gently wiped and opened as before, great care being taken to avoid pressure on the ball. Then, the surgeon, whilst depressing the lower lid, should press very gently against the ball, so as to render the lens prominent, and, introducing the back of the little knife attached to Daviel's curette beneath the edge of the corneal flap, press its point against the capsule of the lens and lacerate it (Plate XVI, Fig. 3). Frequently the lens will instantly escape in consequence of the compression of the ball by the muscles of the eye. If it does not, moderate pressure against the ball with the handle of the curette (Plate XVI, Fig. 4), or seizing the lens with the forceps, or with the curette, will facilitate it; but in all these movements great caution must be exercised lest

* Lawrence, by Hays, Phila. edit. 1847, p. 640.

the vitreous humor also protrude. The operator should then see that the iris has not prolapsed or been caught between the flap and the edge of the cornea; and, being satisfied that all is right, let him at once close the eye and cover it with a light bandage so constructed as to exclude the light, without pressing upon the ball.

AFTER TREATMENT.—The after treatment must be regulated by circumstances, though generally it should be strictly antiphlogistic, the patient being directed to keep cold cloths applied over the lids of the affected eye, to remain quiet in a dark room, to take nothing but liquids for food, and to avoid conversation for the first three or five days. Should mucus collect between the lids, it may be gently wiped away with a soft linen rag, or with a camel's hair pencil. On the third or fifth day, if the lids are not red or swollen, and if the patient is free from fever and pain, the eye may be gradually opened, and the condition of the parts inspected. If there is no prolapse of the iris, if the pupil is clear and regular, and if there is no very high degree of inflammation, the rigid rules before observed may then be relaxed, and the patient simply use a shade instead of the wet cloths, chew a little bread or vegetable food, and be allowed by degrees to see the light. Subsequently, but not before two months after the operation, cataract spectacles may be occasionally employed, as the patient will be compelled ultimately to use them in order to compensate for the loss of the lens.

The performance of the superior and exterior sections of the cornea are so similar to that just detailed as not to require a special description.

SECTION III.

ANATOMICAL RELATIONS OF THE IRIS.

The Iris, by filling up the circular space left at the anterior portion of the choroid coat, constitutes a diaphragm or curtain, with an opening near its centre capable of transmitting or excluding, according to its size, the rays of light which pass through the cornea to the retina. Being a circular septum, the iris is attached only by its external circumference, adhering to the ciliary ligament, but yet in such a manner that it can be separated from it by gentle traction without injury either to itself or the ciliary body.

PLATE XVI.

OPERATIONS FOR EXTRACTING CATARACT AND THE FORMATION OF ARTIFICIAL PUPILS.

Fig. 1. Extraction of the Cataract from the left eye, by the inferior section. 1, 1. The first and second fingers of an assistant raising the upper lid. 2, 3. The middle and forefinger of the surgeon depressing the lower lid. 4. The knife held in the right hand of the surgeon; its point, having passed through the cornea and across the anterior chamber, is seen at its exit near the internal canthus. After Bernard and Huette.

Fig. 2. The completion of the section of the cornea. " "

Fig. 3. Incision of the Capsule of the Lens, in the same operation by the knife of Cheselden, as modified by Boyer. The knife that incises the cornea in extraction may also be made to cut the capsule as it passes across the lens. After Bernard and Huette.

Fig. 4. Expulsion of the Lens. 1. The forefinger of the operator steadying the lower lid. 2. Gentle pressure upon the ball by the handle of the knife applied to the upper lid. After Bernard and Huette.

Fig. 5. Extraction by the oblique section of the Cornea. Fig. 6. Extraction by the superior section of the Cornea. " "

Fig. 7. Section of the Cornea, by the knife of Furnari. " "

Fig. 8. The same operation, showing the removal of the cataract by forceps introduced through the opening in the cornea. " "

Fig. 9. Velpeau's operation for Artificial Pupil. The knife incising both the cornea and iris, so as to cut a flap in the lower portion of each.

Fig. 10. Mulder's operation for Artificial Pupil. An opening in the cornea admits scissors, by which the four angles resulting from the crucial incision made in the iris are excised. After Bernard and Huette.

Fig. 11. Langenbeck's operation for Artificial Pupil. A small incision is made in the cornea only large enough to admit a fine hook, by which a portion of the iris is drawn down, and left to adhere to the wound of the cornea. After Bernard and Huette.

Fig. 12. Scarpa's operation by displacement of the Iris. 1. A cataract needle is seen detaching the iris from the ciliary ligament, so as to leave an opening on its circumference. After Bernard and Huette.

Plate 16

Fig. 1.

Fig. 2.

Fig. 3.

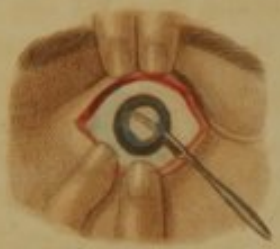


Fig. 10.

Fig. 4.

Fig. 5.

Fig. 6.

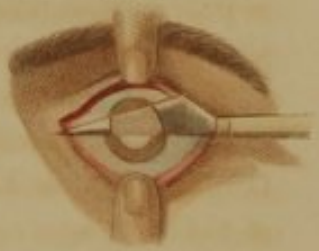


Fig. 11.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 12.

The Pupil, or opening in the centre of the iris, is capable of dilatation or contraction in certain conditions of the eye, in consequence of a peculiar power possessed by the iris, but whether this power is due to the action of muscular fibres, or the result of vascular or nervous action, is a point on which anatomists are not agreed. Dr. Physick taught that the contraction and dilatation of the pupil were due to the existence of two sets of muscular fibres, a series of those arranged circularly causing its contraction, and a radiated or longitudinal set producing its dilatation; but, as this fact has been denied by Arnold and others, it is sufficient for all practical purposes to know that the iris possesses this power under the stimulus of certain causes, without attempting to explain how it is produced. The action of narcotic agents in producing dilatation of the pupil, together with the experiments of Dr. Samuel Cooper, of Philadelphia, in 1797, on the effects of Stramonium, have been already alluded to under the article on Cataract.

When, from a partial opacity of the cornea, or from contraction and closure of the pupil, vision is impaired, and light cannot be freely transmitted to the retina, the operation of forming a new pupil may be resorted to.

§ 1.—FORMATION OF AN ARTIFICIAL PUPIL.

This operation, originally suggested by Cheselden, of England, in 1728,* and performed by him on a boy fourteen years of age, was published in the "Philosophical Transactions" for that year, and also in the appendix to the fourth edition of his "Anatomy," as well as in Ledran's "Surgery." Mr. Cheselden furnished, however, so brief a description of his plan as to create doubts in the minds of his cotemporaries as to the various steps of the operation, though it was well understood that his object was the formation of an opening in some portion of the iris, which should serve as a substitute for the natural pupil.

These doubts, and the various changes produced by disease both in the cornea and iris, together with the diversified character of the causes creating them, have led other surgeons at different periods to various modifications of his operation, although they have followed

* See Observations, &c., Cheselden's Anatomy, 13th edit. Lond. 1722.

the principle laid down by him; the creation of a new point by which the light might be transmitted to the retina being the object of all of them.

These different modes of operating have been classified under five heads.

1st. Division of the iris through the sclerotica, or through an opening in the cornea, called by ophthalmologists CORETOMIA (κορη the pupil, and τομη a section).

2d. Excision of the iris, CORECTOMIA (κορη the pupil, and εκτομη excision).

3d. Separation or tearing of the iris from its ciliary attachments called COREDIALYSIS (κορη the pupil, and διαλυσις dissolution or loosening).

4th. Separation and excision combined, or a modification of the corectomia of Wenzel.

5th. Distortion of the natural pupil. (Hays.)

I. CORETOMIA.

OPERATION OF MR. CHESELDEN, OF ENGLAND. — With a very narrow and pointed knife or needle, cutting on but one edge, Mr. Cheselden punctured the sclerotica about two lines from the cornea, as in the operation of couching. Passing the needle flatwise through the posterior chamber until its point had traversed two-thirds of its transverse diameter, he cut through the iris from behind forwards, by a sawing motion, and withdrew the instrument as it entered.

II. CORECTOMIA, OR EXCISION OF THE IRIS.

This operation was originally performed by Wenzel in 1780.

OPERATION.—Introducing a cataract-knife through the cornea, as in extraction, Wenzel carried its point through the iris, and made a slit in it of sufficient length to permit free vision, taking special care not to press upon the eye lest its contents should be evacuated. On withdrawing the knife, the escape of the aqueous humor caused a flap in the iris to bulge forwards, and this being increased by gentle pressure with the finger on the ball, a portion of the iris was then cut off with fine scissors.

Operation of Dr. Physick.—Dr. Physick made a section of the cornea and iris by a cataract-knife, in a manner similar to that performed by Wenzel, and, introducing through the opening a pair of forceps (Plate XIV, Fig. 5), terminating in small plates, one of which contained a sharp circular punch, similar to that used by saddlers, he seized the iris between the blades, and cut out a piece by closing the plates of the instrument.*

Operation of Beer.—After incising the cornea, Beer introduced a fine hook or teethed forceps, seized the iris, drew it out, and cut off the projecting portion with the scissors.

Operation of Velpeau.—Velpeau punctured the cornea with a thin, long, double-edged knife, resembling the serpent-tongued lancet; then, passing the point through the iris from before backwards, penetrated the posterior chamber, and, passing a line or two across it, brought the knife out again into the anterior chamber, by cutting through the iris from behind forwards. Passing the point again through the cornea, he cut a flap both in the iris and cornea at the same moment (Plate XVI, Fig. 9), the flap in the iris retracting upon itself, and leaving a triangular artificial pupil.† This operation is also but a modification of that of Wenzel.

Mulder, after incising the cornea, introduced fine scissors, and cut out the four angles of an opening made through the iris (Plate XVI, Fig. 10).

III. COREDIALYSIS, OR LACERATION OF THE IRIS.

This operation, as suggested by Scarpa, was performed by him, in 1801, as follows:—

Operation of Scarpa.—"The patient being seated and held as in the operation for cataract, the sclerotic coat is to be punctured with a needle (Scarpa's) about two lines from the union of the sclerotica with the cornea, and the point of the needle made to advance as far as the upper and internal part of the margin of the iris, that is, on the side next the nose. The instrument should then be made to pierce the upper part of the internal margin of the iris close to the ciliary ligament, until its point is just perceptible in the anterior chamber of the aqueous humor; I say just perceptible, because that part of

* Dorsey's Surgery, p. 347, Philadelphia, 1823.

† Bernard and Huette, p. 153.

the anterior chamber being very narrow if the point of the needle is made to advance ever so little before the iris, it must pass into the substance of the cornea. As soon as the point of the needle can be seen in the anterior chamber, it should be pressed upon the iris from above downwards, and from the internal towards the external angle, as if with the view of carrying the instrument in a line parallel to the anterior face of the iris, in order that a portion of its margin may be separated from the ciliary ligament. This separation being obtained, the point of the needle should then be depressed in order to place it upon the inferior angle of the commenced fissure, which may be prolonged at pleasure by drawing the iris towards the temple, and carrying the instrument from before backwards, in a line parallel to the anterior surface of the iris, and the greater axis of the eye."* (Plate XVI, Fig. 12.)

Operation of Langenbeck.—This surgeon opened the cornea by a small knife or needle, and then, passing a fine hook through the wound, with its convexity presenting upwards, carried it through the anterior chamber with the hook presenting flatwise between the cornea and the iris to the very margin of the latter. Then, turning its point against the iris, he transfixed it by gentle pressure, drew the hook and the iris very carefully through the wound, drawing upon the iris until the new pupil was sufficiently large, and, finding that the iris when not drawn upon would remain in the wound, he withdrew the hook and left the iris to contract adhesions in the opening of the cornea (Plate XVI, Fig. 11). It is essential to the success of this operation that the opening in the cornea should not be larger than is requisite for the introduction of the hook, otherwise it will be difficult to retain the prolapsed portion of the iris in the wound.

IV. DISTORTION OF THE NATURAL PUPIL.

Dr. Isaac Hays, of Philadelphia, in 1840, formed an artificial pupil by the following operation:—

Operation.—The patient lying down, the lower lid of the right eye was depressed by an assistant, and the upper lid held by the operator with the two forefingers, so as to steady the ball with the

* Observations on the Principal Diseases of the Eyes, by Antonio Scarpa. Translated from the Italian, by James Briggs, Surgeon, Lond. 1806, p. 412.

third finger. Then a section of the cornea, commencing near its junction with the sclerotica, a little below its middle, and extending so as to divide one-fourth of the circumference, was made by a cataract-knife being carried steadily and quickly forwards so as to prevent the escape of the aqueous humor, and prevent prolapse of the iris, before the incision was completed. As soon as the knife was withdrawn, the humor escaped with a gush, and the lids were allowed to close, and, on separating them after the lapse of a minute or two, the iris was found prolapsed so as to draw the lower edge of the pupil quite to the incision. The patient subsequently enjoyed excellent vision.*

After Treatment.—After any operation for artificial pupil, it is of great consequence that the antiphlogistic treatment, with the use of belladonna or atropine, should be rigidly observed, the strictest attention being given to the prevention of vascular excitement, by diet, venesection, purging, and cold applications outside of the lids.

Remarks on the Value of these Operations.—From the variety of circumstances requiring the formation of an artificial pupil, it is impossible for a surgeon to select any one method of operating as preferable to the others, and his choice must, therefore, be decided by the peculiarity of the case. The position of the pupil must also be governed by the opacity of the cornea; but, as a general rule, the most eligible place for it is as near as possible to the centre of the old one. When it becomes necessary to create a pupil near the circumference of the iris, the nasal is by some deemed preferable to the temporal side, in consequence of its affording more probability of a correspondence with the optic axis of the other eye. Mr. Gibson, of England, with others of extensive experience, object to this, and deem the opening on the temporal side preferable to any other, as permitting a wider field of vision;† but here, as in the other questions connected with the operation, the decision must be regulated by the circumstances of the case. The inferior and external portions are less eligible, and the superior is objectionable from being more covered by the eyelids. As illustrative of the peculiar advantages of one mode of operating over the other, the following conditions of the eye may be referred to:—

1st. When the opacity is in the centre of the cornea of one eye,

* Lawrence on the Eye, edited by Hays, Philadelphia, p. 456; also, Am. Journ. Med. Sciences (see Bibliography).

† Littell on the Eye, p. 267.

the lens being round, and the iris not prominent anteriorly, and when the other eye is sound, coretomia, or incision of the iris, will be best suited to the case.

2d. Coredialysis, or displacement, is specially adapted to cases of opacity of the cornea, involving a greater portion of its convexity, but where the circumference is clear.

3d. When the capsule of the lens is affected, or the iris is adherent anteriorly or posteriorly, the other operations mentioned may be resorted to.

The extent and importance of the subject will, however, forbid any special recommendation of any operation; and in this, as indeed in most of the affections of the eye, the reader will find it advantageous to consult the works of those who have devoted themselves especially to ophthalmic surgery.

CHAPTER VII.

PLASTIC OPERATIONS ON THE FACE.

The production of deformities, in consequence of the loss of integument in various parts of the body, but especially about the face, led surgeons, at an early period, to devise some means by which they could remedy the inconvenience and conceal the defect. This result was generally obtained either by drawing upon the surrounding parts, or by taking flaps from some more distant portion, and modeling them to a proper form, so as to furnish the amount necessary to supply that which was wanting. In all these efforts the success of the operation depended entirely on the production of such an amount of inflammation as should result simply in adhesion, whilst, at the same time, sufficient vitality was preserved in the new portion to ensure the preservation of its structure. On recalling the position of the surgeons of that period, and the limited amount of knowledge of the effects of inflammation that they possessed as compared with that acquired since the observations of Mr. John Hunter, we cannot but regard their operations as indicating a high degree of skill, as well as illustrative of their close observation of the efforts of nature in healing wounds; and notwithstanding the

claims often advanced for the superior character of the surgery of the present day, it may be doubted whether modern operators have ever shown a higher degree of ingenuity and surgical skill than that possessed by those of the period of Taliacotius.

Plastic surgery having originated in the attempt to remedy the deformity arising from the loss of the nose, the account of the different kinds of operations may be best given in connection with the section devoted to disorders of that organ; and the following example of the restoration of a portion of integument upon the forehead is therefore presented, at present, merely to preserve the uniformity of arrangement which has heretofore been observed.

SECTION I.

METOPLASTY, OR RESTORATION OF THE INTEGUMENTS ON THE FOREHEAD.

An ingenious application of the principles of plastic surgery to a case in which a large deficiency of the integument on the forehead required to be supplied from the surrounding parts, has been suggested and performed by Dr. John Watson of New York, and is, it is believed, the first operation of the kind ever practiced. The following account is condensed from a paper by Dr. Watson,* who has also very politely afforded me an opportunity of having the figures illustrating the case copied from a drawing in his portfolio.

Anaplastic Operation for a Hole in the Forehead.—A carpenter, æt. 42, was admitted into the New York Hospital in April, 1844, with necrosis of the os frontis of six years' standing, probably the result of syphilis, contracted some twenty years previous, and of which he believed himself cured; the disease on the forehead, according to his own account, having resulted from an injury. At his admission, a large ulcer existed on the forehead, exposing a considerable portion of the os frontis, the greater part of the external table of which 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 was on the left temple, through which pus escaped. The upper eyelids were somewhat

* Am. Journ. Med. Sciences, vol. viii. p. 537, 1844.

PLATE XVII.

METOPLASTY AND RHINOPLASTY, OR PLASTIC OPERATIONS ON THE FOREHEAD AND NOSE.

Fig. 1. A front view of the Face of a patient, forty-two years of age, who had a large ulcer in the forehead, accompanied with syphilitic caries of the frontal bone previously to being operated on by Dr. John Watson, of the New York City Hospital. The ulcer is represented with thickened and inverted edges, and as retaining a portion of the necrosed bone; a fistulous orifice is also seen at the upper border of each orbit, with another in the left temple, through which pus escaped freely. The eyebrows and upper eyelids are shown as slightly elevated and deformed by the adventitious adhesions existing around these fistulæ. The bone in the centre of the ulcer presents the ordinary characters of caries and necrosis.

Copied from a likeness taken by Dr. Watson.

Fig. 2. Represents the condition of the patient near the termination of the treatment. A linear cicatrix is seen on the forehead, with one or two larger points or depressions in the skin caused by its adhesion to the surface of the bone. After Dr. Watson.

Fig. 3. Represents the line of incision, together with the sutures and lines of union in the wound immediately after the operation. After Dr. Watson.

Fig. 4. Rhinoplasty, as practiced according to the Indian method, by Delpech. A triangular, or somewhat V-shaped flap, 1, 2, 3, has been cut upon the forehead, so that the point of the V will correspond with the root of the nose. At 2, an additional portion has been excised with the flap in order to form the column of the nose, and at 4 the flap is seen rotated upon its base, so as to be brought down in front of the nasal cavity. To favor this rotation, and prevent the constriction of the vessels in the flap which would otherwise result, the incision at the base of the flap has been made slightly longer on the right than on the left side of the nose. The numerous sutures requisite for the approximation of the flap to the nose, together with the bougies introduced into the nostril for the support of the alæ, and to preserve the orifices of the nostril, are also represented. After Bernard and Huette.

Fig. 5. A side view of the original Taliacotian operation, or that revived by Græfe, with the bandage or jacket worn to support the arm until adhesion occurs in the base of the flap. 1, 2, 3. The flap, cut from the skin of the arm, and attached over the nasal cavity by numerous sutures.

After Bernard and Huette.

Plate 17

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

elevated and deformed by adventitious adhesions around these fistulæ. The exfoliated portion of bone was removed by Dr. J. K. Rodgers, who was obliged to enlarge the opening by a short incision in the scalp at the upper and left angle of the ulcer; the undermined integuments, rolled in upon themselves from want of support, turning a portion of the hairy scalp inwards upon the face of the sore, and adhering in a fold along the left border of the ulcer. (Plate XVII, Fig. 1.)

Operation of Dr. Watson.—After shaving the scalp, and removing the cuticle from the centre of the ulcer, by washing it with concentrated aqua ammoniæ, the integuments along the left border of the ulcer were unfolded by the free use of the scalpel.

The point of the knife was then carried completely around the circumference of the opening, through the whole thickness of the soft parts, so as to remove a strip of integument varying from an eighth to a quarter of an inch in width, thus making a smooth and fresh border for the subsequent adjustment of the flaps.

Two quadrilateral flaps, the one on the left and the other on the right side of the opening in the forehead, were then raised by making four incisions horizontally backwards, and nearly parallel with each other, two on each side, one from each upper, the other from each lower angle of the opening, the flaps being detached from the pericranium.

The diseased portions of bone were then removed, as far as they could be detected, by means of 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 had been profuse, was then checked by ligatures.

An attempt was next made to approximate the lateral flaps so as to cover the opening, but this could only be partially accomplished, as they could be made to meet only to the extent of an inch from their lower edges, even after considerable stretching. The portions thus approximated were secured by sutures, but left a large V-shaped gap in the upper part of the forehead. To close this, 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 being dissected up and rotated so as to bring its lower and right angle downwards on the centre of the forehead, thus supplying effectually the deformity; the edges being then accurately adjusted

by numerous points of sutures (Plate XVII, Fig. 3), strengthened by adhesive plaster, and covered by a compress and bandage. The dressings were subsequently kept wet with cold water. The first dressing was removed on the sixth day, and about three-fourths of the line of incision found to have united by the first intention. At the second dressing, on the ninth or tenth day, cicatrization had progressed somewhat further, and in five weeks the patient left the hospital, at which period the wound had entirely cicatrized, with the exception of a pupillary opening communicating with a small point of carious bone that had been overlooked in the operation, and had not then exfoliated. Plate XVII, Fig. 2, represents the patient as cured.

CHAPTER VIII.

OF THE EXTERNAL NOSE.

SECTION I.

ANATOMY OF THE EXTERNAL NOSE.

THE general relations of the nose to surrounding parts are so well known that reference to them in detail is deemed unnecessary. The structure of the nose, proceeding from the outside to the cavity of the nostril, is composed of the skin, cartilages, bones, and mucous membrane.

The skin on the upper portion, or base of the nose, is similar to that on the forehead, is loosely attached to the subjacent parts by a free cellular tissue, and is, therefore, very movable. At the point and lower half of the nose, or sides of the nostril, it is abundantly furnished with sebaceous follicles, and is attached to the cartilages by short fibrous filaments which render it very immovable and difficult to dissect from the subjacent parts, without injuring them. These follicles are generally the seat of the lipomatous tumors found in this region. The cartilaginous portion of the nose is formed by a vertical cartilage or septum, placed in the middle line of the nose, continuously with the bony septum formed by the vomer and nasal lamella of the ethmoid bone, and of the oval cartilages or oblong oval plates, which, forming the structure at the point, are directed

upwards and backwards from the cartilaginous septum. The contact of the oval cartilages with each other forms the columna nasi.

The alæ nasi, or convexities on the sides of the nostril, owe their shape to several small cartilages, united by ligamentous matter. They keep the nostril patulous, and also permit its free motion.

The mucous membrane covers these cartilages as well as the bones of the internal nose.

SECTION II.

OPERATIONS UPON THE EXTERNAL NOSE.

The operations upon this part may be demanded either for the removal of lipomatous tumors, for occlusion of the nostril as the result of ulceration or burns, or for the cure of deformities arising from loss of substance.

The class of tumors usually known as lipomatous, and described as such, or as carcinomatous, are occasionally seen on the lower extremity of the nose. These tumors have been very indefinitely described by European writers, and the soundest view of their pathology will, it is thought, be found in a paper on Polypi and other Tumors of the Nose, by Dr. John Watson, of New York.*

Dr. Watson regards these external tumors "as neither carcinomatous nor lipomatous, but as dependent on hypertrophy of the integuments and cellular tissue, and attended with serous and fibrinous infiltration and excessive development of the sebaceous cryptæ proper to the integuments. These tumors are analogous to the polypous growths, are slowly developed, unattended with pain, and occur either singly or in groups; are disposed to assume a pyriform shape, to become pendulous, and to grow to an enormous size, reaching, in some instances, to the lower lip, and in others below the base of the chin." Their development is often a strictly local complaint, being limited to the skin; does not involve the nasal cartilages; and though vascular, and disposed to bleed freely, they may be removed by shaving or dissecting them off from the cartilages, care being taken previously to introduce a finger into the nostril so as to prevent the injury of the alæ by the incisions, the ulcer being allowed to heal by the second intention.

* Amer. Journ. of Med. Sciences, April 1842, p. 345.

The relief of the contraction of the nostrils resulting from lupus, scrofulous ulcers, or burns, requires the formation of an opening by paring away the tissue around the nasal orifice, and an endeavor to heal the ulcer by the use of nitrate of silver. The production of the opening is sufficiently easy, but its preservation, even with a free excision of the surface of the alæ, is often very difficult, cicatrization and subsequent contraction often closing it as soon as the tubes or tentes are removed.

In a young lady, in whom both nostrils were completely closed, as the result of scrofulous ulceration, the mucous membrane was perfectly sound, and its secretion free enough to escape by the posterior nares; yet, notwithstanding free excision, the use of sponge tentes, caustic, &c., I failed to effect a restoration of the passage.

SECTION III.

RHINOPLASTY.

The restoration of the whole or of part of the nose constitutes a variety of the class of plastic operations designated as Rhinoplasty. These operations are among the most tedious and painful in surgery, and before undertaking them the surgeon will find it advantageous to resort to the following preliminary measures: 1st, make the patient fully aware of what it is necessary to suffer; 2d, inform him of the chances of failure from want of vitality in the new portion; 3d, of the great tendency to contraction in the new organ; 4th, of the probable difference in color and texture between it and the nose in its natural condition. When the result is fully understood by the patient, let the surgeon next proceed to study most thoroughly the probable shape and natural characters of the lost part; make ample calculation for the shrinking of the flap, allowing, generally, for the ultimate loss of at least two-thirds of the portion at first taken; and, cutting pieces of thick, or moderately stiff paper or kid, fit them to the part, or mould a wax nose upon the deficient portion, and by flattening it endeavor to obtain an accurate pattern of the shape of the integuments that will be required, marking it upon the skin by means of lunar caustic. In addition to this, let him also prepare his patient most carefully by an appropriate general treatment, and select such a period and locality as will be most likely to

ward off an attack of erysipelas. In operating for the restoration of a nose where the bones and cartilages are all destroyed, he should also make his patient comprehend that, as the bridge has been destroyed, the new nose will never present the convexity of the old one, but that, though thus defective, it may yet look better, and render him more comfortable than he was before the operation.

The various modes of performing rhinoplasty, like the other plastic operations, have been arranged under three classes: 1st, the Indian method, or original plan of the Brahmins, in which the flap is taken from the integuments of the forehead; 2d, the Italian or Taliacotian operation, where the flap is taken from an extremity, usually the arm, near the insertion of the deltoid muscle, several days before it is applied to the deficient portion; 3d, where it is taken from the forearm, with some modifications, as practiced by Græfe and others among the Germans; and 4th, the French plan, in which a piece taken from the neighboring parts is slid over or rotated so as to cover the deficient portion.

To these may be added the insertion of a piece directly removed from some other portion of the body, and attached to the deficient part.

The plastic operations practiced on the Face date from a very early period, having been long resorted to in India in order to remedy the losses occasioned by the punishment of criminals. In 1597, Taliacotius, of Venice, published a volume on the subject, in which he detailed his methods of operating; and the term Taliacotian has since been often employed to designate all plastic operations, though it should be strictly limited to his or Branca's peculiar plans. Græfe, of Germany, modified this method in 1815, resorting to immediate union of the flap; whilst Labat, Serre, and others, in France, in 1834, published long accounts of their success by means of flaps taken from adjoining parts. In the United States, the Taliacotian operation had nearly fallen into oblivion, when it was successfully revived, in 1837, by Dr. J. Mason Warren, of Boston, who modified the operation of Græfe by taking the flap directly from the forearm instead of the arm. Since then, rhinoplasty in different forms has been frequently resorted to with varying success, by Drs. Joseph Pancoast and Thomas D. Mütter, of Philadelphia; and, very recently,* the original Taliacotian operation for restoration of the end of the nose has been performed by Dr. Horner, of

* May, 1851.

the same city, but without success, owing to the sloughing of the edges of the flap.

§ 1.—INDIAN OR BRAHMIN METHOD OF RHINOPLASTY.

OPERATION OF DR. J. MASON WARREN, OF BOSTON.—"The patient, a young man, aged 28 years, had lost, from ulceration, the whole nose, cartilages, septum, and bones. In the place of the nose, there existed an opening, about one inch in diameter, bordered by a firm cicatrix; and the septum being destroyed, the cavities of the two nostrils were thrown into one. The four front teeth with the alveolar processes had also been lost, and there was an opening between the lip and the upper jaw through which a probe might be passed from the mouth into the nasal cavity. The favorable circumstances connected with the case were the healthy state of the integuments surrounding the opening of the nasal fossa, the great height of the forehead, the whiteness and delicacy of the skin, and the good state of the patient's health.

OPERATION, Sept. 7th, 1837.—"A piece of pasteboard, cut in the shape of the letter V, that is, triangular and with a projection from its base, corresponding with the columna of the nose, was placed upon the forehead, and a trace made around it with the nitrate of silver, as recommended by Lisfranc, in order that it might not be effaced by the blood. A trace was also made around the opening of the nasal fossa at the points where it would be necessary to remove the integuments for planting the new skin taken from the forehead. This was done the night previous to the operation. The clothing being arranged, the patient was laid on a table with his face towards the window and the operator behind him, so as to have the full command of the head. The traces made by the nitrate of silver were about two-thirds of an inch apart between the eyebrows; each side of the triangular portion of the skin was three inches and a quarter in length, with a base of three and a half inches, and the projection from the columna of the nose, which was to be taken entirely from the scalp, previously shaved, was an inch and a half long, and two-thirds of an inch wide.

"The head being firmly supported by two assistants, the incision was commenced between the eyebrows and the flap of skin dissected up so as to isolate it entirely from the skin of the forehead except

where, for the purpose of nutrition, it was left adherent at the root of the nose. The incision on the left side, between the eyebrows, was extended a little further down than on the right, the better to facilitate the twisting of the flap. This incision included the skin, subcutaneous cellular tissue, and a portion of the occipito-frontalis muscle, care being taken not to raise the periosteum from fear of necrosis. The flap, thus dissected and twisted round to the left side, was carefully wrapped in a compress of linen cloth, and before the operation was proceeded in further, attention was given to diminishing the large wound made in the scalp (forehead); little hemorrhage had taken place, and the temporal arteries which had been cut very soon retracted and ceased bleeding. The angles of the wound were now brought together by the twisted suture, two pins being employed on either side. Its edges between the eyebrows were also approximated in a similar manner, and by this means the wound in the forehead was at once diminished to less than half its original size; it was still further reduced by the use of a few strips of adhesive plaster; and a little scraped lint filled up the remainder of the wound. Some spread cerate was placed over the whole surface with a pledget, and the dressing was secured by a bandage round the head.

"The next object was to fasten the borrowed skin in its place. In order to do this, it was necessary to freshen the borders of the opening in the nasal fossa, the traces of which, as stated, had been previously made with the nitrate of silver. For this purpose, a short, narrow knife, somewhat similar to a cataract-knife, was used (resembling the original knife of Taliacotius), and a strip of integument a third of an inch broad, including all that had been indurated in the old cicatrix, removed. The knife was also passed between the lip and upper jaw, in which existed, as before stated, an opening large enough to pass a probe, and the adhesions between the two for the space of an inch entirely cut away, for the double purpose of giving the columna of the nose a more deep and firm adhesion, as well as to close up by inflammation the unnatural communication between the mouth and nasal cavity.

"The flap was now brought down into its place, its angles a little rounded with the scissors, the better to simulate the alæ of the nose, and the whole secured in its place by pins and points of the interrupted suture." In a subsequent operation, the interrupted suture was used, and is generally preferable.

"From that portion of the skin which was to form the columna, the epidermic side was pared a little, so that it might form an adhesion, not only underneath to the jaw, but on its sides to the quadrangular wound made for it in the upper lip.

"A little scraped lint was now placed under the ends of the pins, and a strip of oiled lint introduced into each nostril to prevent adhesion; another strip was placed upon the nose to preserve its temperature, and the dressings were confined by a band of adhesive plaster fixed to the forehead above and partially divided in the middle, so that it might descend on each side of the nose to the lip."*

A double T bandage, made of narrow tape, the horizontal portion of which is applied to the upper lip, and the two vertical portions carried over the root of the nose, will also serve a good purpose and be free from the objections to the use of adhesive plaster.†

§ 2.—TALIACOTIAN OPERATION.

OPERATION.—In the Italian or Taliacotian operation, as it is more frequently termed, the nose, upper and lower lips, or ear, have all been restored by means of flaps taken from other portions of the body, and especially from the skin of the arm.

In the operation on the nose, Taliacotius made two parallel incisions in the integuments of the arm over the belly of the biceps muscle, at such distances from each other, and of such lengths as seemed likely to furnish a sufficient flap, allowance being made for the subsequent shrinking of about two-thirds of the portion taken, cutting it so as to free the skin from the fascia. The incisions corresponded with the vertical portions of the letter H. Or the skin was elevated by broad forceps, and then transfixed, as in the ordinary introduction of a seton in the neck. In either case, after passing the knife beneath the skin from one incision to the other, Taliacotius introduced a piece of linen spread with cerate in order to prevent adhesions between the flap and the subjacent parts, and allowed the wound to suppurate for ten or fifteen days, in consequence of which a contraction of the width of the flap was effected, whilst it was also thickened and rendered more organizable. A bandage, consisting

* Boston Med. and Surg. Journ., vol. xvi. p. 69, 1837.

† See Smith's Minor Surgery.

of a jacket, with a hood for the head, and a sleeve to contain and support the arm, with bands to hold it fast to the head, so that the flap could be steadily kept attached to the nose, was next prepared. The edges of the surface to be restored being then freshened by paring off the cicatrix, by means of a thin and broad-bladed knife, the flap was freed from the arm by its upper extremity, the arm brought up to the head, and the fresh end of the flap attached to the raw surface of the nose by means of numerous points of the interrupted suture, after which the bandage was tightened, and the arm left attached to the head (Plate XVII, Fig. 5).

After fifteen or more days, when union had taken place, the attachment of the flap to the arm was divided and trimmed so as to fill up the remainder of the deficient portion, this end being retained in its position by a few turns of a bandage, passed from the head around the nose, lip, or ear, according to the part operated on.*

Remarks.—This operation, though applied to all parts of the face, is especially adapted to the restoration of the tip of the nose, the loss of portions of the lips and ears being more readily supplied by flaps taken from the adjacent parts by either sliding or rotating them upon their base.

With some slight modifications, it has been successfully performed by Dr. J. Mason Warren, of Boston, in April 1840.† In this case, the flap was separated from the arm on the fifth day, union having then occurred.

By a modification of the French method, Dr. J. Pancoast has succeeded in restoring the middle of the nose, together with the ala of the left side. In his case, a great portion of the hard palate, the sockets of the upper incisor teeth, the cartilaginous septum, superior lateral cartilages, inferior turbinated bones, together with a considerable portion of the inferior oval cartilages, and the integuments of the nose, had been destroyed by scrofulous ulceration, the tip and margin being drawn upwards and also depressed inwards by the cicatrization.

Operation.—The patient being laid on a table with his head supported by pillows, the integuments of the depressed cicatrix, just

* Gasparis Taliacotii Borroniensis. De Curtorum Chirurgiæ per insitionem, additi cutis traducis, instrumentorum omnium atque deligationum iconibus et laterilis. Venetiis, 1597. This book, together with many other rare and ancient medical works, may be found in the Loganian portion of the Philadelphia Library.

† Boston Med. and Surg. Journ., vol. xxii. p. 261.

below the ossa nasi, were dissected off so as to obtain a bevelled raw surface, to receive the margins of the flaps. The end of the nose was then separated from the ossa nasi by pushing a sharp-pointed, straight bistoury, with the back to the cheeks, across the cicatrix, and cutting outwards. It was also found necessary to divide some adventitious adhesions within the nostril, and to extend the incision of the cheek outwards and downwards through the root of the oval cartilages, before the tendency to retraction of the tip could be overcome.

A triangular flap of integuments was then marked out on each cheek just below the malar protuberance, of a size calculated to fill the breach, the outer limb of each triangle being rounded so as to give a prominence to the ridge of the nose, when the base of the flaps were brought together, and the edges of the flaps bevelled inwards towards their centre, so as to furnish an oblique surface, by which they might rest in the raw edges of the nose. Being dissected up with as much subcutaneous cellular substance as could be taken without involving muscular fibres, the hemorrhage was arrested by torsion, and the flaps twisted upon the pedicle, from below upwards, so as to make the lower margin of the flap on the cheek become the upper on the nose.

The flaps were then united by their bases upon the dorsum of the nose, and by their sides to the adjoining parts, by small palladium pins and the twisted suture. The nostrils were lightly stuffed with oiled lint, and the wounds on the cheek united by hare-lip sutures, applied so that the stress should be towards the canthus of the eye, and not upon the middle of the eyelid, which might have caused ectropion, when lint, wet with warm water, and covered with oiled silk, completed the dressing. At the first change of dressing, complete union was found to have taken place everywhere except at the median line where there was some suppuration.

After some further additions to remedy defects arising from ulceration and contraction, the nose, ten months after the operation, looked quite natural. In his subsequent operations, Dr. Pancoast employed the interrupted suture as preferable to the twisted.*

Restoration of the Alæ Nasi may be accomplished either by a half flap of the Indian method, by the Taliacotian operation, or, if the loss is very limited, by a piece taken from some other part, and

* Pancoast's Operative Surgery, Philad. 1844, p. 350, and Amer. Journ. Med. Sciences, vol. iv. p. 337, N. Series, 1842.

immediately attached in the opening, an operation which has fully succeeded in the hands of Dr. J. Mason Warren, of Boston.*

§ 3.—RESTORATION OF THE COLUMNA NASI.

LISTON'S OPERATION.—In deficiency of the columna nasi, the late Mr. Liston took the flap from the upper lip, the point of the nose being raised, and its apex freshened at its attachment. By two vertical incisions on each side of the centre of the upper lip, a flap was cut of the entire thickness of the part, wide enough to allow of shrinking, and the frænum being freely dissected off, the flap was everted upwards, so that the mucous membrane presented outwardly. Removing the membrane from the top of the flap, it was attached by a pin, through its end, to the apex of the nose, and fastened by the twisted suture, uniting the lip as in the hare-lip operation. Exposure to the air soon changed the mucous membrane, and after a time it resembled the original structure of the columna.†

For many other plastic operations, and for much valuable experience, the reader may advantageously consult the papers of Drs. Warren, Pancoast, and Mütter, as quoted in the Bibliography, all of which contain drawings explanatory of the various steps in the operations.

VALUE OF THESE OPERATIONS.—In estimating the value of these Rhinoplastic operations, and especially of that for the restoration of the entire nose, much must depend upon the nature of the deformity. Most frequently, or when the operation is at all proper, the deficiency is very great, and under such circumstances even an imperfect-looking nose will be deemed, by most patients, better than none. But, when it is remembered that the integuments of the new organ will retain most of the ordinary appearances of skin, whilst that of the natural nose possesses a large number of follicles; that the hair upon the flap is apt to grow and require the frequent use of the tweezers for its extraction; that the new nose will generally be paler than the surrounding skin, and that, except in the Taliacotian operation, a cicatrix of some size will be visible at the part from which the flap has been taken, the surgeon may well hesitate and think whether, with the risk of failure or an imperfect success, it may not be better

* Boston Med. and Surg. Journ., vol. xxii. p. 268, 1840.

† Liston's and Mütter's Surgery, p. 168, Philad. 1846.

to import from Paris, or elsewhere, an artificial nose, the manufacture of which has now attained considerable perfection, and then, if on its reception the patient's vanity is not gratified, the operation may be undertaken with less chance of censure, should the result not entirely correspond with his or her anticipations. In the successful cases, which are those mainly reported, there is certainly great cause for satisfaction, but, as the operation has been at different periods lauded highly, and then fallen into disrepute, is it not probable that the number of failures, or abortive attempts, will again throw it into comparative oblivion? Plastic operations for the restoration of small deficiencies have been positive triumphs of science; but that for the restoration of an entire nose is by no means so well established, notwithstanding the *éclat* attached to the successful cases. Those which have been seen by the author have certainly not presented captivating specimens of this organ.

CHAPTER IX.

OF THE INTERNAL NOSE, OR THE NASAL CAVES.

SECTION I.

ANATOMY.

THE internal nose consists of two large fossæ in the middle of the superior maxillary bones, which present a very irregular surface. These fossæ, or cavities, are separated by the vertical septum, which, in the natural condition of the part, is a plane surface, and corresponds with the inner side of the nostril. The upper part of each fossa is formed by the cribriform plate of the ethmoid bone, the cells of which diminish very much the width of this portion of the cavity, so that the space between the upper and middle turbinated bones and the septum narium is frequently not more than three lines.

The bottom or floor of the nostril is formed by the palate process of the superior maxillary and palate bones, and is concave and about half an inch wide.

The external face is very irregular, presenting a number of convexities or prominences (Plate XVIII, Fig. 1), which are intended

to afford a greater surface for the lining or olfactory membrane. Among these prominences, that caused by the convexity of the inferior turbinated bones is very apparent, and tends much to diminish the breadth of the nostril throughout its whole depth. The middle meatus of the nose, or the space between the middle and inferior turbinated bones contains the orifice of the antrum Highmorianum. This orifice is usually situated about the middle of the bone, but its precise situation and direction are so uncertain that it is stated, by an accurate anatomist,* to be found with some difficulty in the subject, though quite apparent in the skull.

The inferior meatus of the nose is between the lower turbinated bone and the floor of the nostril. At the anterior part of this meatus, about five lines from the anterior extremity of the turbinated bone, is the orifice of the ductus ad nasum.

This orifice is found at the upper part of the inferior meatus, about eight lines from the floor of the nostril.

The mucous membrane lines the whole nose, penetrates into the several sinuses and cavities communicating with it, and is continuous at the nostrils with the skin, and at the posterior nares with the lining membrane of the pharynx.

The posterior orifice of the nostrils, or the posterior nares, is divided, like the anterior, by a vertical septum (vomer). Its perpendicular diameter is about an inch, but its transverse diameter is only six lines (Velpeau), points which should be remembered in the introduction of the tampon for the arrest of epistaxis.

SECTION II.

OPERATION ON THE NASAL CAVITIES.

Removal of Foreign Bodies.—The introduction of beans, beads, grains of coffee, cherry stones, ribbon, &c., into the nostrils of children, sometimes gives rise to considerable trouble in their extraction, especially when the article is one capable of swelling from heat and moisture. In every instance, however, it is desirable to attempt it at as early a period as possible, in order to avoid the turgescence and serous infiltration of the lining membrane of the nose.

Unless of considerable size, these bodies are seldom arrested upon

* Special Anat. and Histology, by Wm. E. Horner, M.D., vol. ii. Phila. 1851.

the floor of the nostril; more frequently they will be found between the inferior or middle turbinated bones and the septum; and, in attempting their removal from this position, the delicacy of these bones should be borne in mind.

A piece of annealed wire, covered with thread, such as is used by the milliners in the manufacture of ladies' bonnets, and formed into a loop, will often prove a simple and efficient instrument for the removal of the substance, when there is but a small space at its side through which to pass an instrument.

Foreign bodies may be extracted either from the front of the nostril or pushed back into the throat, according to their proximity to one or other of these orifices. As they seldom fill up the entire front of the nose, a curette or curved probe, or Leroy's instrument for removing fragments of calculi from the urethra, may generally be passed on one side of the article, so as to enable the operator to draw it forward. If jammed between the inferior turbinated bone and the septum, gentle pressure from above downwards, by placing it upon the floor of the nostril, will facilitate its subsequent removal either by the instruments before named, or by polypus or common dressing forceps. If, however, the foreign substance should be a piece of ribbon, or something similar, which has been stuffed high up in the cavity, washing out the nostril by a stream of water from a syringe, will often dislodge one end and enable the operator to seize and draw it out with his forceps.

§ 1.—ARREST OF HEMORRHAGE FROM THE NOSTRIL.

Bleeding from the nostril, when excessive, and when the use of powdered galls or tannic acid, or matico, or gum Arabic, or alum, have failed, may usually be arrested by plugging up both the anterior and posterior extremities of the nostrils, so as to prevent the escape of the blood, and cause the formation of a clot.

PLUGGING THE NOSTRIL WITH BELLOCQUE'S INSTRUMENT.—This instrument (see Plate XIV, Figs. 21, 22) consists of a curved silver tube, in which is placed a piece of watch-spring of sufficient length to reach from the uvula to near the front teeth. To one end of this spring is attached a silver button, with an eye capable of readily receiving a ligature; to the other is screwed a probe, which is intended to push out the spring.

Operation.—After preparing a little pellet of charpie, of a size corresponding with the opening in the posterior nares, and after passing a long ligature through the eye of the button at the end of the spring, and drawing the latter fully within the canula, the surgeon should pass the tube along the floor of the nostril, keeping it close to the side of the septum, until it reaches the uvula. Then, pushing forward the spring, the button will readily pass into the mouth, or its passage in front of the uvula may be facilitated by the forefinger introduced into the mouth. When the button is near the teeth, one end of the ligature should be drawn out of the mouth, and a pellet of charpie attached to it by tying the ligature round its middle. (Plate XVIII, Fig. 1.) Then, on withdrawing the spring into the canula, and removing it from the nose, the pellet may be drawn up into the posterior nares, so as to leave one end of the ligature in the mouth, and the other in the nostril. It only remains to plug up the front of the nostril, and tie the two ends of the ligature rather loosely in a loop near the teeth, or to carry them towards the cheek and fasten them with adhesive plaster.

Should the surgeon not be able to obtain Bellocque's canula, he may readily carry a ligature through the nostril and mouth by means of a common elastic catheter; the ligature being passed through the eye of the instrument, and the latter withdrawn after the pellet is in position. In either case, after the lapse of several hours, the lint in front of the nostril should be removed by the fingers or forceps, and that from the posterior nares displaced either by pressing it into the throat by a probe, whence it may be drawn by the thread left attached to it for this purpose, or it may be drawn out simply by employing the end of the ligature left in the mouth.

§ 2.—POLYPI IN THE NOSTRILS.

Pathology.—In order to appreciate the value of the different modes of treatment which have been proposed for the relief of polypi, it is necessary that reference should be briefly made to their structure and general position. Various divisions of polypi have been described by writers, and especially by Dupuytren, in all of which more attention has been given to their consistence than to their general pathological characters. In an excellent paper by Dr. John

PLATE XVIII.

ANATOMY OF THE INTERNAL NOSE TOGETHER WITH THE OPERATIONS FOR NASAL POLYPI.

Fig. 1. A vertical section of the Head, in its median line, so as to show the interior of the Nose, Mouth, and Throat.

1. The middle turbinated bone. 2. Inferior turbinated bone. 3. Anterior and cartilaginous portion of the nostril. 4. Middle palatine suture. 5. Roof of the mouth. 6. An ear catheter passed along the floor of the nostril and entering the orifice of the Eustachian tube. 7. Middle meatus of the nose. 8. Inferior meatus, near the nasal orifice of the ductus ad nasum. 9. The sound of Laforest introduced into the duct. 10. Section of the uvula. 11. Bellocque's canula passed along the floor of the nostril and soft palate, behind the uvula into the pharynx. The spring has been protruded, and the ligature with the pellet of charpie attached is about to be drawn back into the posterior nares in order to close one side, as in tamponing the nostril. 12. The epiglottis cartilage. 13. Section of the œsophagus. 14. Genio-hyoglossus muscle. 15. Origin of genio-glossus muscle. 16. Section of lower jaw at the chin. 17. Structure of the chin. 18. A probe introduced into the buccal orifice of the duct of Steno.

After Bernard and Huette.

Fig. 2. A vertical section of the Nose, showing the application of a ligature around a guttural polypus by means of the "porte" of Charriere.

1. The ligature passed in a loop through the nostril. 2. The "porte" which has seized it in the pharynx, and directed it around the base of the tumor. This instrument opens at the end by means of a spring, so that it can seize or be detached from the ligature without difficulty. The forefinger of the surgeon will often do quite as well.

After Bernard and Huette.

Fig. 3. Section of the Face, so as to show the removal of a pyriform nasal polypus, by means of the wire ligature and double canula as practiced by Physick.

After Sir Charles Bell.

Fig. 4. A side view of Dr. Mott's operation for the removal of a large nasal polypus, which filled the entire nostril. The integuments have been incised and dissected back, whilst the dotted lines show the course of the saw through the bones.

After Dr. Mott.

Plate 18

Fig 1

Fig 2

Fig 4

Fig 3

Watson, of New York,* much has been added to our knowledge of the origin and structure of these tumors, and I cannot present the reader with any details more valuable than those furnished by his article. From this, the following account is, therefore, condensed.

KINDS OF POLYPI.—Six kinds of polypi may be noticed in connection with the surgical affections of the nostril.

1st. The mucous or soft polypus, caused by the accumulation of mucus within the muciparous follicles, and arising either from a change in the consistence of the mucus itself, or from obliteration and obstruction of the ducts, resembling, in this respect, the sebaceous and encysted tumors of the scalp and other portions of the body, all of which, like polypi, may become pedunculated if acted on by the weight of the contents of the sac.

2d. The polypus from hypertrophy, induration, and infiltration of the mucous and submucous tissues of the nostril, and similar to the tumors frequently seen near the lower part of the rectum. These tumors are, in fact, a prolapse of the thickened and infiltrated Schneiderian membrane, and attended with an effusion of fluid into the subjacent cellular tissue, as the result of inflammation.

3d. Fleshy polypi or caruncular excrescences, of a florid red color, and though not painful except when irritated, possessed of a certain degree of sensibility. These are less disposed to assume a pedunculated attachment than any other benign form of polypi. Similar growths have been found at the inner edge of the meatus urinarius of the female, and in the external meatus of the ear, by Sir A. Cooper, and others have seen them in the rectum.

4th. Fibrous polypi, supposed by Velpeau to have their special origin in the fibrous tissue covering the bones in the nasal cavity, and to lie between the bone and the proper mucous tissue. When very large, these are usually found projecting into the posterior fauces, though the other forms may also project either forwards or backwards. These tumors are, as stated by Dr. Watson, invariably attached by a firm and fibrous pedicle.

5th. Gelatinous polypi, which are of rare occurrence, Dr. Watson having seen but one. In this case, the disease appeared to have originated in the antrum between the mucous membrane and the bone, and then to have encroached on the surrounding parts. It was surrounded by a sort of imperfect capsule, with subdivisions of

* Amer. Med. Journ., vol. iii. p. 325, New Series, 1842.

cellular tissue, some of which were exceedingly delicate, and all of them filled with a gelatinous, semi-fluid substance of a transparent pale white or amber color. At some points, this matter was more like soft calf's-foot jelly, without any visible envelop, but here and there the tumor contained opaque, grumous, bloody deposits. The bones retained their proper character, and had not degenerated, and all the surrounding tissues were simply affected by the pressure of the tumor.

6th. External polypi, generally called lipoma, and referred to in a previous page.

7th. Carcinomatous polypi, most frequently originating in the periosteum or bony structure of the upper jaw, and, sooner or later, invading and deranging surrounding tissues.

SEAT OF POLYPI.—This is to be ascertained mainly by dilating the nostril, by introducing the blades of the dressing forceps, or by a speculum, or by directing the patient to blow through the nostril so as to force them forward.

Most frequently polypi arise from the membrane spread over the turbinated bones, or near the orifice of the maxillary sinus, being seldom found on the septum, and also as rarely arising from the floor of the nostril. The first two forms are generally confined to the tissues lining the external and upper wall of the nostril. The third form, though not so strictly limited, is often found near the external orifice of the nostril at or below the turbinated bones. The fourth is most frequently found to arise in the posterior fauces immediately behind the top of the septum, or probably from the septum itself.* In a case which I attended in consultation with my friend, Dr. J. M. Wallace, the tumor extended from this point along the body of the sphenoid bone, and left it perfectly denuded of its periosteum, as was shown after its removal.

The fifth or gelatinous polypus, as already seen, arises in the antrum Highmorianum, and the sixth, though frequently arising on the nasal surface of the upper maxillary bone, is restricted to no definite point of attachment.

OPERATIONS.—The mucous polypi may frequently be cured by the plan proposed by Dr. Watson, of puncturing them and evacuating their contents, after which the sac wastes away. The extraction of other polypi may be attempted either by the polypus forceps, by the

* Watson, loc. citat.

wire ligature and double canula of Levret (Physick and Randolph), (Plate II, Figs. 11, 12), or by the knife, caustics, sternutatories, &c. being comparatively limited in their application, or resorted to either as palliative means, or as adjuvants to the other plans of treatment.

Removal by the Forceps.—The patient being directed to blow his nose, and being seated before a good light with his head well supported, the surgeon should introduce the forceps closed, and with the width of the blades corresponding to the vertical diameter of the nostril, grasp the tumor as near as possible to its base; then, rotating the instrument in his hand so as to twist the tumor, pull it away with a jerk as soon as it is felt to yield to the torsion movement.

Strangulation and Extraction by the Wire Ligature and Double Canula.—This plan, which is most frequently resorted to, and which is the least liable to injure the bony structure, is practiced as follows: Pass a piece of well annealed iron wire through the barrels of the canula, and fasten one end firmly around one wing of the instrument. Then, seizing the free end of the wire, push or pull it through one of the barrels of the canula until a loop of the proper size is formed at the end which is to be passed into the nostril. On carrying this into the nose with the loop parallel with, and close to the septum, turn it transversely beneath the fundus of the tumor, and endeavor to slide it over and up to the pediculated portion; after which, the free end of the wire should be seized with forceps similar to those used by bell-hangers, and drawn as tightly as possible. If the polypus is not too dense in its structure, this will constrict its pedicle to a mere shred, and it only remains to tear it away at the end of the canula, in the loop thus tightened. After a few minutes, the patient should be again directed to blow his nose, especially on the side affected, when the surgeon, again forming a loop, fishes about in the nostril for another tumor, which is extracted as before (Plate XVIII, Fig. 3).

In large polypi, and especially where they protrude by the posterior nares, it may become necessary to strangulate them and leave them to slough off. When the wire ligature can be made to surround the tumor, the more perfect strangulation accomplished by it should cause the surgeon to give it the preference. But its large size will occasionally preclude the use of it in this manner. In the case of a large polypus which projected behind the soft palate as low as the extremity of the uvula, and filled completely the posterior nares and cavity of the nose, Dr. Physick, after vainly attempting to extract it

with the ligature and forceps, passed a portion of tape made stiff by means of a piece of silver wire into the nose and throat, and getting it around the base, tied the tumor in this manner. In a similar case in which I assisted Dr. Wm. Gibson, a violin-string was passed around the base by means of Bellocque's canula, and both ends brought out of the nostril, when they were passed through the barrels of a canula and the tumor strangulated, as in the usual application of the wire ligature. The canula was kept in the nostril until the third or fifth day, when the tumor sloughed off.

In a large fibrous polypus which filled the nostril, Dr. Valentine Mott removed the tumor after the ligature had failed, by making a section of the soft parts from the inner canthus of the eye to near the angle of the mouth, and sawing out the greater part of the os nasi, ascending ramus of the superior maxillary and inferior turbinated bone.* (Plate XVIII, Fig. 4.)

Excision.—Except in the very rare cases of exceedingly firm polypi, or those near the nasal orifice, this operation is seldom practiced. When resorted to at the anterior orifice, the tumor should be hooked forwards, and excised either with a probe-pointed bistoury, or with scissors, though the first is preferable.

In all these operations, if the subsequent hemorrhage is excessive, tamponing the nostril may be required.

Value of these Operations.—In most cases, the wire ligature and double canula will prove most serviceable, next the forceps, and lastly excision, simple polypi requiring only to be punctured, or their coats to be ruptured by sternutatories, in order to evacuate their contents.

CHAPTER X.

SECTION I.

ANATOMY OF THE EXTERNAL PORTION OF THE MOUTH.

In studying the parietes of the mouth, two parts are to be separately noticed: first, its orifice as formed by the lips, and its sides as

* Amer. Journ. Med. Sciences, vol. v. p. 87, 1842.

constituted by the cheeks. The tissues composing both these portions are the skin, cellular substance, fat, blood-vessels, muscles, and nerves, together with the mucous membrane.

The skin and cellular substance present nothing requiring a special description. The muscles of this region are the orbicularis oris, closing the orifice of the mouth; the zygomatici and levatores anguli oris, which draw back its angles; the buccinator, which dilates its cavity, and forms the greatest portion of the sides of the cheek; and the masseter, which assists in closing the jaws, being inserted into the lower jaw in advance of its angle. The depressors and levators of the lips complete the enumeration.

The principal blood-vessels are the facial artery and vein with their branches, both of which pass on to the face, side by side, over the surface of the inferior maxilla, directly in advance of the anterior edge of the masseter muscle; being at this point quite superficial, they may be readily compressed by the pressure of the finger against the jaw just in advance of the muscle. The nerves are the branches of the seventh pair (portio dura), which are widely distributed over the face after it emerges from the parotid gland (Plate XXIII, Fig. 2), and the infra-orbitar (second branch of the fifth pair), which, coming out through the infra-orbitar foramen of the superior maxillary just below the middle of the orbit, is also freely distributed to all the tissues. Expression and motion are due to the portio dura, and sensation to the branches of the fifth pair.

The salivary glands (Plate XXIII, Fig. 1), although opening into the mouth, are yet so situated as to be rather intermediate to the head and neck, and the description may, therefore, at present, be limited simply to their ducts as mainly belonging to the region under consideration, the position and operations practiced upon the glands themselves being reserved for the account of the neck, owing to the importance of their vascular connections with this part.

The duct of Steno, or the parotid duct, departs from the anterior edge of the gland a few lines below the zygoma, traverses the outer face of the masseter, and perforates the buccinator muscle and the lining membrane of the mouth, so as to have its orifice opposite the second large molar tooth of the upper jaw (Plate XVIII, Fig. 1). Its position may be accurately marked by drawing a line from the tip of the nose to the lobe of the ear (Physick). The duct of the submaxillary gland may be found opening by a small projecting orifice on the anterior margin of the frænum linguæ. The ducts of

the sublingual open either into that of the submaxillary, or directly into the mouth, on either side of the frænum.*

The further details of this portion of the face, being of but little practical value to the surgeon, may be omitted, with a simple reference to the explanations of the figures (Plate XVIII, Fig. 1, and Plate XXIII, Figs. 1, 2).

SECTION II.

OPERATIONS ON THE LIPS.

The operations upon the lips are chiefly those required for the cure of hare-lip, of cancer, of contraction or closure of the mouth, and for cheiloplasty or the formation of a new lip.

§ 1.—SIMPLE HARE-LIP.

The congenital defect of union in the two halves of the lip, termed Hare-lip, may usually be remedied by paring off or freshening the vertical portion of each half, and then uniting them by suture.

Various modes of accomplishing this have been proposed by surgeons, but differ mainly in the character of the incision. Without, however, referring to these in detail, this account may be limited to that which I have generally found successful.

Operation.—The child, being either firmly held or tied up in a bag, the end of which is drawn around its neck, should be placed in a semi-recumbent posture, or, if lying down, raised up from time to time during the operation, so as to prevent the escape of blood into its throat and stomach, as this is apt to induce fever. The surgeon, then seizing the left half of the lip with his left forefinger and thumb, should dissect it freely from its attachment to the gum, and seizing the right half in the same manner, dissect it also freely from the gum, this free dissection of the lip from its attachments being essential to success, by diminishing the subsequent strain on the line of union. After freeing the lip very fully at this point, let him next introduce a spatula of soft wood beneath the lip, and have its free extremity held by an assistant. Then seizing the left

* Horner's Anatomy.

half at its free angle, with a tenaculum or forceps, let him extend the flap upon the spatula, and commencing at the nostril, cut through the lip, so as to make the incision to its lower edge, in a slightly semicircular or bent direction, like an A jointed or bent outwards at the cross-piece, the joint or angle being near but not quite in the centre, as proposed by Dr. J. Rhea Barton, and also by Guerin* (Plate XIX, Fig. 1). This edge of the lip being then seized by the assistant, the coronary artery may be compressed between his thumb and forefinger, so as to check the bleeding.

The opposite half being now treated in the same manner, the wound will exhibit two almost semi-elliptical cut surfaces, so arranged as to present their concavity towards the median line of the fissure.

The surgeon, then passing a ligature through the lower edge of each flap, and drawing upon it, should accurately adjust the angles of the incision to the same level, and giving the ligature into the hand of an assistant, so as to preserve their position, pass a sharp-pointed steel or insect pin through the flaps from left to right, taking care not to carry it through the mucous membrane. After surrounding this pin with a twisted suture, let him next introduce a second or even a third pin, and approximate the surfaces of the incision well up into the nostril by other ligatures (Plate XIX, Fig. 2), when the ligature first introduced at the lower edge of the lip, and which should have been held by the assistant during this time, may be withdrawn. The sutures should then be supported by strips of adhesive plaster, slit so as to allow the ends of the pins to pass through them, and extended from the front of one cheek across the lip to the other cheek, in order to take the traction off from the pins. Four days subsequently, the latter must be withdrawn by a rotatory movement, without, if possible, disturbing the ligatures or plaster, and this may be readily accomplished either by nicking the latter over the head of the pins, or by drawing them through the slits made in the strips previous to their application. On the fifth day, the cheeks being well supported by an assistant, these strips may be removed, and new ones applied every three days during the first week or two, until the union is accomplished. Throughout, or at least until the sixth day, the child, if unweaned, must be fed with a spoon, but after this it may be allowed to suck with the plasters on. During the first twenty-four hours after the operation, it is also especially

* Gazette Médicale, June 1844.

PLATE XIX.

OPERATIONS PRACTICED ON THE LIPS AND MOUTH.

Fig. 1. A front view of a single Hare-lip with the lines of the incision for freshening the edges as advised by Dr. Rhea Barton. 1, 1. The semi-elliptical incisions. Modified from Bernard and Huette.

Fig. 2. Arrangement of the Sutures at the close of the operation. After Bernard and Huette.

Fig. 3. Operation of Mirault, of Angers, for single Hare-lip. 1. The flap cut from one side. After Bernard and Huette.

Fig. 4. The same operation, showing the line of union and position of the principal pin. After Bernard and Huette.

Fig. 5. Front view of a double Hare-lip, showing the septum or anterior edge of the inter-maxillary bone, containing the two central incisor teeth. After Bernard and Huette.

Fig. 6. The union of the parts, after the operation of double Hare-lip, when both sides are to be united at the same time. The risk of sloughing of the central part from excessive inflammation or want of vitality, is an objection to this mode of operating. After Bernard and Huette.

Fig. 7. A contracted Mouth consequent on ulceration, showing Dieffenbach's operation. 1, 2. The integuments as left by the two incisions which start from 3, the mucous membrane remaining untouched. 3. Point for the introduction of the scissors. 4, 5. The lines of incision. The ulceration has exposed the gums and teeth at the opposite corner of the mouth. After Bernard and Huette.

Fig. 8. View of a Mouth, as contracted in consequence of an ulcer. 1, 2. The two points at which the sharp-pointed scissors were introduced so as to divide the integuments on both the upper and lower lip, towards the median line. The mucous membrane, being subsequently divided, was reflected over the edges of the incision and fastened to the skin by several points of the interrupted suture. After Nature.

Fig. 9. The appearance of Fig. 8 after the integuments have been removed.

1. The mucous membrane untouched. This is to be divided in the median line of the mouth, and reflected so as to form a rounded edge to the new lips. After Bernard and Huette.

Plate 19

Fig. 2.

Fig. 1.

Fig. 3.

Fig. 5.

Fig. 4.

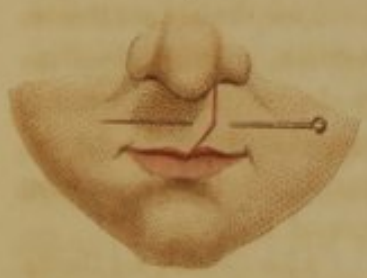


Fig. 6.

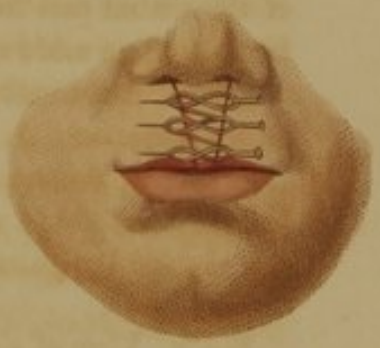


Fig. 7.

Fig. 8.

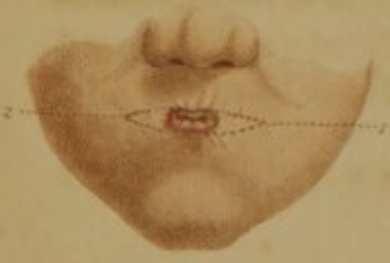


Fig. 9.

necessary that the patient should be watched, lest hemorrhage occur, and the blood, escaping into the mouth, be carried into the stomach, without the bleeding being suspected. If, however, the pins are inserted in the lip deeply enough to pass behind the coronary arteries, the compression of these vessels by the ligature will allow but little probability of hemorrhage.

REMARKS.—The advantages of the semi-elliptical incisions over those which are straight will be found in the absence of the notch in the lip usually consequent on the contraction of the wound, the angular character of the incisions preventing the linear shortening of the cicatrix. The value of the temporary ligature in the free edge of the lip will also be found in the greater accuracy with which the angles can be adjusted before inserting the first pin.

MIRAULT, of Angers, France, operates as follows: By a straight incision he pares off one-half of the fissure (Plate XIX, Fig. 3). Then incising the other portion (generally the left), he cuts it so as to leave a pedicle of the membrane on the free edge of this flap, which, being carried across the fissure and united to the opposite half, prevents the formation of any notch or depression (Plate XIX, Fig. 4).

MALGAIGNE, in order to avoid the notch on the free surface of the lip, makes a curved incision from above downwards, so as to pare off the mucous covering of the fissure, but without cutting it free from the inferior angle or that continuous with the margin of the lip. Leaving the portion pared off adherent, and depending by this pedicle, he unites the wound by pins and the twisted suture. Then, trimming and shortening the pediculated portion with the scissors until there is only a piece in each half long enough to fill up the notch, he unites them on a level with the lip by a small and fine pin.*

REMARKS.—Judging from personal observation, Hare-lip is a very common complaint in this locality, it having occasionally happened to me to have three patients under treatment at one time, and in one winter at the Clinic of the University of Pennsylvania, ten were treated in the course of six months. Out of the large number that have been seen (I should think some fifty), but two failures have occurred, after pursuing the plan above stated, and in one of these (double) the result was undoubtedly due to an attack of cholera infantum, of which the child died. After operations by the scissors

* Operative Surgery, by Brittain, p. 334, Phila. edition.

and the ordinary straight incision, I have seen several (five?) failures. As respects the period for the operation, the earliest possible time, after the tissues seemed to be firm, has always been selected, usually soon after the third month of infancy, and it has always been deemed necessary to continue the adhesive strips a week after the removal of the pins.

Dr. J. Mason Warren, of Boston, as well as several other surgeons, also prefer an early period for their operations, but resort to the interrupted suture in place of employing the hare-lip pins.

§ 2.—DOUBLE HARE-LIP.

In the variety of the disease known as Double Hare-lip, there is usually a double fissure in the lip and palatine portions of the mouth, together with a tubercle or intermediate structure resembling and corresponding with the intermaxillary bone of animals (Plate XIX, Fig. 5). The projecting extremity of this bone usually contains either the germs of the incisor teeth, or the teeth themselves, according to the age of the patient, and is often a source of difficulty, by causing the interruption of the circulation through the middle flap.

Ordinary Operation.—If the central flap is to be preserved, it should be first freed from its attachment to the gum, but with judgment, lest its vitality be impaired from want of base. Then one of its edges being freshened with the scalpel and wooden spatula, the opposite half of the fissure should be freed from its attachment and also freshened, as in the operation just detailed; the remaining portion of the operation being performed as in that for simple fissure. After a few weeks, when the union is firm, the remaining half of the lip may be operated on in a similar manner, or, if circumstances induce the surgeon to think differently, both sides may be united at the same time by transfixing them with the pins, as represented in Plate XIX, Fig. 6.

Remarks.—Some surgeons recommend, in double hare-lip, the performance of the operation on both sides of the fissure at the same period, but, in my experience, this has seemed more liable to failure: 1st, because the stress upon the pins, or upon the newly-formed cicatrices after their removal, is much greater when both sides are thus operated on; and 2d, from the inflammation or compression of the middle flap by the ligatures being more apt to induce sloughing.

To operate first on one side and then repeat it, will, it is thought, in most instances prove preferable. When the incisor teeth project outwardly, it will generally be necessary to extract them, or to cut off the inferior anterior extremity of the projecting intermaxillary bone before proceeding to the incision in the lips. But in children, unless the portion of the alveolar processes to be removed is limited, the germs of the permanent incisors will be entirely destroyed. When the projection necessitates interference, I prefer therefore the plan proposed by Blandin of excising, with bone nippers or strong scissors, a triangular piece of the septum, with its base downwards, behind the alveolar processes, and then to bend or force back the projecting portion, any attempt to push back this end of the bone by bandages alone being very apt to induce such inflammation in the soft parts as will necessitate their removal.

The fissure so often seen in the hard palate in connection with both simple and double hare-lip may subsequently require an operation; though it will often be much diminished or cured, simply by the contraction and constriction of the bones consequent on the union of the fissure in the soft tissues of the lip, especially if the patient is operated on at the early period mentioned. The treatment of the fissure in the soft palate will be referred to under the head of Staphyloraphy.

§ 3.—CANCER OF THE LIP.

This affection may be seen either in the form of a small shot-like tumor, of a larger induration, or as an ulcer. When the surgeon is satisfied that the removal of the tumor will retard the progress of the disease, he may excise it by an elliptical incision around its base, in the same manner that he would remove a tumor in any other part of the body; but as these cancerous affections are apt to invade the surrounding tissue, and the parts here involved possess much vitality, he should be especially careful to cut away such an amount of the adjacent sound parts as will insure the entire removal of the complaint. As the best and simplest mode of operating, he may proceed as follows:—

Ordinary Operation.—Make either with the scissors or scalpel a V incision of such a size as is necessary for the entire removal of the disease, with its base corresponding to the free margin of the lip. If the scalpel is used, a wooden spatula should be placed so

as to support the portion cut, during the incision, after which the wound may be united as in hare-lip. From the great extensibility of the cheeks, very considerable portions of the lips, and especially of the lower one, may be removed without deformity; and I have recently seen two patients, in each of whom I removed a piece over one inch in width at the base of the V, near three years since, for cancer, and in both of whom it is difficult to see any deficiency.

Should the disease require the loss of more tissue than can be supplied by approximating the sides of the incision, resort must be had to the formation of a new lip, or to the operation of CHEILOPLASTY, as hereafter shown.

§ 4.—ENLARGEMENT OF THE MOUTH.

The operation of re-establishing the orifice of the mouth is one that is occasionally rendered necessary in consequence of its contraction or closure from the cicatrices resulting from ulceration or from burns. Among the best plans of operating in these cases is the very ingenious one of the late Professor DIEFFENBACH, of Berlin.

DIEFFENBACH'S OPERATION.—Wishing to preserve enough of the mucous membrane to cover the edge of the incisions required in enlarging the mouth, Dieffenbach introduced into the patient's mouth the forefinger of one hand, and sticking the point of one blade of the sharp-pointed scissors into the cheek a line or two beyond the point at which he wished to make the new angle of the mouth, he transfixed all the tissues except the mucous membrane (Plate XIX, Fig. 7). On pushing the point forwards to the contracted orifice, he was enabled to incise all this texture in the line (3, 4) of the free edge of the lower of the new lips; then, re-introducing the point of the scissors at its first place (3) of entrance, he divided these textures also, with the exception of the mucous membrane, in a line (3, 5) corresponding with the free edge of the upper lip.

The triangular piece (1, 2, 3, 4, 5) being then carefully dissected off from the lining membrane of the mouth, 1, 2, the latter was left uninjured (Plate XIX, Fig. 9).

On dividing this membrane in the middle, to within two lines of the angle of the first incisions, it only remains to attach it neatly by sutures to the bleeding surface in order to complete the mouth.

After union has taken place, the resemblance of the new mouth to a normal one is often excellent.

On two occasions, I repeated this operation (Plate XIX, Fig. 8) with entire satisfaction; and many other surgeons, especially Dr. Mütter, have reported similar instances of success.*

§ 5.—CHEILOPLASTY.

Plastic operations for the restoration of the lip may be required in diseases of either of them, though it is most frequently demanded in that of the lower lip. In either case, the operation is termed Cheiloplasty. In the upper lip, it may be performed by adapting a flap taken from the arm to the deficient portion, as in the old Taliacotian operation; but the greater facility afforded by approximating the edges of the deficiency, as in the ordinary hare-lip operation, renders this mode of operating a rare occurrence.

The Taliacotian operation has also been applied to the lower lip, but there is as little to recommend it in this as in the former case, and the loss of substance from cancerous degeneration or ulceration, when so extensive as to require any plastic operation, may be more readily supplied by either of the following methods: —

Operation of Dr. J. Pancoast, of Philadelphia.—In a case of cancer of the lower lip, Dr. Pancoast excised the diseased margin of the lip by an incision which entirely circumscribed it. A vertical incision was then made in the middle line of the chin nearly down to the level of the os hyoides, and crossed by a horizontal cut over the base of the lower jaw bone. The four angular flaps, thus formed, were now dissected up from the jaw and the angles of the crucial incision, or the ends of the flaps removed so as to leave a lozenge-shaped space (Plate XX, Fig. 1). The margins of the upper flaps were then brought to the level of the angles of the mouth, and united on the median line by the twisted suture, after which the lower flaps were united, so as to cover the point of the chin.†

Operation of Chopart.‡—Chopart, in a case of cancer of the lower lip, included all the diseased structure between two parallel vertical incisions, which, commencing at the margin of the lip, extended down to near the os hyoides. These incisions formed a square flap which was dissected off from the chin from above down-

* Amer. Journ. Med. Sciences, vol. xx. p. 342.

† Pancoast's Operative Surgery, p. 356, Philad. 1844.

‡ Bernard and Huette, p. 179.

PLATE XX.

THE OPERATIONS OF CHEILOPLASTY AND GENIOPLASTY.

Fig. 1. A front view of the operation of Dr. Pancoast for the removal of an extensive Cancer and the formation of a new Lower Lip. The cancer is shown as circumscribed by a curvilinear cut. A vertical incision in the median line of the chin, extended from the curvilinear cut nearly to the os hyoides, and another which was horizontal and parallel to the base of the lower jaw, formed four flaps. The angles of the flaps being removed, the upper flaps, 1, 2, were raised to the proper level, and united by the twisted suture on the median line, when the lower flaps, 3, 4, were also united on the median line so as to cover the front of the chin. After Pancoast.

Fig. 2. A front view of Chopart's operation for the same object. 1, 5, 3, 6. The vertical incisions. 2, 4. The horizontal cut circumscribing the disease. 2, 4, is to be raised to the level of 1, 3. After Bernard and Huette.

Fig. 3. Operation of Lallemand for closing the gap left by the excision of a Cancer, which involved the angle of the Mouth and a portion of the Cheek and Lower Lip. 1. The remaining portion of the lip, which is to be drawn over to the angle of the mouth at 2. A flap formed of the integuments of the neck having been dissected off, is shown as being partially rotated on its base and about to be carried up to cover the deficiency. The wound on the neck may either be approximated at its edges, or left to heal by the second intention. After Bourgery and Jacob.

Fig. 4. A three-quarter view of Dr. Mott's operation for the relief of Anchylosis of the Jaw dependent on Cicatrization of the Mouth, with the restoration of a part of the Cheek. 1. The cicatrix arising from an ulcer. This was entirely excised, leaving an opening in the cheek. 2. The tongue-shaped flap, cut to fill up the opening by being rotated upon its base. After Mott.

Fig. 5. A side view of Dr. Mütter's operation for the Formation of a New Cheek. The edges of the ulcer which resulted from extreme salivation were first freshened, the useless teeth extracted, and four flaps formed by incisions in the course of the dotted lines so as to permit the approximation of the edges of the flaps. After Mütter.

Plate 20

Fig 1

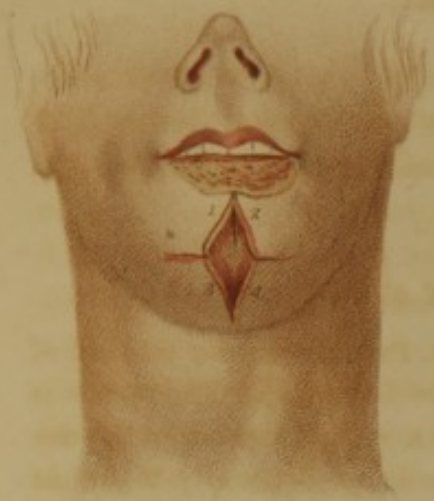


Fig 2

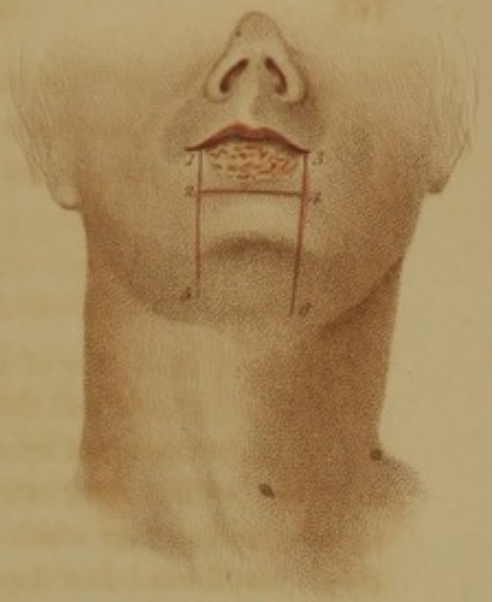


Fig 3

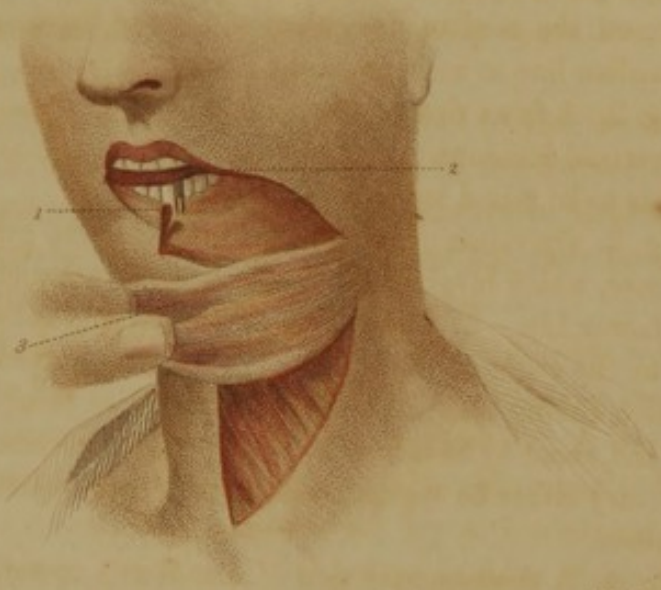


Fig 4

Fig 5

wards. The diseased portion being then cut off by a horizontal incision, the head was slightly flexed and the flap drawn up to the level of the angles of the mouth, where it was maintained by several stitches placed in the line of the vertical incisions (Plate XX, Fig. 2).

When the preservation of a portion of the mucous membrane can be accomplished, it will add much to the natural appearance of the new lip.

Operation of Malgaigne.—This accomplished surgeon removes all the diseased structure either by a V incision, or by two vertical incisions, which, starting on each side of the cancer, reach to the chin, and are there united by a horizontal cut, as in the upper incision of the operation of Chopart.

In the V incision, in consequence of the triangular wound, it is necessary to prolong the angle of the mouth on each side by a transverse cut, and to dissect the flaps so as to give them a triangular shape. Then, drawing them forward, and uniting their vertical edges by sutures upon the median line, it only remains to close the horizontal incision, in order to obtain a proper fullness for the lip.

In the two vertical incisions, the gap being square, it is necessary to make two horizontal cuts, by which the angles of the mouth may be elongated. Then, making another horizontal cut parallel to the base of the jaw, detach the two square flaps thus formed, and unite them on the vertical or central line, as well as on the horizontal incisions, when the cheeks will be made to contribute to a lip which contains a portion of the orbicularis, as well as the lining membrane of the mouth.*

Dr. Pancoast, in a case of extensive loss of substance from the explosion of gunpowder, also made a new lip by the following process:—

Operation.—After removing the rounded edges of the cicatrix in a V-shaped piece, he carried two curved incisions from a point four lines above the apex of the V (which was on a level with the lower surface of the inferior maxilla) in the direction of the extremities of the os hyoides. Then, freely separating the integuments from the bone and rotating the flaps a little upwards, he drew them inwards, and united them to each other on the middle line by two twisted

* Malgaigne, Op. Surg. p. 340, Phila. edit.

sutures, closing the incision below the chin with adhesive strips.* Other instructive cases are reported in the same paper, which is amply illustrated by woodcuts.

§ 6.—GENIOPLASTY.

The application of the principles of plastic surgery to the restoration of deficiencies in the cheeks must, like the operations already spoken of, depend upon the peculiarities of the case. The two instances hereafter stated may, therefore, suffice as illustrations of this class of operations.

In a patient of Dr. MOTT'S, of New York (see Plate XX, Fig. 4), in addition to the loss of substance in the cheek consequent on sphacelus during an attack of typhus fever, there was also some false anchylosis of the jaw. To remedy this, he operated as follows, April 8th, 1831:—

MOTT'S OPERATION.—An incision, commencing a little within the upper angle of the mouth, was carried around the outer margin of the cicatrix to a little within the lower angle of the under lip, so as to remove all the newly-formed tissues within it. Then, after overcoming the anchylosis, the lips were brought together at the angle of the mouth by a suture, and a portion of integument sufficiently large, and of a corresponding shape to replace the portion removed, was taken from the side of the jaw and neck (Plate XX, Fig. 4). This portion, being turned into the space it was intended to fill, left a tongue three-quarters of an inch in breadth connected with the adjacent parts, and sufficient for all the purposes of circulation. The edges were then accurately adjusted by means of the interrupted suture and adhesive strips, and the lower wound drawn together as much as possible by adhesive plaster, when the whole was covered with lint, a compress, and bandage. On the eighth day, adhesion appeared to have taken place at every point, when three of the stitches were removed, and in about one month the patient went home cured.†

DIEFFENBACH, in cases where the sides of the ulcer could be at all approximated by drawing upon the substance of the cheek, freshened the edges of the opening and united them by sutures; then, in order

* Amer. Journ. Med. Sciences, vol. v., New Series, p. 106.

† Ibid., vol. ix. p. 47, 1831.

to obviate the danger of separation of the wound when the sutures were withdrawn, or when the cicatrix was stretched, he made an incision across the base of the flap at the side where the parts were most tense, and left this wound to heal by granulation.

Operation of Dr. Mütter, of Philadelphia.—In order to relieve a shocking deformity of the face, resulting from the sloughing consequent on profuse salivation, Dr. Mütter operated as follows: Having first extracted the useless teeth of the upper jaw, which would have prevented the proper adjustment of the flaps, or induced their ulceration, and freshened the edges of the ulcer, he detached the integuments from the side of the jaw, so as to permit some approximation of the wound. Two incisions above and below the ulcer were then made so as to form four flaps (Plate XX, Fig. 5), and these were united to each other in the line of the teeth, as far forwards as the angle of the mouth. The edges of the remaining ulcer, being partly approximated by the hare-lip suture, were subsequently caused to cicatrize under the use of the nitrate of silver. The result was entirely satisfactory.*

§ 7.—Removal of Tumors from the Cheeks.

From disease of the buccal glands and other causes, it sometimes becomes necessary to remove tumors from the substance of the cheeks. No other rules need here be given, in reference to elliptical or such other incisions as the case may call for, except two of a general kind: 1st, to make them as much as possible in the line of the zygomatici or levatores anguli oris muscles, so as to conceal the cicatrix by bringing it into the direction of the natural folds of the cheek; and 2d, if the tumor is far back, or towards the angle of the jaw, to guard against injury of the duct of Steno.

§ 8.—Salivary Fistula.

As the position and general anatomy of this portion of the face have been already given (page 159), it is only necessary at present to mention the operations resorted to in cases where from a wound

* Lecture on the Operations in Surgery, by Robert Liston, with numerous additions, by Thomas D. Mütter, M. D. Philad. edit., p. 244.

or ulceration the duct of Steno has been opened and the saliva flows out upon the cheek. Various plans have been suggested for the relief of this defect, but the object of all of them is the same, to wit: to close the orifice on the external side of the cheek, and keep open that upon its inside. The nearer the external opening can be made to approach the character of a simple incised wound, the greater will be the chance of its closure; and the following operation, as proposed by Dr. Horner, by reducing the parts to this condition, has, both in his hands and my own, been followed by perfect success. In a patient on whom I recently operated,* the cure was accomplished in a few days, the external parts healing by the first intention.

Operation of Dr. Horner, of Philadelphia.—The patient being seated with the head well supported by an assistant, the operator introduces a strong broad wooden spatula within the cheek of the affected side, where it should be firmly held by an assistant, who also supports the patient's head. The wound being then slightly elongated by incising its sides in the line of the zygomaticus major muscle, a round punch, like that of the saddlers, should be placed over the fistulous orifice, care being taken to avoid the anterior edge of the masseter. Then, on pressing the punch firmly against the spatula within the mouth, a piece of nearly the entire thickness of the cheek will be removed, and a fresh opening made directly into the mouth, when the external wound, being accurately closed by sutures and adhesive strips, will usually heal kindly, and the internal opening be found to give free vent to the saliva. The punch must have a keen edge, and the cheek be well supported inside, in order to obtain a clean cut (Plate XXIII, Fig. 3).

SECTION III.

DIVISION OF THE MASSETER MUSCLE FOR IMMOBILITY OF THE LOWER JAW (FALSE ANCHYLOSIS).

This disease, which has been claimed as peculiarly an American one, was first treated of as a distinct affection by Dr. Mott, of New York.† The operation for its relief is especially demanded in those cases where the anchylosis is dependent on cicatrization or contraction of the soft parts, and was first performed by Dr. J. W.

* June, 1851. † Mott's Velpeau's Operative Surgery, vol. iii. p. 1139.

Schmidt, of New York, Oct. 1841.* Subsequently, Dr. J. Murray Carnochan, of the same city, published an account of a similar operation performed by him in 1840; but, as his publication was after that of Dr. Schmidt, the latter has generally received the credit of priority. In Dr. Schmidt's case, a young lady, in consequence of rigidity of one of the masseter muscles, caused by an extensively ulcerated throat when a child, had not been able for more than twelve years to open her mouth so that the end of the little finger could be inserted. After dilatation and similar means had failed, Dr. Schmidt operated as follows:—

Operation of Dr. Schmidt.—A narrow bistoury being passed through the mucous membrane of the mouth immediately in front of the anterior edge of the masseter muscle, on a line with the alveolar process of the lower jaw, the integuments of the cheek were raised from the muscle with one hand, the bistoury passed over the masseter between it and the integuments, but without cutting through the latter, and the muscle completely divided to the bone, after which the mouth was immediately opened by a lever. Considerable hemorrhage followed, and some extravasation into the cellular substance of the cheek, but this soon subsided, and the case succeeded perfectly. To prevent the union and subsequent contraction of the muscle as before, pieces of soft wood of a wedge-shape were kept in the mouth during the night, and occasionally during the day.†

The danger likely to ensue from inattention to the anatomical relations of this region will be readily foreseen by every anatomist, and may be recognized by reference to Plate XXIII, Fig. 2, where the position of the vessels and of the salivary duct is shown after the removal of the parotid gland.

Dr. Mott's Operation.—In seventeen cases of false anchylosis of the jaw, reported by Dr. Mott,‡ forcible dilation was practiced, after, or in some instances without, division of the contracted tissues. To overcome the contraction and expand the jaws, Dr. Mott employed only a screw and lever, similar to that of Heister, as depicted in the "Armamentarium Chirurgicum" of Scultetus, and also in the "Surgery" of John Bell. The levers, being introduced between the teeth, are to be gradually expanded by turning the screw.

An instrument suggested, and frequently employed by Dr. J.

* Published in the Amer. Journ. of Med. Sciences, p. 516, Oct. 1842.

† Ibid., loc. cit.

‡ Mott's Velpeau, loc. cit.

Rhea Barton (Plate XXII, Fig. 1), will also be found to furnish an excellent means of relieving anchylosis. Its advantages over the lever of Heister consist in the breadth of its plates, in their being covered by a layer of caoutchouc, and in their affording a better basis for the teeth, in consequence of which the latter are less liable to injury.

CHAPTER XI.

OPERATIONS PRACTICED WITHIN THE MOUTH.

The operations that may be required in this region are those dependent on diseases of the tongue, tonsils, and palate.

SECTION I.

ANATOMY.

The anatomical relations of the parts within the mouth may at present be confined to such portions of the cavity as are found within the line of the teeth, and require therefore but a brief description.

The Tongue, being composed in a great measure of the genio-hyoglossus, hyoglossus, and lingualis muscles, which connect it both with the os hyoides and the lower jaw, is covered by a mucous membrane, the reflection of which to the floor of the mouth constitutes the Frænum Linguæ. The general arrangement of the fibres of the genio-hyoglossus, and their expansion from their origin into the bulk of the tongue, may be understood by referring to Plate XVIII, Figs. 1, 2.

The Lingual artery is the main source of the blood supplied to the tongue. Coming from the external carotid, this artery penetrates the hyoglossus muscle just above the os hyoides, and of course lies too deep for any operation upon this organ except its extirpation (Plate XXI, Fig. 1). The sublingual branch of this vessel, being more superficial, passes forward just above the sublingual gland, near the median line of the tongue, between the mylo-hyoid and genio-hyoglossus muscles, to supply the floor of the mouth and

its lining membrane. Except in an attempt to extirpate the sublingual gland, it is not much exposed to injury in operations upon this part. The ranine artery and its accompanying vein are the continuation of the lingual artery, and advance on each side of the median line of the tongue directly to its tip, where there is an anastomosis of the vessels of each side. The ranine veins are especially superficial, and may be seen just beneath the mucous membrane on turning up the tip of the tongue. They can, therefore, be readily injured, and may give rise to trouble, especially in children. The hypoglossal nerve is shown in Plate XXI, Fig. 1, and requires no further reference, as it is not proposed to treat of the various wild operations that have been recommended for the cure of stammering.

The Glands of the mouth at present demanding notice are the sublingual, submaxillary, and the tonsil. The Sublingual gland, being only covered by the mucous membrane of the mouth, may be readily seen on turning up the tip of the tongue. Its duct or ducts open into the mouth on either side of the frænum below the tongue. The duct of the Submaxillary gland (Plate XXIII, Fig. 1) terminates by a small projecting orifice on the anterior margin of the frænum. The obstruction of this orifice gives rise to the disease termed ranula, and consists in an accumulation of saliva within the duct, which, by distending the latter or by forming cysts, creates a tumor. The saliva also sometimes deposits sabulous matter, and gives rise to concretions which are usually situated in the duct itself.

The Tonsil glands (Plate XXI, Fig. 5), in a healthy condition, are six or eight lines long, four or five wide,* and about three thick. They are situated within and between the half arches of the palate, and concur in forming the isthmus of the fauces. Immediately beneath or outside of the tonsils, or outside of the cavity, that is, towards the skin of the neck, lies the carotid artery, with the vessels found between the greater cornu of the os hyoides and the angle of the lower jaw. The proximity of these vessels should be remembered by the surgeon when using a bistoury upon these glands, as there is only a thickness of about three lines of tissue between them and the artery; and a case is reported by Béclard, in which the internal carotid was opened in an operation upon this region.†

The Palate is composed of two portions—the hard or bony structure, formed by the palate plates of the palate and superior maxillary

* Horner's Anat., vol. i. p. 569. † Blandin, Anat. Topographique.

bones, and the soft palate, which is composed of the mucous membranes and the muscles. The soft palate stretches across the back of the mouth from side to side, and obliquely downwards and backwards from the posterior margin of the hard palate. Its inferior free margin presents in its centre a projection (uvula) from a half to three-quarters of an inch long in the healthy state.

The Uvula (Plate XXI, Fig. 5) is composed of the azygos uvulæ muscle, which, arising from the posterior pointed termination of the middle palate suture, goes down into the uvula, but the point of the muscle stops a half inch short of its inferior extremity. The free end of the uvula is formed of loose cellular substance covered by mucous membrane, and in catarrhal inflammation often becomes œdematous, swollen, and elongated, so as occasionally to require excision; but this excision should never be extended to the muscle, lest it impair the voice, and give it a nasal twang from the patient's inability to close the orifice of the posterior nares.

From each side of the uvula proceed two crescentic doublings of the lining membrane, called the Half Arches, and designated as anterior and posterior. Within or beneath these folds lie the muscles of the part, some of which are important in connection with the operations on this region.

The Constrictor Isthmii Faucium is within the anterior half arch, arises from the soft palate near the base of the uvula, and is inserted into the side of the tongue near its root. It will close the opening between the mouth and pharynx.

The Palato-Pharyngius is within the duplicature forming the posterior half arch; it arises near the base of the uvula, and is inserted into the sides of the pharynx, and into the posterior margin of the thyroid cartilage. It draws the soft palate downwards, or draws the pharynx upwards.

The Tensor Palati arises from the spinous process of the sphenoid bone; passes downwards; winds around the hook of the internal pterygoid process, and is inserted into the soft palate near its middle, and into the posterior lunated edge of the palate bone. It spreads out, or extends the palate.

The Levator Palati arises from the point of the petrous bone, and passes downwards to be inserted into the soft palate. It draws the soft palate upwards.*

* Horner's Anat. vol. i. p. 490, eighth edition.

In the various operations for fissure of the palate, attention to the action of these muscles is essential to a successful result.*

SECTION II.

OPERATIONS UPON THE TONGUE AND THROAT.

The operations practiced on these parts consist in such as are required for the relief of cancer, ranula, or hypertrophy in the tongue, together with those upon the uvula and tonsils.

§ 1.—CANCER OF THE TONGUE.

When the development of cancer is of a limited extent, and shows itself as a circumscribed tumor, its removal may be accomplished either by the ligature or by excision.

Preliminary Measures. — In order to remove a cancerous tumor, or before attempting any operation upon the tongue, the surgeon will find it necessary to obtain entire control of the member by inserting into its tip a tenaculum, a needle and ligature, or a pair of hooked forceps; but the former is preferable, both on account of its simplicity and efficiency. In order to employ it, direct the patient to protrude the tongue, and spear the tip of the organ, by rapidly passing the point of the tenaculum through its structure, when its motions may be perfectly controlled without creating any very great suffering, and the hand of the assistant holding the instrument will then have this unruly member entirely in its power.

Ligatures, either of silk or wire, may be resorted to for the removal of cancerous tumors when the disease is slight. When the silk ligature is employed, the base of the tumor should be transfixed by a needle armed with a double ligature, and then, on dividing this at its loop, each portion of the tumor may be strangulated by tying the ends firmly around its base. As the tissue to be constricted is extremely dense, it is requisite that the ligature should be drawn very firmly, in order perfectly to strangulate the portion included in the loop.

The Double Canula and Wire Ligature.—When the wire liga-

* See Staphyloraphy.

PLATE XXI.

OPERATIONS PRACTICED ON THE TONGUE AND TONSILS.

Fig. 1. A side view of a vertical section of the Mouth and Tongue, showing the anatomical relations of the Vessels and Nerves of the Tongue. 1. The lingual artery. 2. Its sublingual branch. The veins accompany the arteries. 3. The hypoglossal nerve. 4. The ranine vessels as seen near the tip of the tongue. After Bernard and Huette.

Fig. 2. A front view of the Removal of the end of the Tongue as practiced either for Cancer or Hypertrophy. 1, 2, 3. The lines of the V-shaped incision. 4. A pair of tumor-shaped forceps (Plate I, Fig. 1), holding the portion to be extirpated and controlling the tongue until the vessels are ligated. The incision should, therefore, not be carried entirely to 3, until the hemorrhage is checked and the flaps partially united. After Bernard and Huette.

Fig. 3. The preceding operation as completed. " "

Fig. 4. A three-quarter view of a Hypertrophied Tongue (Lingua Vitula), as it existed in Dr. Harris's patient prior to the operation. After Harris.

Fig. 5. A front view of the anatomical relations of the parts about the Fauces, as shown with the Mouth widely opened. 1. The dorsum of the tongue as depressed within the teeth. 2, 3. The tonsils *in sitû*. 4. The uvula. 5. The anterior half arch. 6. The posterior half arch with the tonsil between it and 5. 7. The soft palate. After Bernard and Huette.

Fig. 6. A vertical section of the Mouth and Pharynx, to show the extirpation of the Tonsil, by Physick's instrument. 1. The right tonsil, excised and about to be removed in the instrument. 2. The Tonsilitome of Physick. Modified from Bernard and Huette.

Fig. 7. A similar view of the parts in the Throat, showing the excision of the Tonsil by means of the probe-pointed curved bistoury and tumor-forceps. 1. The forceps holding the gland. 2. The bistoury in the act of excising it. Modified from Bernard and Huette.

Plate 21

Fig. 1.

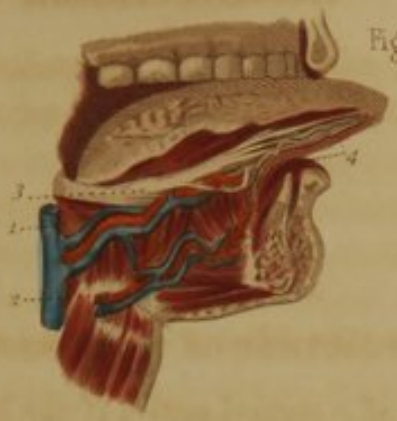


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

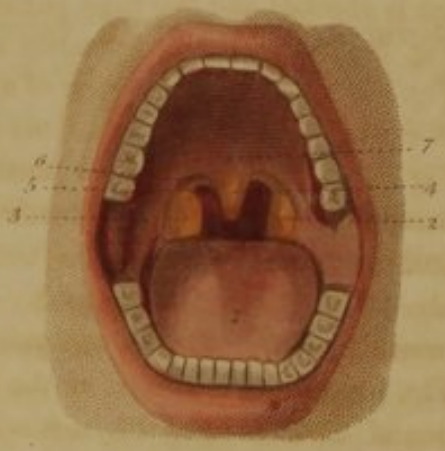
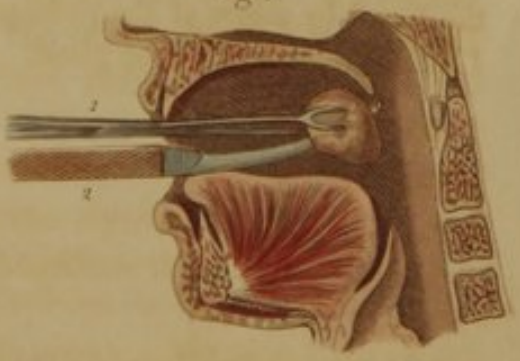


Fig. 6.

Fig. 7.



ture is employed, the double canula of Levret (Plate II, Fig. 11) should be prepared as directed for polypus of the nose; the motion of the tongue be perfectly controlled by the means just mentioned; a superficial circular incision made around the base of the tumor; a tenaculum passed through the diseased structure so as to elevate it from that portion of the organ in which it is deposited, and then the loop of the wire passed over the tenaculum and carried around the tumor in the incision first made. The wire should then be drawn as firmly as possible, fastened to the wing of the canula, and the latter left wrapped with linen or tin foil, protruding at the angle of the mouth nearest to it until sloughing occurs, when the instrument may be removed.

EXTIRPATION.—Excision of these tumors may be accomplished in this as in other cases, by elliptical incisions and dissection, the anterior cuts being made first in order to prevent the hemorrhage from impairing vision. Subsequently, the wound should be closed by one or more stitches of the interrupted suture.

In more extended cases of disease, amputation or excision of the end of the tongue by a V-shaped incision (Plate XXI, Figs. 2, 3), as mentioned under Hypertrophy, may be required.

§ 2.—HYPERTROPHY OF THE TONGUE.

Under the name of Lingua Vitula, authors have described an enlargement of the body of the tongue which sometimes has been so great as to require the excision of the enlarged portion in order to enable the patient to retract the tongue within the mouth. The following operation, by Dr. Thomas Harris, of Philadelphia, in May, 1835, which was the first performed in the United States, sufficiently illustrates the ordinary proceeding in such cases.

AMPUTATION OF THE TONGUE, BY DR. HARRIS.—The patient, aged 19, had the tongue enlarged at birth. A short time previous to the operation, it projected beyond the upper incisors three inches; its circumference was six inches, and its vertical thickness one inch and a half (Plate XXI, Fig. 4), and filled up the jaws so completely that it was necessary to have his food cut into small pieces and introduced at the side of the mouth.

OPERATION.—The tongue being elevated, a strong ligature was passed through its tip, so as to control its movements. The under

surface was then dissected from the floor of the mouth about three-fourths of an inch behind the anterior part of the jaw, and a strong straight bistoury introduced into the organ at the point where the dissection terminated, whence it was pushed through between the median line and the left ranine artery, and being drawn forward and laterally, made to cut a flap, which terminated near the first bicuspid tooth. The left ranine artery being then secured with a ligature, the bistoury was again introduced in a corresponding position on the right side, and the opposite or right flap made in a similar manner. The artery of this side being now secured, and the central portion, or space intervening, divided by strong scissors, the incisions or flaps resembled the letter V, and being approximated by three interrupted sutures, made a pointed well-formed tongue of the ordinary length. A year subsequently the patient articulated distinctly, and was relieved of all deformity.*

Having had the opportunity of witnessing this operation, I could not but notice the great advantage possessed by the operator from the use of the means employed in controlling the motions of this organ; and as but one-half of the structure was incised at a time, the hemorrhage was readily controlled by the immediate application of the ligature to the artery. The flaps were then accurately adjusted by sutures without any difficulty.

In a previous case, June 1829, the same surgeon applied a ligature to the enlarged portion, in order to cause it to slough off, but the irritation was so great that he was subsequently obliged to amputate the end of the tongue with a catlin. In this patient, the tongue protruded beyond the teeth four inches; its circumference was six inches and three-fourths, and its vertical thickness one inch and three-fourths.†

In a case, also congenital, operated on by Dr. H. S. Newman, of Pennsylvania, the enlargement was very great, the portion amputated measuring in length $2\frac{3}{4}$ inches, circumference $7\frac{1}{2}$ inches, thickness $1\frac{1}{2}$ inches.‡

The operations for the relief of tongue-tie, and also that for ranula, will be found among those of minor surgery.§

* Amer. Journ. of Med. Sciences, vol. xx. p. 15. † Ibid., vol. vii. p. 17.
‡ Med. Recorder, vol. vii. p. 541. § See Smith's Minor Surgery.

§ 3.—EXCISION OF THE UVULA.

When, in consequence of chronic inflammation, the mucous membrane of the uvula becomes infiltrated, or when it and the muscle become relaxed, its end is apt to fall upon the edge of the glottis, and produce a cough and irritation of the throat, accompanied by profuse expectoration and such other natural symptoms of phthisis pulmonalis, as have been mistaken for those of this complaint. The effect of this state of the parts, and the mode of relief were early suggested by the late Dr. Physick, of Philadelphia, who also reported a special instrument for the amputation of the elongated portion. Various other surgeons have since then proposed instruments which they deemed advantageous, and calculated to accomplish their object; but it will be found that a pair of dressing forceps to seize the point of the velum pendulum, and scissors or a bistoury to excise it, are all that are necessary.

Ordinary Operation.—Seize the end of the uvula by the forceps held in the left hand, depressing the tongue with the joint of the instrument, or by a spoon in the hands of an assistant. Then, with a pair of scissors hooked at the end like Plate XXV, Fig. 1, or curved on the flat, and held in the right hand, cut entirely through the elongated part, removing the piece in the grasp of the forceps. If the mucous membrane is not cut entirely through at the first clip, or if it escapes from the grasp of the forceps, the fragment will be apt to fall into the glottis and induce such violent coughing as will render its subsequent excision very difficult. Not more than three-eighths of an inch should be excised, and it is of great consequence to avoid amputating the muscle, as this will materially affect the voice, as before mentioned, and cause the individual to speak in a nasal tone.

After Treatment.—Nothing more is requisite after this operation than to gargle the throat several times a day with cold water, and to guard against the use of hot, or highly seasoned, or salt food. Should there be any hemorrhage of consequence, touching the end of the stump with the nitrate of silver will generally arrest it.

§ 4.—EXCISION OF THE TONSILS.

Chronic inflammation of the tonsils, or repeated attacks of quinsy, sometimes cause such effusions of lymph into the parenchymatous structure of these glands as results in induration and permanent enlargement, or in the condition sometimes, though improperly, designated as scirrhus. The continuance of this enlargement being a constant source of irritation, such patients are liable to inflammation of the throat on the slightest change of temperature.

To relieve this sensibility, after the failure of other means an operation for their removal may become necessary.

Operation of Dr. Physick.—In order to accomplish this object without any risk of hemorrhage, Dr. Physick proposed and practiced, for some years, the removal of these glands by sloughing, induced by strangulating them with the double canula and wire ligature before referred to. But in consequence of the pain and inflammation which sometimes ensued, this application has justly been supplanted by the operation of excision. Various instruments have been recommended for this operation, and for a list of those suggested by surgeons in the United States, the reader is referred to the Bibliographical Index at the commencement of the volume. At present, one of two instruments is most frequently resorted to in this country, viz., that of Dr. Physick, slightly modified by Schively (Plate XXV, Fig. 3), and that of Dr. Fahnestock.

The instrument of Dr. Physick consists of a ring, which surrounds the part to be excised, and of a triangular-shaped knife, which, sliding in the ring, guillotines the gland.

Dr. Fahnestock's instrument was also formed of a ring, but his knife was of a similar shape, and excised the tonsil by drawing it towards the operator. This instrument has justly been objected to from the difficulty of giving a good edge to a circular blade, and also from its cutting by pulling upon the gland rather than dividing it like a knife. That of Dr. Physick, as modified by Schively, having none of these defects, and its cutting edge being of such a shape as enables the surgeon readily to preserve or renew it himself, is preferred by many, and has much to recommend it. M. Velpeau prefers the instrument of Fahnestock, but has modified it to some extent; and I have lately seen a further modification by Charriere, in which the knife is only half a ring, and made to cut

like a curved bistoury. This is, however, nothing new, a similarly-shaped knife having been suggested and used by Drs. Rogers and Cox, of New York, nearly twenty years since.*

Operation of Excision.—The patient being seated before a strong light, the head supported against the breast of an assistant, and the thumb of the latter made to press on the external parts just behind the angle of the jaw, so as to render the tonsil prominent in the throat, and force it from between the half arches, the surgeon should introduce the instrument flat upon the tongue, pass it rapidly back to the fauces, turn it on its side, so as to place the tonsil in its ring, transfix it with the needle attached to the instrument, and pushing the knife backwards, shave off all the portion included in the ring by a movement similar to that of a guillotine. Then removing the instrument, the excised portion will be brought out with it in less time than it takes to describe the steps of the operation (Plate XXI, Fig. 6).

Should this instrument not be at hand, a probe-pointed bistoury and dressing forceps may be made to answer by a skillful manipulator (Plate XXI, Fig. 7).

After Treatment.—The only after treatment that is requisite is that referred to in excision of the uvula.

The simplicity of the operation, as performed by the Tonsilitome, is such that it is difficult, at the present time, to realize the anxiety and discussions of the surgeons of the period when extirpation of the tonsil was first suggested.

CHAPTER XII.

RESECTION OF THE BONES OF THE FACE.

The sawing or removal of a portion of any bone, having long been designated by surgeons as a Resection, and being also generally understood to mean the cutting or paring off of any part,† it does not seem necessary to change the word, as has lately been suggested, under the erroneous idea that resection means the repetition of a section, to obviate which inaccuracy, the use of the term Exsection

* See Bibliography.

† Webster's Dictionary.

PLATE XXII.

A VIEW OF SOME OF THE INSTRUMENTS EMPLOYED IN ANCHYLOSIS AND RESECTION OF THE JAW BONES.

Fig. 1. A three-quarter view of Dr. Rhea Barton's Dilator for expanding the Jaws in cases of False Anchylosis. The horse-shoe plates are to be placed upon the teeth as far within the mouth as possible and separated by turning the screw. This instrument will also be found highly useful in cases of mania where it is necessary to employ the stomach tube.

Schively's pattern. From the Instrument.

Fig. 2. A pair of hawk-bill Scissors, useful in dividing the middle palate suture in Resection of the Upper Jaw. The probe-pointed end is to be passed into the nostril, and the other blade made to cut from the mouth upward.

From the Instrument.

Figs. 3, 4. Strong double-edged and curved Scalpels, for operating about the Bones of the Face.

Rohrer's pattern. From the Instrument.

Fig. 5. A triangular Knife, employed by Dr. Horner for the transverse division of the soft palate in Resection of the Upper Jaw.

From the Instrument.

Figs. 6, 7. Strong Knives, or Scrapers, for excising carious, or other diseased bones.

Luer's pattern. From the Instrument.

Fig. 8. A fine and flexible Saw, useful in incising various parts of the facial bones.

From the Instrument.

Fig. 9. Dr. Rhea Barton's metacarpal Saw, originally employed by him in resecting the femur for the relief of anchylosis of the Hip-joint.

Schively's pattern. From the Instrument.

Plate 22

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

has been suggested.* As the old nomenclature is entirely correct, the introduction of a new term has nothing to recommend it, and in the subsequent remarks the word "resection" will be employed, as it has heretofore been almost universally used, to wit, to designate the section of any portion of a bone, whether performed for the first or on any subsequent occasion.

SECTION I.

ANATOMY.

The Superior Maxillary bone articulates with the frontal, nasal, and unguiform bones; in front with the os frontis by its nasal process, by means of a firm regular suture; with the ethmoid in the orbit of the eye, and with the malar bone at its anterior external angle also by a firm suture. To the pterygoid process of the sphenoid bone at its posterior inferior portion; to its fellow of the opposite side; to the vomer in the middle line of the mouth, and to the palate bones in the same line posteriorly, it is also joined by more or less close adhesions.

The Inferior Maxilla forms the lower outline of the face extending entirely around it from ear to ear. It articulates with the temporal bone just in advance of the external meatus of the ear by means of its condyloid process. This process is a transverse cylindrical ridge directed inwards and slightly backwards, and springs from the ramus of the jaw by a narrow neck. The coronoid process is in advance of this, and has the temporal muscle inserted into its point.

The Masseter Muscle, arising from the parts about the zygoma, is inserted into the base of the jaw at its angle. The muscles forming the floor of the mouth are also attached along the base of the jaw on the inner side of the bone, and it is by this attachment that the tongue mainly maintains its position in advance of the glottis. When these attachments are divided, the tongue will be drawn in upon the glottis, and may induce suffocation unless artificial means are employed to prevent it. The carotid artery in its connections with the parotid gland is found near the angle of the jaw, but, by drawing the bone well forwards and downwards, the artery will be

* Mott's Velpeau, by Townsend.

separated to some extent from the bone, in consequence of the posterior adhesions of the parotid.

SECTION II.

OPERATIONS UPON THE JAW BONES.

§ 1.—RESECTION OF THE UPPER JAW BONE.

The growth of tumors, generally of a fungous or malignant character, and their encroachment on the surrounding bony structure of the mouth, has suggested the important operation of Resection or amputation of the Superior Maxilla, in order to remove the mass entire. The credit of originating this operation has been assigned to different modern surgeons, most of whom had, however, been anticipated by the surgeons of a previous period.

The earliest reference to the removal of this bone which is known to have been recorded, is that of Acoluthus, a surgeon of Breslau, who is stated by Gensoul* to have removed a portion of the upper jaw for a tumor in 1693. Jourdain, in May, 1768, in consequence of the presence of a tumor, also removed a part of the antrum. In 1820, Dupuytren likewise amputated a considerable portion of the alveolar cavities of the bone. In the year 1824, Dr. David L. Rogers,† of New York, removed nearly the entire portion of both upper jaws, as far back as the posterior parts of the antrum.‡ Mr. Lizars, of England, and Gensoul, of France, operated about 1827. Drs. A. H. Stevens, of New York, in 1840, and Warren, of Boston, in 1842,§ with many others, subsequently accomplished the same thing. To Gensoul, of Lyons, however, is generally ascribed the credit of having first described a general and available method of extirpating the bone, in consequence of his having published a treatise on this subject, the operation of Dr. Rogers, of New York, not having removed the entire bone, on which the claim to priority seems to rest, although the latter showed most fully the practicability of the proceeding three years before Gensoul's operation. But, as the possibility of extirpating the upper jaw was first suggested by the success

* Gensoul, sur les Maladies du Sinus Maxillaire, &c. Paris, 1833.

† Cooper's Dict., Appendix, by D. Meredith Reese, M. D., N. Y. 1849.

‡ Bibliography. § Bost. Med. and Surg. Journ.

attendant on the removal of most of the lower one, and as this was performed in the United States by Dr. Deaderick, two years before the operation of Dupuytren, the priority of American surgeons might be readily sustained in any claim for originality were the operation in reality a new one. The most, however, that can be said in favor of its modern origin, and the claims of any surgeon to its suggestion since 1820, is that the operative proceeding took a definite form at that period, though it had been spoken of and performed in various degrees more than one hundred years previously.

As characteristic of the ordinary operation as at present pursued, the following one, performed by Dr. Warren, may be first referred to.

Operation of Dr. Warren.—The patient being seated with his head well supported, an incision was made through the cheek down to the bone, from the middle of the external edge of the left orbit, to the left angle of the mouth, and was followed by a copious gush of blood. The internal or nasal flap was then quickly dissected forwards to the middle of the nose, cutting off the attachment of the cartilage of the left alæ of the nose, and freeing the eyeball from the inferior part of the orbit, by dividing the inferior oblique muscle, the fascia of the eye, and the periosteum. The outer or lower flap was now rapidly dissected from the os malæ and superior maxilla, and around the latter bone as far as its union with the pterygoid process of the sphenoid; but the uniting space was not penetrated at this time, on account of the large pterygoid branch of the internal maxillary, which it would have been difficult to secure at this stage of the operation.

The two flaps being separated, the anterior extremity of the spheno-maxillary fissure was perforated, and the cutting forceps applied to the broadest part of the os malæ directly opposite to the perforation, by which it was smoothly divided in a few seconds.

The same instrument was next applied at the internal angle of the eye in an oblique direction from the lower edge of the orbit to the lower termination of the os nasi, and the bone divided without difficulty.

In the mean time, the blood flowed in torrents; one large artery required immediate ligature; but the bleeding of the others was controlled by compression of the carotid artery. The mouth of the patient filling with blood, frequent pauses were required to afford him an opportunity of ejecting it, and occasionally he was recruited with a little wine.

PLATE XXIII.

A VIEW OF THE ANATOMY OF THE SIDE OF THE FACE, AND OF SOME OF THE OPERATIONS PRACTICED ON IT.

Fig. 1. A side view of the Anatomy of the Face after the removal of the integuments. 1. The shape and position of the parotid gland. 2. The duct of Steno. 3. The sublingual gland. 4. The facial artery, at the point where it passes on to the face. 5. The facial vein. 6. The sterno-cleido-mastoid muscle. 7. The external jugular vein. 8. The zygomatic muscle. 9. Branches of the portio dura nerve emerging from the upper edge of the parotid; other branches are seen on the face.

After Bernard and Huette.

Fig. 2. The same Section after the removal of the Parotid Gland. 1. The portio dura nerve at its exit from the stylo-mastoid foramen. 2. The duct of Steno divided transversely. 3. The external carotid artery when freed from the parotid. 4. The temporal artery. 5. The facial artery after removal of the sublingual gland. 6. The sterno-cleido muscle. 7. Main trunk of the external jugular vein.

After Bernard and Huette.

Fig. 3. A three-quarter view of Horner's operation for the cure of Salivary Fistula. A wooden spatula supports the inside of the cheek; a slight longitudinal incision is made at the external fistulous orifice, and the hand of the surgeon is seen pressing the punch against the spatula so as to cut out a piece through the cheek. The external incision, being closed by a point of a suture, heals usually by the first intention, leaving the orifice, made by the punch, open in the mouth.

Drawn from Nature.

Fig. 4. A view of the operation of Resecting the Upper Jaw, as practiced by the incision of Dr. Warren. 1, 2, 3. The flaps everted, and turned over the nose and eye so as to expose the bone. The left hand of the surgeon is holding, 4, the bone at the moment of disarticulation by the knife, 5, which is working at the pterygo-maxillary fissure. Velpeau's operation is nearly the same as that of Dr. Warren.

After Bernard and Huette.

Fig. 5. Represents the completion of the operation, the union of the wound by the twisted suture, and the line of the cicatrix.

After Bernard and Huette.

Plate 23

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

The most difficult part of the operation remained, that of dividing the sound from the diseased parts within the mouth, and separating the maxillary from the sphenoid and palate bones without injuring the latter; so as to leave the patient the whole of the soft palate with the palatine plate of the os palati to support it.

In order to accomplish this without dissection, an incision was made through the mucous membrane of the hard palate, beginning at the edge of the palatine plate of the os palati, and extending forwards to the front edge of the jaw, and then upwards across the alveoli into the bone. To facilitate this incision, the central incisor within the left side was extracted so as to break the anterior part of the alveolus. Then, by a single stroke of the cutting forceps, the upper maxillary was separated from its fellow, and its palate plate cut through as far as its junction with the os palati. In order to separate the palatine plates of the maxillary and palate bones, the forefinger of the left hand was passed into the mouth to the last molar tooth, and its pulp turned forwards to receive and support the cutting instruments, the flow of blood preventing anything being seen. A strong pointed knife was then stuck through the hard palate at the union of the maxillary and palate bones, so as to separate them and also free the maxillary from the pterygoid process of the sphenoid, thus accomplishing the disunion of all the bones concerned.

Finally, the knife was passed externally behind the upper maxillary bone into the space between this and the pterygoid process, and seizing the bone with the left hand by its orbitar and alveolar portions, it was, by a gradual movement, started from its situation (Plate XXIII, Fig. 4), and aided by a few touches of the knife freed from its remaining periosteal attachments. The hemorrhage was arrested by ligatures and lint. Eight weeks afterwards, the patient went home, and three months from that time continued well.*

Dr. Wm. E. Horner, in a case of scirrhus of the antrum, has succeeded in removing the whole of the upper jaw *without any external incision*, thus saving the patient the scar in the face. The removal of a considerable portion of the same bone was also successfully performed by Dr. A. H. Stevens, of New York, in 1823, and published in the *N. Y. Journ. of Med. and Surg.* for 1849. The publication of the case having been delayed for several years, from

* Boston Med. and Surg. Journ. vol. xxvi. p. 9, 1842.

motives of delicacy to the patient, who was widely known, Dr. Stevens has not received that general credit to which his ingenuity entitled him. Dr. Horner was ignorant of it at the time of his operation.

REMOVAL OF THE SUPERIOR MAXILLARY BONE WITHOUT ANY EXTERNAL INCISION IN THE CHEEK.—Dr. HORNER, having determined to avoid cutting through the cheek as commonly practiced, the patient was seated in a chair, with his head well supported and partially etherized. The assistant, supporting the patient's head, then raised the angle of the mouth on the left side, and held it widely open, whilst the upper lip and cheek were dissected from the superior maxilla as far back as possible, in a line parallel with the superior margin of the buccinator muscle. The two incisor teeth on the left side were then drawn, and the corresponding alveoli cut through in the middle line by a narrow saw (Plate XXII, Fig. 8), which worked its way from the mouth into the left nostril; then a pair of strong hawk-bill scissors (Plate XXII, Fig. 2), such as are used by gardeners for lopping off twigs, took out the two vacated alveoli at a clip.

A thin, flat, well-tempered knife, with a strong round handle, (Plate XXII, Fig. 3), was now struck through the roof of the mouth into the nose at the junction of the palatine processes of the palate and superior maxillary bones (posterior middle palate suture), so as to cut forwards and separate the maxillary bones from each other in the middle.

The narrow saw was again used to cut through the root of the nasal process of the maxillary bone, and strong scissors, curved on the flat, cut through the orbitar plate at its margin, the incision being carried back to the pterygoid process of the sphenoid, around and below the malar bone.

The base of the soft palate was then detached by a short triangular knife (Plate XXII, Fig. 5), curved on the flat, so as to leave the soft palate attached to the palate bone. A few touches of the knife freed the remaining attachments.

The pterygoid process, malar bone, and the orbitar plate of the upper maxillary, were not disturbed, but left. The tumor, in addition to the bone, was also attached to the posterior part of the cheek, and to the external pterygoid muscle. The gouge and scissors, however, removed any part that could be detected.

The bleeding was profuse, especially from what was believed to

be the posterior palatine artery; but the vessel was readily secured by means of a ligature and Physick's needle; and a few other ligatures, with charpie, arrested the remainder of the hemorrhage. The drawing (Plate XXIV, Fig. 1) shows the appearance of the mouth immediately after the removal of the bone, though representing it on the right instead of the left side of the face, in consequence of its being daguerreotyped, this peculiarity having been overlooked by the engraver.

The additional time required for this mode of operating is probably fifteen or twenty minutes; but it saves the patient a scar for life.*

Seven months afterwards, the patient continued well; and his daguerreotype (Plate XXIV, Fig. 2) shows the small amount of deformity.

Dr. STEVENS, of New York, in August, 1823, extirpated a fungus from the antrum maxillare, and removed a considerable portion of the bone also without any external incision.

OPERATION OF DR. STEVENS, OF NEW YORK.—The second incisor and the last molar tooth but one being first extracted, the upper lip was dissected off from the jaw as high as the infra-orbitar foramen. The bone being now bored through by means of a trocar, which was carried backwards and downwards till it perforated the palatine membrane near the junction of the left os palati with the palatine process of the left superior maxilla, the palatine membrane was incised from this point to the external edge of the first left incisor tooth. The palatine process of the superior maxilla was next divided by a saw, with its teeth directed downwards, passed through the route made by the trocar; and the bone, both above and below, between the socket of the last molar tooth and the perforations of the trocar, was also divided by a fine flexible saw, seven inches long, made of watch-spring, and having teeth only in its middle for the extent of three inches, the division being made in the direction of a curved line, which extended from the point where the trocar first entered to the alveolar cavity of the molar tooth extracted. No bad symptom followed, and in six months the opening in the antrum was completely closed.

The patient, seven years subsequently, was in perfect health.†

* Med. Exam., No. 1, p. 16, 1850.

† Velpeau's Surgical Anatomy. Appendix, by John W. Sterling, M. D. Vol. ii., p. 518. N. Y., 1830.

Dr. Mott, in an operation for a large polypus of the nose, was compelled to make a partial section of the upper jaw, by an incision through the integuments from below the internal canthus, down the side of the nose, and through the upper lip about three lines from the angle of the mouth. Then dissecting back the two flaps thus made, he divided the necessary portion of the bone with a saw.*

In certain tumors requiring the entire amputation of the jaw, this kind of incision will be found to expose the bone freely; and in the case of a very large tumor, where removal by the plan of Dr. Horner could not succeed, this incision would open the parts sufficiently, and create a scar that would be well placed for concealment.

Remarks.—In this as in every other surgical operation, the circumstances of the case exert so great an influence on the decision of any of the means to be employed, that an estimate of their value must necessarily be only an approximation. Where the tumor will permit it, there is, however, no question that the operation of Dr. Horner, for the removal of the bone without an external incision, is the best for the patient, as it saves him a most unsightly scar, and, when the cheek can be freely dissected off from the surface of the tumor, exposes the part with considerable freedom. But if the development of the disease requires a more free opening of the integuments, in order to afford space for acting in the various steps of the disarticulation, then the simple curved incision from the outside of the malar bone to the angle of the mouth, as practiced by Dr. Warren, and subsequently by Velpeau, will probably answer better. In all external incisions, and especially those near the masseter muscle, the operator should bear in mind the position of the duct of Steno, and so arrange his incisions and dissections as to leave it uninjured in the lower flap of the integuments.

The severity of the operation of amputating this bone, together with the deformity which it was supposed would ensue on the removal of so considerable a portion of the face, at first created great distrust among surgeons as to its propriety. Subsequent experience having shown that these objections were without foundation, the cases in which it has been repeated have become more numerous,† and the result, as far as learned, has been satisfactory, the greatest evils having resulted rather from delaying the operation until the

* Velpeau's Surgery, by Mott, p. 907.

† See Bibliography—article on Upper Jaw.

disease had progressed too far into the surrounding structure than from its performance in those cases where the bone was removed whilst the complaint was limited to the antrum.

STATISTICS OF THIS OPERATION.—Resection of the entire bone has been performed by Dr. Jno. C. Warren twice; one patient was cured, the other died; and the same surgeon has also performed partial resection many times with perfect success.* After collecting all the cases reported by Drs. Rogers, Warren, Stevens, Mott, Eve, Horner, Gensoul, Lizars, and others, and analyzing them, the following result is shown:—

Of seventeen cases reported, twelve were cured and five died, or about three-fourths were cured, that is, the patients were doing well at periods varying from six weeks to five years after the operation. But several of those above reported as cured, are so referred to by the operators solely in connection with the results of the operation, some of them being expressly mentioned as dying subsequently of the disease. In prognosticating the result of this operation, it should therefore be remembered that, though its happy termination is more marked than that of other great operations (nearly three-fourths recovering), yet the tendency to ultimate death from the disease is but slightly diminished by removing it from the point in which it was first apparent.

§ 2.—RESECTION OF THE INFERIOR MAXILLA.

This bone may be resected either partially or entire, the latter having been successfully performed by Walther of Bonn, by Græfe of Berlin, and lately by Dr. Carnochan of New York, and the former accomplished so often as to render it difficult to register all the cases.†

At one period, the amputation of even part of the lower jaw was regarded by surgeons as a most formidable operation, and its practicability doubted; and to the surgeons of the United States is certainly due the credit of having shown its feasibility, the amputation of nearly one-half of the bone without ligating the carotid artery having been successfully performed by Dr. W. H. Deaderick, of Rogersville, Tennessee, in Feb. 1810,‡ on a boy fourteen years of

* Manuscript of Dr. Warren.

† See Bibliography—article on the Lower Jaw. ‡ Bibliography.

PLATE XXIV.

RESECTION OF THE UPPER AND LOWER JAW.

Fig. 1. A view of the inside of the Mouth immediately after the removal of the left superior maxillary, as performed by Horner, without any external incision in the cheek. The soft palate is shown as preserved, but the engraving has reversed the side from which the bone was taken, making it appear as if performed on the right side.

After Nature.

Fig. 1, *a*. A side view of the portion of bone removed from the mouth. " "

Fig. 2. A likeness of the patient seven months after the operation. " "

Fig. 3. A front view of Barton's operation for Resection of the Lower Jaw without destroying its base, thus preserving the outline of the Face. In the original operation, the lower lip was divided vertically at its left angle, but this has not been done in the drawing, in consequence of its not being universally necessary. When the tumor permits it, the simple horizontal cut in the integuments, as shown in the figure, brings the cicatrix under the chin, where it is hardly perceptible.

After Nature.

Fig. 4. An outline of a Skull, showing the relative size and position of the Tumor in Dr. Barton's patient.

After Barton.

Fig. 5. An Outline of an Inferior Maxilla, showing the line of incision in the Jaw. " "

Fig. 6. A side view of Lisfranc's operation for Resection and Disarticulation of half of the Lower Jaw, at the moment of removal, the jaw being everted and drawn forwards and downwards in order to avoid any injury to the artery at this point.

After Bernard and Huette.

Fig. 7. A front view of the Resection of the Chin or middle portion of the Inferior Maxilla, as practiced by Dupuytren. A vertical incision in the median line of the chin enables the operator to turn back two flaps, 1, 2, and expose the bone, which may then be readily divided by Hey's saw, if it is desirable to cut from before backwards, or by the chain saw passed around the bone and made to cut from behind forwards. The latter is preferable, in most instances.

After Bernard and Huette.

Plate 24

Fig 1

Fig 1 a

Fig 2

Fig 3

Fig 4

Fig 5

Fig 6

Fig 7

age—a fact deserving of more notice, as claims to the credit of originating the operation have been advanced in Europe by the surgeons of both England and France.

Whether the evils resulting from the loss of the entire maxilla should not forbid its repetition, is at present a question that experience has not settled. It should therefore be deliberately considered by every surgeon before attempting it, the difficulties of the operation not being so great as the evils likely to ensue to the patient on its completion.

§ 3.—RESECTION OF ONE SIDE OF THE JAW.

Operation of Dr. Deaderick.—An incision was commenced under the zygomatic process, and continued over the tumor (which almost entirely enveloped the left portion of the jaw, and occupied nearly the whole mouth) in the direction of the bone, to nearly an inch beyond the centre of the chin. A second incision was then begun about midway and at right angles with the first, extending a short distance down the neck. The integuments being now separated from their connection with the tumor, and the jaw sawed through near at its angle, as well as at the centre of the chin, there was no difficulty in freeing it from its other attachments. The wound was then closed in the usual manner, and the boy had a speedy and happy recovery. Thirteen years subsequently, there was no connecting medium between the ends of the divided bone.* The description of the tumor shows it to have been osteo-sarcoma.

Remarks.—As the account of this operation was not published by Dr. Deaderick until nearly one year after Dr. Mott's operation, and the latter surgeon had performed his operation before he heard of that of Dr. Deaderick, the credit of priority has been strongly urged and by many accorded to the latter gentleman. But, as the case of Dr. Deaderick, though not published until 1823, contains the evidence of those who know it to have been performed in 1810, justice would seem to demand that Dr. Deaderick should obtain the renown which has been so frequently attached to those who only followed in his footsteps. The decision of this point seems, however, to have been a difficult one even at an early period, a special committee of the New York Society having been unable to settle the question† as to the priority of the claims of American or Euro-

* Amer. Med. Recorder, vol. vi. p. 516. Phila., 1823. † Bibliography.

pean surgeons, hesitating between those of Dr. Mott and Dupuytren, but being at that time ignorant of Dr. Deaderick's operation. European surgeons usually assign the credit of the first operation to Dupuytren in 1812; but there is, as just shown, every reason to believe that the operation of Dr. Deaderick anticipated that of Dupuytren two years, and the credit of having first performed it is therefore due to the surgeons of this country, and especially to those of the Western States.

In the early operations performed by Dr. Mott, ligating the carotid artery a few days prior to removing the bone was deemed essential to success; but many cases operated on by others, as well as that of Dr. Deaderick, have proved that this step is only a complication of the proceeding.

Dr. Wm. Gibson, in a late operation before the medical class of the University of Pennsylvania (Jan. 1851), removed the entire half of the jaw, without tying any vessels of consequence; and if the bone is drawn well forwards previous to attempting its disarticulation, and the knife made to shave off the soft parts close to the angle and ascending ramus of the jaw, it will be found that there is really very little risk, as the artery, by remaining *in sitû*, is removed several lines from the incisions required for the disarticulation of the bone.

Ordinary Operation for Resection and Disarticulation of half of the Jaw.—The patient being seated on a chair, so that his feet will not touch the ground and enable him to tilt himself backwards, and having his head supported by an assistant, the surgeon should make a horizontal incision over the tumor, from the angle to the symphysis, along the base of the inferior maxilla. A vertical cut over the symphysis from the lip to the end of the first incision will then free the flaps, which should be dissected back from the tumor, one being turned up on the cheek, and the other downwards and backwards. After sawing through the bone at the symphysis from without inward, shave off with a strong good scalpel all the soft parts on the inside, as far as the angle of the bone. Then, drawing the bone outwards and forwards, use it as a lever; and, whilst its upper attachments are upon the stretch, insert behind the coronoid process, and just below the zygomatic arch, a bistoury, so as to detach the temporal muscle from its insertion. At the same time, depress the bone so as to dislocate the condyloid process, and, drawing it forcibly forwards so as to remove it from the artery, divide the capsular liga-

ment and the pterygoid muscles, which will generally free the jaw entirely (Plate XXIV, Fig. 6).

The wound may then be closed with a few stitches, and with adhesive plaster.

Removal of the Middle of the Bone.—The patient being arranged as before, the surgeon seizes one angle of the mouth with his left hand, while an assistant does the same with the other, and, drawing the lip tense, divides it immediately in its middle by a single vertical incision. The two flaps, being then shaved off from the bone to the desired extent, are to be held by the aids; and the teeth at the points of division being extracted, the bone may be cut through either by Hey's or the chain saw, the latter cutting from behind forwards, after being passed around the jaw by means of a needle. If it is desirable to divide the bone from before backwards, one similar to that of Hey (Plate XXIV, Fig. 7) must be employed.

The point of the tongue being now held, either by a ligature introduced through it, or by means of a tenaculum, so as to prevent its being drawn into the pharynx, the surgeon should shave off the muscular attachments from the inside of the bone, and close the wound by sutures.

Should the portion of bone to be removed be the entire chin, it will perhaps be necessary to attach the tongue to the side of the cheek for a few days by means of a suture, in order to prevent its retraction upon the glottis, as this may induce suffocation.

Barton's Operation for removal of half the Jaw, by a longitudinal section, without destroying the base of the bone, so as to preserve the line of the face.—The patient had a tumor (epulis), which had taken entire possession of the mouth, forcing the tongue into the pharynx, and stretching the jaws widely apart. It also rose up outside the superior maxillary bone (Plate XXIV, Fig. 4), protruding the lips, cheek, and neck on the left side.

Operation.—An incision, being commenced over the left angle of the lower jaw, was carried on a line with the under edge of the base around to near the edge of the masseter on the opposite side, through the integuments and muscles of the cheek and lip, so as to open the cavity of the mouth. The under lip towards the left commissure of the mouth was then cut through vertically, so as to meet the first incision at a right angle. The tumor, being thus exposed, was found to be adherent to the anterior and posterior surfaces of the bone. These adhesions were detached from the anterior face

of the bone as high up as it was sound. With a small narrow saw (Plate XXII, Fig. 9), the bone was cut through longitudinally from without inwards, in a line parallel to the base of the jaw, and just below the maxillary canal. This section extended as far back as the roots of the last molar tooth on the left, and the second molar on the right side. A vertical cut was then made through the alveoli between these teeth, so as to meet at a right angle the horizontal division of the bone (Plate XXIV, Fig. 5). The portion thus insulated contained the diseased mass, and, after separating the attachments of the soft parts, enabled the operator to take it away entire (Plate XXIV, Fig. 3), leaving the base of the bone in a healthy state, except at one point on the surface, which was readily taken off with the nippers. No blood-vessels required the ligature except the left facial and right coronary arteries. The flap being replaced, the vertical cut through the lip was closed by the hare-lip suture, and the rest by the interrupted suture and adhesive plaster. In a month, the patient was well; the contour of the face was preserved, and he was able to masticate his food with the three remaining molars and their antagonists of the upper jaw.*

Remarks.—Although so important a portion of the general outline of the face is necessarily removed in these operations, the deformity which results from the operation is by no means such as might be anticipated. In the case of a gentleman formerly an Interne of Lisfranc's at the hospital of La Pitié, and whom I saw in Paris in 1839, the deficiency was admirably concealed by his whiskers; and in the modification proposed by Dr. Barton, of Philadelphia, where a rim of the base of the jaw was left, it is very slight. In all cases, where the amount of the disorder will permit it, Dr. Barton's method of operating will be found to be the most advantageous; but it is essential to a successful result that as much as possible of the base of the bone below the orifice of the nutritious artery should be preserved in order to obviate the risks of necrosis from the want of circulation.

Statistics.—When we remember the character and extent of the parts involved in this operation, it must be admitted that the success attending resection of the lower jaw, and the relief afforded by it from a painful and loathsome complaint, is such as is highly creditable to the surgery of the nineteenth century.

* Amer. Journ. of Med. Sciences, vol. vii. p. 331, 1831.

Out of about one hundred and sixty cases collected from various sources by Velpeau, there have only been forty deaths, or one-fourth of the whole number operated on, a success which is very great when compared with the serious character of the operation.*

SECTION III.

OPERATIONS ON THE PALATE.

The occurrence of a fissure, either in the hard or soft palate, or in both, is most frequently the result of a congenital defect, and often co-existent with a similar fissure in the alveolar processes of the upper jaw as well as in the lip, as was mentioned when treating of the operation for hare-lip. In consequence of the effect of this fissure upon the tone of the voice, as well as upon the enunciation of words, it becomes desirable to attempt its closure by uniting the two halves, or by performing a plastic operation at as early a period as will be permitted by the patient, or rather so soon as the individual is willing and able to assist the operator in the efforts required for its execution. If the case is seen during infancy, the cure of the hare-lip will often diminish the size of the fissure in the palate, or materially aid the subsequent operation; but if both hare-lip and fissure of the palate are present in an adult, the operation must first be performed upon the lip, and then, if necessary, repeated upon the palate, the operation of staphyloraphy or union of the fissure of the palate being very much the same in principle as well as means of treatment with that resorted to for the relief of hare-lip.

§ 1. STAPHYLORAPHY.

This operation, which was suggested by a French dentist, Le Monier, in 1764, and termed Staphyloraphy (σταφυλη, the palate; and ραφη, suture), was revived by Græfe, of Berlin, in 1817, but methodized and first published with the rules for its performance by Roux, of Paris, about 1819. In 1820, a nearly similar operation was performed by Dr. John C. Warren, of Boston, he being at the

* Velpeau—Med. Opératoire, vol. ii. p. 620.

PLATE XXV.

A VIEW OF THE INSTRUMENTS EMPLOYED IN OPERATIONS UPON THE THROAT AND ESPECIALLY IN STAPHYLORAPHY.

Fig. 1. Scissors for Excising the Uvula.
Schively's pattern. Drawn from the Instrument.

Fig. 2. Gibson's Glosso-catochus, or Spatula, to depress the Tongue.
Schively's pattern. Drawn from the Instrument.

Fig. 3. Schively's modification of Physick's Tonsilitome for excising the Tonsil Gland. The ring surrounds the tonsil; the needle transfixes it, and the angular knife shaves it off. " "

Fig. 4. A long-handled double-edged Scalpel, for freshening the edges of the fissure in the operation of Staphyloraphy. " "

Fig. 5. Curved Scissors, with long handles for the same purpose. " "

Fig. 6. Physick's Forceps, with long handles, and holding a small needle of the proper curve, to facilitate its passage through the side of the Uvula. This curve may be readily given to the ordinary curved needle, simply by pressure and gentle heat. The catch on the handle of the forceps enables the operator to free the needle in a moment, after transfixing the part, and again to seize its point with the same instrument, so as to draw it through the opposite side of the fissure. Schively's pattern.

Fig. 7. Gibson's Forceps for inserting the ligatures in Staphyloraphy, at the moment when the needle is passed through the palate. " "

Fig. 8. The same instrument drawing the ligature into its position. " "

Figs. 9, 10. Needles of different sizes, as adapted to Gibson's Forceps. The shoulder near the spear point facilitates the grasp of the forceps, which close around it in consequence of a little split in the top of the first upright portion. Schively's pattern.

Plate 25

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

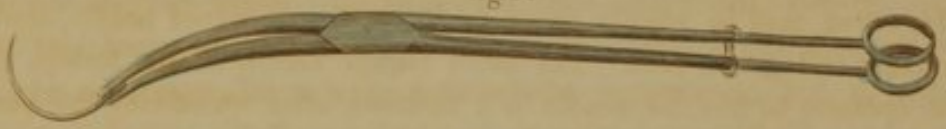


Fig. 7.

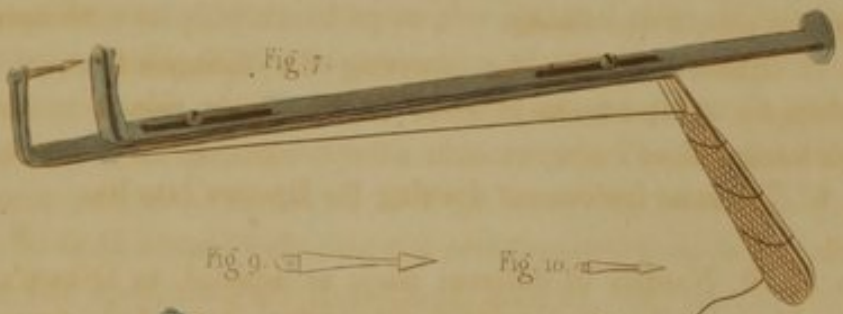
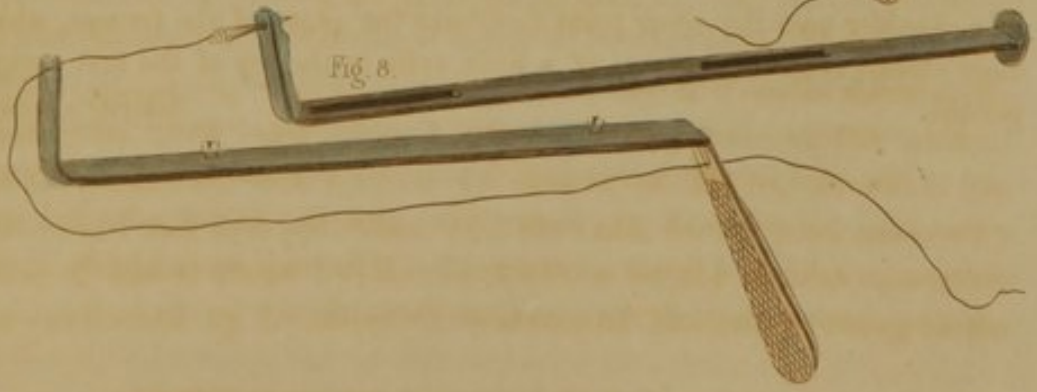


Fig. 9.

Fig. 10.

Fig. 8.



time ignorant of the views or operations of the other surgeons. In many respects, the steps proposed by Drs. Warren and Roux correspond, though the means suggested by Dr. Warren are the simplest. The operation of the latter being, however, generally regarded as the basis of the various modifications that have since perfected the proceeding, his plan may be first referred to.

Operation of M. Roux, of Paris.—Four different objects, which are to be attained in four different stages of the operation, have been laid down by M. Roux as likely to facilitate the surgeon's manipulation, and the success of the means employed.

1st. The paring off the edges of the fissure.

2d. The introduction of the ligatures at equal distances through its margins.

3d. The knotting of the ligatures and the approximation of the freshened sides of the fissure.

4th. The relief of any tension in the parts consequent on the suture.

Instruments.—The instruments proposed by Mr. Roux for accomplishing these objects are sufficiently complicated, consisting of three silk ligatures, made of two or three strands, and waxed; of six small-curved but flat needles, each end of the three ligatures receiving one needle; of a porte-aiguille or needle-holder; of dressing forceps; and of a probe-pointed bistoury, and curved scissors.

Operation.—The patient being seated before a strong light, with the head thrown back and supported against the chest of an assistant, the mouth is to be kept widely opened by means of a cork placed between the molar teeth. The surgeon, being placed in front, then seizes, with the forceps held in his left hand, the right lip of the fissure (Plate XXVI, Fig. 1); and, with his right hand armed with the needle-holder, introduces the point of the needle from before backwards behind the uvula, in order to traverse the flap from behind forwards at three or four lines from the free edge of the fissure. The needle, being thrust in as far as its head, is then freed from the needle-holder, and seized at its point by forceps, which draw it and the ligature through into the mouth. After resting a few seconds, the same manœuvre is practiced on the left half of the fissure with the other needle of the same ligature, the two ends of which are thus brought out into the mouth. In passing three ligatures, the operator should commence by the lowest, then pass the highest, and, lastly, apply the third in the middle of the

fissure. Plate XXVI, Fig. 1, shows the ligatures as the last is being passed through the right side of the fissure.

The extremities of the ligatures, 3, 3, 4, 4, 5, 5, being brought outside the mouth, and their loop or central portion depressed towards the pharynx, the surgeon proceeds to

Freshen the Edges of the Fissure.—To accomplish this (Plate XXVI, Fig. 2), he should seize the lower end of the left margin with the forceps, 1, held in the left hand, and cut off the edge from behind forwards with the probe-pointed bistoury, 2, or curved scissors, (Plate XXV, Fig. 5,) held in the right hand, cutting from below upwards, and prolonging the incision a little beyond the centre or angle of union of the two sides of the fissure. The other margin is then to be incised in the same manner by cutting a little beyond the angle of union, in order to free the flap.

In order to tie the ligatures, M. Roux commences by knotting the middle ligature (Plate XXVI, Fig. 5) with the fingers, and, after making a simple knot, confides it to an assistant, who holds with a serre-nœud (knot-tier), whilst he ties the second and then the first ligature, drawing them tighter than is necessary to approach the edges of the wound, in order to prevent any separation. This being completed, the ends of the ligatures are then cut close to the knots, and the patient kept from eating, drinking, or speaking during two or three days; the ligatures being removed on the third or fourth day, and the lowest ligature being left twenty-four hours longer than the others.

It is essential that the ligatures be placed at equal distances; that the points of each one be on the same level, and that they be at a proper and equal distance from the free edge of the fissure.* If, on knotting the ligatures, the strain upon the parts seemed to be too great, or such as might excite an apprehension of their tearing out, Roux made an incision in the sides of the soft palate (Plate XXVI, Fig. 5), and allowed these wounds to heal by granulations.

Operation of Dr. Jno. C. Warren.—In the case of a young girl, aged seventeen years, who from birth had suffered from a cleft on the left side of the uvula, extending as far as the ossa palati, where the fleshy membrane was so thin as to be transparent, the operation of staphyloraphy was performed by Dr. Jno. C. Warren, of Boston, as follows:—

* Bernard and Huette, p. 207. Paris, 1850.

"The patient being well supported and secured, a piece of wood an inch wide, a little curved at the end, and with a handle to be held by an assistant, was placed between the molar teeth on one side, to keep the mouth open. A sharp-pointed curved bistoury was then thrust through the top of the palate, above the angle of the fissure, and carried down on one edge of the cleft to its extremity; and the same was done on the opposite side, so as to cut out a piece in the form of a letter V, including about a line from each edge. Next, a hook, or curved needle, fastened in a handle, with an eye on its extremity, and a movable point, armed with a triple thread of strong silk, was passed doubled into the mouth through the fissure and behind the palate, and the latter pierced by it at one-third the length of the fissure from the upper angle of the wound, so as to include about three lines of the edge of the soft palate. The eye with the ligature, being seen, was seized by a common hook and drawn out. The eyed hook was then drawn back, turned behind the palate, and the other edge transfixed in a similar manner. A second and a third stitch were now passed in the same way, the third being as near as possible to the lower end of the fissure. Then, seizing the upper ligature with the fingers, the knot was tied without using a serre-nœud, and placed on one side of the wound in order to prevent its pressing on the fissure; the others being tied in a like manner, and the fissure closed. The patient was exhausted by the operation, but soon revived; remained twenty-four hours without speaking or taking a drop of liquid into her mouth, then used a little water. In seven days, the stitches were removed, and she left the hospital a day or two after. Two years subsequently she swallowed perfectly and spoke well."*

In 1826, a similar operation was successfully performed on a boy æt. eleven. The cure was perfect.†

Remarks on the American Operations.—The first of these operations is stated by Dr. Warren to have been original with himself, as he was not at that time acquainted with the operations performed in Europe. From the simplicity of the instruments employed, and the freshening of the edges from above downwards, his method has advantages over that of M. Roux, from the fact that

* Amer. Journ. of Med. Sciences, vol. iii. p. 1, 1821; and MS. Records of Mass. Hospital.

† Amer. Journ. of Med. Sciences, vol. iii. p. 1, 1828.

PLATE XXVI.

A FRONT VIEW OF THE OPERATION OF STAPHYLORAPHY.

Fig. 1. The operation as practiced by Roux. 1. The needle-holder (porte-aiguille), in the act of carrying the last ligature through the right side of the fissure. 2. Dressing forceps holding this margin. 3. The first ligature as placed, the ends being brought out the angles of the mouth, and the loop being loose behind the palate. 4. The second ligature as introduced. 5. The third ligature.

After Bernard and Huette.

Fig. 2. The three Ligatures, 3, 4, 5, as before shown, being accurately placed, the surgeon proceeds to freshen the edges of the fissure with a probe-pointed bistoury, taking care not to cut the loops of the ligatures. 1. Forceps holding the free end of the palate. 2. The bistoury paring off a strip.

Fig. 3. Operation of Warren. 1. The knife freshening the edge of the fissure from above downwards. 2. The forceps steadying the margin so as to favor its regular incision.

Modified from Pancoast.

Fig. 4. The introduction of the Sutures by means of Physick's Forceps and a curved needle. 1. Physick's forceps introducing the needle. 2. Dressing forceps seizing its point at the moment when it is liberated from the instrument of Physick. 3, 4, 5. Position of the sutures. They should all be introduced at equal distances and as nearly parallel as possible.

After Pancoast.

Fig. 5. The operation of Staphyloplasty, as practiced by Dieffenbach. 1, 2, 3. The sutures as tied, and closing the fissure. 4, 5. The two longitudinal incisions made on each side of the soft palate, so as to remove the strain from the line of union.

After Bernard and Huette.

Plate 26

Fig 1

Fig 2

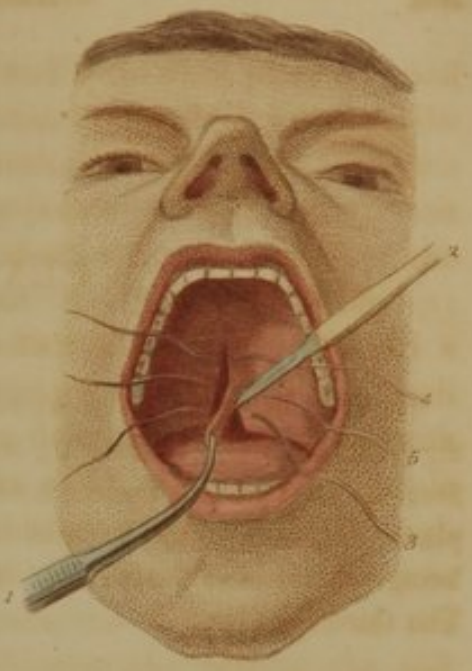


Fig 3

Fig 4

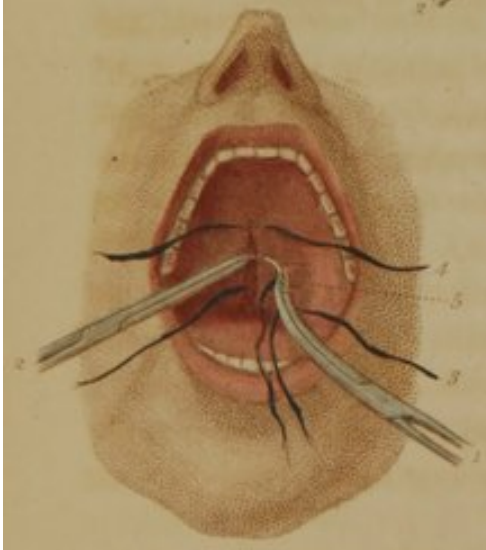


Fig 5

the incision of the soft tissues is facilitated by the traction, whilst the flap, being left adherent above until the completion of the opposite edge, is less likely to cause irritation about the fauces. That these two surgeons should devise similar expedients at the same time, and yet each be ignorant of the proceeding of the other, only shows the uniform tendency of different minds when devoted to the same object.

After the first operation of Dr. Warren, Dr. A. H. Stevens, of New York, Sept. 1826,* operated successfully by first inserting the ligatures, and then paring the edges.†

Dr. Mettauer, of Virginia, in 1827, operated for staphyloraphy, and in 1837 published an excellent essay,‡ from which the reader may gain much that is of practical value. Dr. M. employed the leaden ligatures recommended by Dieffenbach.

Dr. Wells, of Columbia, South Carolina (1832), in a case of recent wound, was enabled to apply the sutures by heating a common (surgeon's) needle in a lamp, bending it to a proper curve, and passing it through the fissure by the aid of Physick's needle.§ This simple contrivance seems to have answered perfectly, and is certainly capable of supplanting all the more complicated instruments, and has been successfully used by Drs. Mütter and Pancoast, of Philadelphia,‖ in staphyloraphy.

Dr. Gibson,¶ of Philadelphia, operated with instruments of a useful kind, some of which have been transferred to these pages.

Dr. Alexander Hosack, of New York, also published, in 1833, a memoir upon this subject, with illustrations of his own instruments; and Dr. N. R. Smith, of Baltimore, employs a peculiar hook or needle for the suture.

In fact, there are few operations in which surgeons seemed to have felt the necessity of more perfect instruments than in that of staphyloraphy. Each one has, therefore, endeavored to improve on those of his predecessor, and especially in reference to the introduction of the needles, thus showing that placing the ligatures is the most difficult step in the operation. The simplicity and efficiency of Dr. Physick's forceps, as employed by Dr. Wells, of South

* North American Medical Journal, vol. iii. p. 233.

† North American Medical and Surgical Journal, vol. iii. p. 233, 1827.

‡ Amer. Journ. of Med. Sciences, vol. xxi. p. 309, 1837.

§ Ibid., vol. x. p. 32, 1832.

‖ See Bibliography. ¶ Instit. and Pract. of Surg., vol. ii. p. 40.

Carolina, and subsequently by Drs. Mütter and Pancoast,* removes, however, this great obstacle to the rapid performance of the operation.

The advantages resulting from the transverse incisions suggested by Roux, or the lateral sections practiced by Dieffenbach, have recently been more systematically presented and specially urged on account of their anatomical relations, by Mr. Ferguson, of London, in the *Transactions of the Royal Medical and Surgical Society* for 1845.† By many, the views of Mr. Ferguson are regarded as original; but the following facts show that he had been anticipated.

In connection with the history of an operation for fissure of the palate, Dr. J. Mason Warren published, in the *New England Quarterly Journal of Medicine and Surgery*, No. IV, p. 544, April, 1843, an account of the division of both the pillars of the palate, and of its happy influence upon the union of the freshened edges of the fissure. Mr. Ferguson's paper did not appear until December 21, 1844, when, in the *Medical Times*, he published an account of the dissection, from which he was led to suggest the special division of the levator palati and palato-pharyngeus muscles. As Mr. F. entered minutely into the anatomy of the structure concerned, and also demonstrated the importance of dividing these muscles, he has doubtless aided the progress of the operation; but it is apparent from the references just made, that the idea was not a novel one, having been put in execution nearly two years previously by Dr. Warren. Froriep also appears to have been fully aware of the value of this muscular division, having described and figured the part in his "Nottizen" early in 1823.‡

Dr. Mettauer, of Virginia, in 1837, also recommended the section of the muscles by repeated lateral incisions, as a preparatory step to the operation in cases of great loss of substance, allowing the parts to heal by granulations, &c., as suggested by Velpeau in staphyloplasty.§

To Mr. Ferguson, however, is certainly due the credit of demonstrating in a scientific manner the special effects upon the fissure of each of the muscles, which had been previously divided without reference to the anatomical details of the region.

* See Operative Surgery, by Jos. Pancoast, M. D., Philada., and the papers referred to in the Bibliography.

† Ferguson, Practical Surgery, p. 506, Philadelphia edition, 1848.

‡ Chirurgische Kupfertafeln. Weimar, 1823.

§ Amer. Journ. Med. Sciences, vol. xxii. p. 309, 1838.

§ 2. STAPHYLOPLASTY.

In the operation of staphyloraphy, as just detailed, the attempts of surgeons have generally been limited to cases in which the fissure was only in the soft palate, the opening in the bony structure being left untouched or covered up by a metallic plate. The following ingenious operation, by Dr. J. Mason Warren, of Boston, presents a means of remedying the opening in the bones, as well as that in the soft tissues, by means of a portion of the neighboring structure. As the opening is thus closed by a flap taken from the adjoining soft parts, being made to slide over the fissure, as in plastic operations elsewhere, the operation has been termed Palatoplasty, Staphyloplasty, or Uranoplasty, according to the position of the opening, either of which names is sufficiently applicable to the operations on any part of this structure.

Operation of Dr. J. M. Warren.—The patient, being placed on a low seat, in a strong light, has his head firmly supported against the breast of an assistant, who raises or depresses it, as circumstances may require. The patient is then directed to keep the jaws widely separated, to retain any blood which may collect, as long as possible, so as not to embarrass the operator and restrain all efforts at coughing, in all which he should be encouraged by the surgeon. The use of a speculum is deemed by Dr. Warren altogether inadmissible, as it obscures the light and prevents the proper manipulation of the instruments. The mucous membrane of the hard palate being now carefully separated from the bones with a long double-edged bistoury, curved on the flat, should be rather peeled than dissected off, in consequence of the difficulty of making any sawing motion with the knife in this confined position, the obstacles being always greater in proportion to the obliquity of the palatine vault. As the dissection approaches the connection of the soft parts with the edges of the palate bones, where the muscles are attached and the union most intimate, great care must be taken lest the mucous membrane be perforated; and as soon as this dissection is terminated, it will generally be found that, by seizing the soft palate with the forceps, it can be brought into the median line. If the fissure is wide, and this cannot be effected, then the soft parts being forcibly stretched, a pair of long powerful French scissors, curved on the flat, should be carried behind the anterior pillars

of the palate, and its attachments to the tonsil and to the posterior pillar carefully cut away, when the anterior soft parts will at once be found to expand and an ample flap be provided.

The edges of the palate may now be freshened by seizing them on either side with hooked forceps, and removing a slip with the scissors or sharp-pointed bistoury. A small curved needle, armed with a strong silk thread, confined in forceps with a movable slide (Physick's), should then be introduced at the upper edge of the fissure, and carried from before backwards on the left side, and from behind forwards on the right, or *vice versâ*. Three or four ligatures being thus introduced, the patient should clear his throat of mucus and blood, the ligatures be wiped dry, and tied with deliberation, beginning at the upper and proceeding gradually downwards, waiting a little between each ligature in order to allow the throat to accommodate itself to this sudden and almost imperceptible tension of the soft parts. No forceps are required for holding the first knot while the second is tied, the object being better effected by making two turns of the thread instead of one, and by enjoining perfect quiet on the patient until the second knot is tied.

Dr. Warren has always arrested the hemorrhage consequent on the incisions by iced water and the finger, and does not wait before introducing the ligatures. The ligatures also were generally removed in forty-eight hours, or on the third day; drinks were employed with caution from an early period, and the patient was nourished by oatmeal gruel in injections.*

Velpeau operated successfully, and closed an opening in the hard palate three-quarters of an inch long and half an inch broad, by the following means:—

Operation.—Having noticed that the fibro-mucous membrane of the palate, in consequence of its firmness and slight vascularity, was very apt to mortify and slough, either in whole or part, the operation was performed as follows: Two flaps, six to ten lines long, of a triangular shape, were cut, one from in front, the other from behind the opening and dissected off, and brought down towards each other. Then, being united by means of a suture at their apices, a wound was left, which gradually closed up the fistula in every direction by the approximation and cicatrization of its borders, the cure being

* Operations for Fissures of the Soft and Hard Palate (Palatoplasty), by J. Mason Warren, M. D. New England Quarterly Journal of Medicine and Surgery, No. IV. p. 358. Boston, 1843.

aided by a longitudinal incision, made from time to time upon the two sides of the opening, as well as by occasional transverse ones upon the root of each flap.*

Dr. Pancoast, of Philadelphia, has repeated this operation, with some modifications, and obtained partial success.†

STATISTICS.—The results of this operation are shown by the following cases: Of twenty-four cases operated on by Dr. Warren,‡ it appears that he has succeeded in twenty-three of them; and Roux, in 1842,§ obtained a success of two out of three in simple fissure, but of only one out of three when it was complicated with a fissure in the hard palate.

CHAPTER XIII.

OPERATIONS PRACTICED UPON THE EAR.

THE operations resorted to for the relief of disorders of the Ear consist in those required for the external, and those demanded by the internal portions of this organ.

As the details of this department of surgery are sufficiently extended to have engaged the entire attention of a special class of those who have desired fully to treat its various complaints, the present account must be limited merely to the general anatomical and operative details.

SECTION I.

ANATOMY OF THE EAR.

Of the two portions of the ear, one is external, being the ear of common language, whilst the other is designated as the internal ear, being the structure mainly concerned in the sense of hearing.

The External Ear consists of a fibro-cartilaginous and fleshy sub-

* Velpeau, Med. Operat., tome i. p. 681.
† Operative Surgery, p. 357.
‡ See Bibliography, on Staphyloraphy.
§ Gazette Médicale.

PLATE XXVII.

INSTRUMENTS AND OPERATIONS UPON THE EAR.

Fig. 1. Dupuytren's Forceps for the removal of Polypi.

Fig. 2. Fabrizj's Forceps for the removal of foreign bodies.

Fig. 3. A Curette for the same purpose.

Fig. 4. Itard's Ear Speculum.

Fig. 5. Bonafond's Ear Speculum.

Fig. 6. Caoutchouc Bottle, fitted with a pipe and cock, for injecting Air or Ether into the Eustachian Tube.

Fig. 7. Itard's Catheter for the Eustachian Tube.

Fig. 9. Blanchet's Catheter for the Eustachian Tube.

Figs. 10, 11. Deleau's Instrument for Perforating the Tympanum. In one the perforator is concealed; in the other it is protruded from its sheath.

Fig. 12. A Vertical Section of the Head in order to show the angular course of the Eustachian Tube and of the External Auditory Canal. 1. The inferior turbinated bone. 2. The middle turbinated bone. 3. The pharyngeal orifice of the Eustachian tube, directly behind the posterior extremity of the inferior turbinated bone. 4. The angular direction of this tube. 5. The membrana tympani. 6. The external auditory canal; its direction completes the arch formed by the Eustachian tube. 7. The carotid artery.

Fig. 13. Removal of a Polypus, by the Forceps, from the External Auditory Canal.

Fig. 14. Perforation of the Tympanum by Deleau's Instrument. 1, 2. The instrument. 3. The membrana tympani at the point of perforation, so as to avoid the handle of the malleus.

After Bernard and Huette.

Plate 27

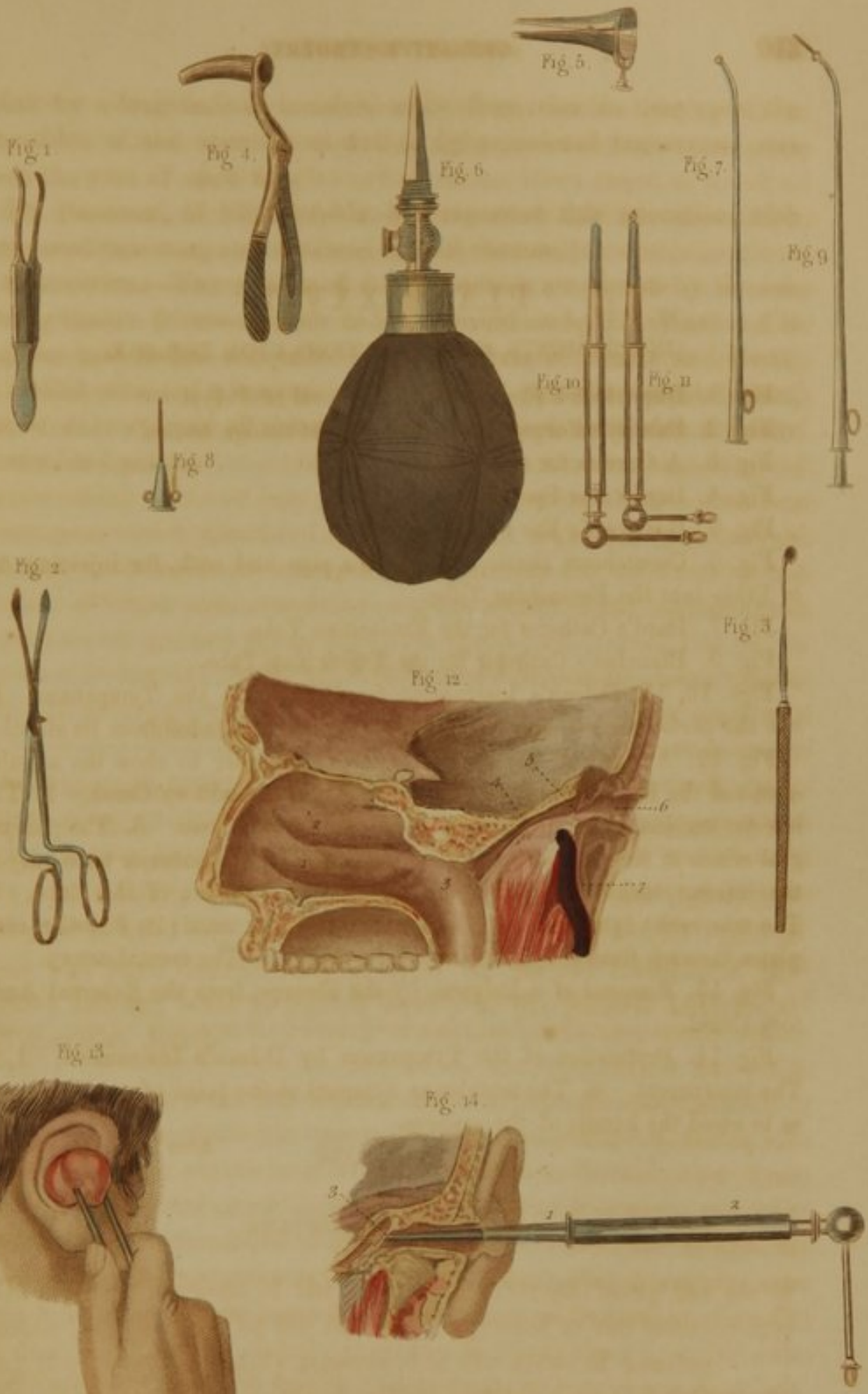


Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10
Fig. 11
Fig. 12
Fig. 13
Fig. 14

stance, which is covered by the skin and attached to the side of the head by ligaments and muscles, and of a cartilaginous tube which leads from the external meatus to the internal ear. The Lobus, or soft and fleshy portion of the ear, is at the inferior extremity of the organ. When lost, it may be, in a measure, replaced by a plastic operation (technically known as otoplasty), in which a flap is taken from the adjacent integuments and attached to the cartilaginous portion, as will be detailed hereafter.

The Meatus Auditorius Externus, or orifice of the cartilaginous tube, is at the bottom of the concha or fossa, found in the external ear. Its orifice is about three lines in diameter. The canal itself in the adult is an inch long from its orifice to the membrana tympani, or septum which closes it inwardly, and it is narrower in the middle than at either of its extremities.

This tube is also more expanded downwards than it is transversely; consequently, foreign bodies lodged in it may be most readily seized by forceps passed beneath and above the object. The speculum should also be opened in the vertical line instead of transversely.

As the cartilaginous tube runs inwards with a slight inclination forwards, and with a convexity upwards in its curvature, it is requisite to pull the external ear *upwards and backwards* when it is wished to look to the bottom of the canal.

The Membrana Tympani is a complete membranous septum interposed between the meatus externus and the tympanum at the bottom of the canal just spoken of. It is placed very obliquely across the meatus, so that its upper edge inclines outwards, and its lower edge inwards, the latter forming a very acute entering angle with the floor of the meatus or the cartilaginous canal (Plate XXVII, Fig. 12), which gives it an additional length, and renders it difficult to see to its bottom. An examination of the part, therefore, requires a strong light.

The membrane of the tympanum is slightly tense, and has its middle drawn inwards in consequence of its being attached to the handle of the malleus.

In the Internal Ear, the tympanum is the portion which is interposed between the meatus auditorius and the labyrinth.

At the fore part of the tympanum is the Eustachian tube, which runs for six or eight lines in the petrous portion of the temporal bone and terminates in a cartilaginous and membranous portion,

which communicates with the pharynx at the posterior nares (Plate XXVII, Fig. 12).

The orifice of the Eustachian tube is found in the upper part of the throat on a line with the posterior end of the inferior turbinated bone. It is rounded, oval, or trumpet-shaped, and large enough to admit the tip of the little finger (Plate XXVII, Fig. 12). The canal in its whole length measures nearly two inches, and its course is nearly horizontal, backwards and outwards towards the membrana tympani, diminishing as it goes backward, so as to receive with difficulty a small probe. It is lined in its whole extent by a fine and extremely delicate mucous membrane, which is continuous with that in the throat.* In catarrhal affections, its mucous secretions sometimes fill the whole cavity of the tympanum; and it is also liable to adhesion of its side as well as to stricture.

SECTION II.

OPERATIONS ON THE EAR.

§ 1.—OTOPLASTY.

The formation of a new lobe for the ear is a plastic operation, invented by the late M. Dieffenbach, of Berlin, in which a proper shaped flap is taken from the side of the head, or rather from the lateral portion of the neck, and being slid from its original position is fastened by sutures upon the deficient part. After union has taken place, the flap is cut free at its base, as in the operations of Rhinoplasty.

Another mode of operating will be found in the following method of Dr. Pancoast, of Philadelphia.†

Operation.—A piece of integument rather larger than the natural size of the lobe was marked out by an incision in front of the ear, and a semicircular portion of larger size, but narrowed where it touched the cicatrix, dissected up from behind the ear or over the insertion of the sterno-cleido-mastoid muscle. A sharp-pointed bistoury being then passed under the front portion of the ear, it was freed from its attachments by a single sweep of the instrument, and

* Horner's Special Anatomy, vol. ii., Philadelphia, 1851.

† Amer. Journ. of Med. Sciences, vol. v. New Series, p. 100, 1843.

the everted edge of the tragus loosened with the knife, leaving a raw surface, which was of considerable size, and bled freely, but without requiring ligatures. The margins of the wound in front being closed with the hare-lip suture and adhesive plaster, the posterior flap was brought round over the lobe to the anterior portion of the ear, where it was fastened with two stitches of the interrupted suture; the parts presenting a good appearance, though the lobe was purposely made larger than natural, in order to admit of the shrinking which always ensues upon operations of the plastic class. The lower point of the ear, which had been strained downwards by the cicatrix, retracted when loosened during the operation to nearly the natural length, and the success was perfect.

Remarks.—The operation of Dr. Pancoast is a slight modification of that of Dieffenbach, and was performed to relieve the cicatrix from a burn, the pinna being drawn close to the head, and the lobe lost in the common covering of the face and neck.

Any operation for the restoration of the lobe is, however, one of doubtful utility. At best, the restored portion cannot aid or affect the hearing, and will not resemble the lobe, whilst the removal of the flap produces cicatrices upon the neck, which are apt to cause a greater deformity than that arising from the original defect.

The removal of tumors from the lobe requires the same steps as those demanded by tumors elsewhere.

§ 2.—FOREIGN BODIES IN THE MEATUS AUDITORIUS EXTERNUS.

These may consist of insects, beads, coffee grains, and similar articles, accidentally introduced into the meatus, or of collections of hardened wax, combined with epithelial scales, wool, hair, or other substances, either naturally or accidentally collected in the tube itself.

I. EXTRACTION OF FOREIGN BODIES.

Operation.—Whenever it is desired to remove an insect from the ear, the head of the patient should be inclined to one side, and the meatus filled with any mild oil, which may be retained in the ear a few minutes, simply by keeping the head in an inclined position. The oil thus occupying the tube closes the respiratory pores

of the creature, and soon either kills it or causes it to seek the surface to obtain air or to escape, when it may be seized, or subsequently washed out with a syringe and tepid water, especially if inflammation exists, as this increases the sensibility of the part.

If the foreign body should be a hard substance, and one not capable of absorbing water, then the best plan of removing it will be to wash it away by the force of a stream of water thrown in on one side of it, and made to fly outwards from the resistance created to its entrance by the surface of the membrane of the tympanum.

II. TO WASH OUT FOREIGN BODIES.

Operation of Dr. Marion Sims, of Alabama.*—Introduce the point of a long, but large nozzled syringe, as near as possible to one side of the foreign body, there being very few that will distend the meatus so completely as to prevent the passage of a stream of water on one side. Then drive in a full stream with all the force of the syringe, and the recurrent stream will generally bring the foreign substance to a point where it may be seized with the forceps or curette.

Remarks.—In introducing an instrument into the ear of an adult, the peculiarity of the structure should be recollected, and the operator should, therefore, pass it either from above or below, as the vertical diameter of the meatus is greatest in this direction; but in a child it must be directed either in the front or back of the meatus, the transverse measurement being here the greatest. Hardened wax may be softened by warm oil or water, and then either picked out with the scoop or washed out, the ear being drawn upwards, outwards, and backwards, in order to facilitate its escape, by straightening the cartilaginous tube.

Should every other means fail, the surgeon may resort to the plan of Paulus Ægineta, and, perforating the meatus below, introduce a probe behind the foreign body, and thus push it outwards.

* See Bibliography—Article, Ear.

§ 3.—POLYPI IN THE MEATUS EXTERNUS.

Polypi in the ear, like polypi elsewhere, may be of different kinds, that is, either soft, mucous, fleshy, or carcinomatous. Generally these tumors arise from the tympanum, or its membrane, and distending the meatus, sometimes project externally (Plate XXVII, Fig. 13). If of the soft kind, they may be removed by seizing them with forceps, and rotating the latter until the polypus is twisted, when simple traction will suffice; or, if it is possible to pass a loop around it, the strangulation may be effected by a wire or silk ligature in a small double canula like that of Levret, as I have done in two cases successfully. If more firm, the polypus may require excision in pieces, the hemorrhage being readily arrested by compression in the meatus. In all cases, however, it is usually desirable to apply the nitrate of silver to the base of the tumor after its removal; to keep the meatus clean, by repeated syringing, and to introduce, occasionally, astringent washes.

Where the polypus is very large, and fills up the meatus externus entirely, the repeated applications of the wire ligature will enable the surgeon to remove it entirely.

Operation of Fabrizj, of Modena.* The patient being so seated as to throw the light into the meatus, the surgeon passes the loop of a wire ligature, contained in a double canula, around the polypus, passing it by means of a probe as far as possible into the auditory canal and towards the base of the tumor. After firmly constricting it with this loop, let him next pass the loop of a second ligature in its canula over the first, drawing upon the latter, so as to carry the second ligature as deeply as possible. Then, constricting the tumor by this, remove the first ligature and canula, and if the second does not cause the tumor to come away, carry a silk or buckskin ligature in a flexible canula below it, and twist the ligature until the tumor is cut off. (Plate XXVIII, Figs. 9, 10.)

§ 4.—PERFORATION OF THE MEMBRANE OF THE TYMPANUM.

This operation, which was suggested by Sir A. Cooper in 1800, in order to permit the entrance of air into the middle ear when the

* Bourgery, Med. Opérat. tome 7me, p. 33.

PLATE XXVIII.

INSTRUMENTS AND OPERATIONS UPON THE EAR.

Fig. 1. A Brass Air-Syringe, employed by Horner for filling Fig. 2.

Drawn from the Instrument.

Fig. 2. A Tin Drum or Air-Chamber, employed by Horner. 1. A cock to regulate the exit of the air. When charged, and the syringe removed, the opening of the tube is to be applied to a catheter previously passed into the Eustachian tube, and the force of the current regulated by turning the cock at 1.

Drawn from the Instrument.

Fig. 3. Horner's Knife for Perforating the Tympanum.

Fig. 4. A Syringe, employed by Horner for forcing ether, air, or water through the Eustachian tube, from the external meatus into the throat, after perforating the membrane of the tympanum; being the most certain mode of testing the permeability of the tube.

Drawn from the Instrument.

Fig. 5. The Nozzle of Fig. 4 passed through a cork so as to enable it to plug up accurately the external meatus in injecting the ear through the perforation in the tympanum.

Drawn from the Instrument.

Fig. 6. A Coil of Silver Wire, forming a Spring for the retention of a Catheter passed through the Nostril into the Eustachian Tube.

After Bourgery and Jacobson.

Fig. 7. A Frontlet employed by Itard for the same purpose.

After Itard.

Fig. 8. A view of the Frontlet as applied on the patient. "

Fig. 9. Fabrizj's Mode of Strangulating Aural Polypi by the repeated application of the ligature with its canula.

1. The hand of an assistant holding the canula as applied with the first ligature. 2. The second canula and ligature about to be applied below the first. The operator is seen passing its loop over the first canula and ligature and around the tumor; whilst with a probe he endeavors to press the ligature deep towards the membrane of the tympanum.

After Bourgery and Jacobson.

Fig. 10. A Vertical Section of the Ear, showing the subsequent construction of the base of the tumor.

After Bourgery and Jacobson.

Plate 28

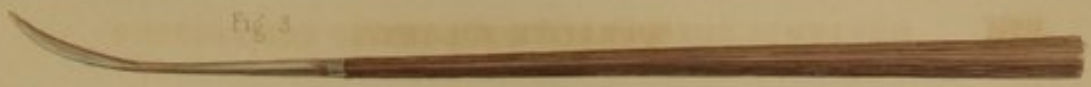


Fig 3

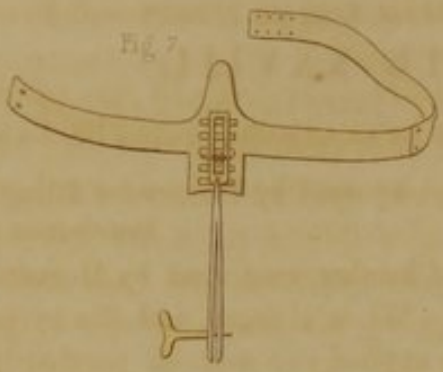


Fig 7


Fig 8


Fig 1


Fig 4


Fig 5


Fig 6


Fig 10

Fig 2


Fig 9

Eustachian tube was permanently closed, or when the membrana tympani was too much thickened and changed to vibrate, is a simple operation, though it has not been much practiced, owing, apparently, to a want of confidence in its utility, or of fear, lest injurious consequences should result. Such fears are, however, groundless; the puncture being readily made, not productive of great pain, and often healing with great facility.

Operation of Sir Astley Cooper.—After inclining the head, so that a strong light shall fall directly in the meatus, introduce a small trocar, or the instrument of Deleau (Plate XXVII, Figs. 10, 11), or the knife of Horner (Plate XXVIII, Fig. 3), at the anterior inferior side of the membrane, and transfix it so as to avoid the handle of the malleus.

In cases where the Eustachian tube is closed by mucus, and the surgeon finds it difficult to clear or dilate it by catheterism through the nostril, or when he wishes to assure himself positively that this tube is patulous, perforation of the membrane of the tympanum will enable him to act upon the cavity of the tube very advantageously, and to test with great certainty the condition of the inner portion of the ear by forcing a current of air from a syringe through the meatus externus against the puncture in the membrana tympani. As the wound in the membrane will heal readily, the patient runs no risk of injury if the Eustachian tube prove to be totally impervious, whilst, if choked, it can be thoroughly cleansed by driving the mucus into the throat in the natural course of the tube. By thus demonstrating the pervious condition of the tube, the diagnosis of the character of the deafness will be much simplified.

Operation of Dr. William E. Horner, of Philadelphia.—A method, which Dr. Horner has practiced on many occasions, enables him to pass a stream of water from the meatus externus into the nose. It is accomplished as follows: Perforate the inferior half of the membrana tympani by a sabre-shaped knife, one line in breadth, the edge of which is on the convex margin (Plate XXVIII, Fig. 3), by first plunging the cutting edge upwards, and then revolving it on its axis, so that the incision may be angular, or the shape of a ∧, which will leave a flap easily moved. A small pipe, surrounded by a cork, should then be introduced tightly into the meatus externus, and a small syringe, holding an ounce and a half, adapted to the pipe, in order to force the water through the hole pierced into the membrana tympani, as just directed. The stream

being thrown in, as thus directed, will then be found to wash out the tympanum and the Eustachian tube, with great facility, as may be readily ascertained by seeing the water escape from the nose. The air douche may also be most perfectly accomplished in the same manner; in any other way it is very defective, and not to be relied on for what it professes to do, viz., to open the Eustachian tube, as a very little reflection will prove. For example, let the same cork be fitted into a vial, and then let the operator try to inject air from the syringe into the bottle, and he will have a representation of the real effect of the air douche by the catheter introduced into the Eustachian tube from the nostril, as usually practiced.

Dr. Horner has yet done no harm by this operation, but has, on the contrary, done some good. The principal idea of the profession, now existing in regard to the cause of deafness, and evolved by the assertions of leading aurists, is the fact of there being an obstruction of the Eustachian tube, but this Dr. Horner believes to be a mistake, the obstruction of this tube being, in his experience, very unusual as a simple form of disease, though very large claims are made upon public credulity by operators who boldly assert its existence.*

In the air douche, by the Eustachian tube, as usually advised, the introduction of the air may be regulated by a column of water acting on a large reservoir of air, or by means of the cock in the canister (Plate XXVIII, Fig. 2), or by simply resorting to the caoutchouc bottle (Plate XXVII, Fig. 6).

§ 5.—CATHETERISM OF THE EUSTACHIAN TUBE.

When the position of the orifice of the tube in the pharynx is recollected (Plate XXVII, Fig. 12), it will be seen that this is also a simple operation, though the verbiage in which it has often been described tends to create a belief in its being difficult. Aurists have recommended various instruments for the performance of this operation, and the catheters most in repute are those figured in Plate XXVII, Figs. 7, 9.

ORDINARY OPERATION.—The patient being seated with the head slightly thrown backwards and firmly supported, the surgeon takes the catheter in his right hand, and, after oiling it, introduces it into

* Dr. Horner in MS.

the nostril on the side to be sounded. Then, keeping its point upon the floor of the nostril, and its convexity upwards and inclined against the septum narium, slides it backwards until it reaches the soft palate, as may be readily told by the sense of touch transmitted along the instrument, or by the patient making a slight gulp or effort to swallow. At this moment, the surgeon should turn the point of the catheter upwards and outwards by rotating it a quarter of a circle, and then, by a slight movement forwards and backwards, he may slip it into the tube with as much, if not more ease than a catheter can be made to enter the bladder, when the proper position of the instrument will be at once known by its steadiness, and also by the sensation of the patient.

Then, in order to inject air or liquids, it is only necessary to compress the nostrils and catheter in the fingers of one hand, and employ the syringe or gum elastic bottle with the other, or to resort to a little wire spring (Plate XXVIII, Fig. 6), or to a frontlet, (Plate XXVIII, Fig. 8).

The frontlet, forceps, air-drum, &c., will all be found essential to the operations of those who may wish to devote themselves especially to aural surgery; but, for the general operator, the instruments, figured in Plates XXVII and XXVIII, will prove sufficient.

Remarks.—The almost universal necessity that exists in the United States for every surgeon to practice several distinct portions of his profession, as well as the absence of definite instruction in these complaints, usually noted in the ordinary courses of education of our medical schools, has, for many years, induced the majority of the profession to shun the treatment of aural complaints, and forced patients into the hands of empirics. All the operations upon the ear are, however, so easily practiced, and the character of the complaints requiring them so very limited, that this condition of things may be remedied by any surgeon.

In order to prove this, an effort has now been made to describe as fully as is necessary all the ordinary operations required for the relief of deafness, and if the reader will follow the description, in connection with the plates, he will, it is hoped, find them quite full enough. Pages have been written on most of these operations, but with the tendency to confuse and embarrass rather than encourage the reader. Washing out the external and internal auditory tubes, with perforation of the membrana tympani, or perhaps the mastoid cells, really constitutes the entire portion of aural operative

surgery, and are certainly easily executed. The prognosis of the complaints requiring these operations is, it is true, often doubtful, or decidedly unfavorable, yet it should be remembered that, even when unable to cure, a surgeon may effect much good by assuring the patient of the impossibility of his being relieved, and every operator should, therefore, gain such an amount of practical skill as will enable him to give an opinion. By washing out the meatus externus, and examining the condition of the membrane of the tympanum; by catheterizing the Eustachian tube, or by perforating the membranum tympani, and testing the permeability of the passage to the throat, as above described, much advantage will often be gained by the patient, whilst many persons will be saved from the hands of unprincipled men, who in the majority of cases only do them harm.

OPERATIVE SURGERY.

PART III.

OPERATIONS PRACTICED ON THE NECK AND TRUNK.

PART III.

OPERATIONS PRACTICED ON THE NECK AND TRUNK.

CHAPTER I.

SURGICAL ANATOMY OF THE NECK.

THE Neck is usually described by anatomists as that region of the body which is situated between the head and the trunk, being bounded above by the base of the jaw, mastoid portion of the temporal bone, and occipital part of the skull, and below by the clavicles, sternum, and scapulæ. In its general outline, this region is cylindrical or cylindroid, with the base upon the shoulders. On the front and sides it is decidedly convex, presenting certain well-marked prominences, which, by establishing fixed points of reference, are highly useful to the surgeon. On its posterior face it is flat and regular, presenting nothing deserving of especial notice.

The prominences and depressions seen on the front of a well-formed neck indicate the position of certain important organs which are often objects of solicitude to an operator. Thus, immediately above the sternum, in the median line of the neck, is a depression called the supra-sternal fossa, near or in which are usually found the roots of the large blood-vessels directly connected with the heart as well as several important nerves. Above this, in the median line, is the prominence caused by the larynx and trachea, and a little outwardly on each side of this line may be seen the elevation caused by the sterno-cleido-mastoid muscle. In front of this muscle, or between it and the trachea, is the carotid fossa or depression, where, from the superficial position of the vessel, its pulsations may be readily felt. At the base of the neck, near the clavicles and exterior to the sterno-cleido-mastoid muscle, is the supra-clavicular depression or fossa containing part of the subclavian artery and vein, together with some other vessels of importance; and at its upper portion, in the

space adjoining the angle of the jaw, are several important parts which will be referred to more in detail hereafter.

The cylindrical shape of the neck, and the enlargement at its base, render the smooth application of a broad bandage around it nearly impossible, and it will hence generally be found necessary either to make all such pieces of dressing quite narrow, or to give them a curved shape on the lower edge like that seen in the stocks worn by men as an article of dress, in order to enable them to fit the clavicular portion of this region. A similar shape will also be requisite to adapt them to the upper and lateral parts of the neck, and especially to the outline of the chin and sides of the jaw.

Owing to the great importance of the various organs contained within the neck, and the necessity of an accurate knowledge of their relations to each other, it has been found advantageous to divide it into numerous sections or departments, either by imaginary lines, or by following the course of well-known muscles. Each of these sections demands special attention, the advantages of such a subdivision being found in the facility as well as accuracy with which the position of their contents may be recognized. Of the various regions thus created by anatomists, none seems to me to present points of greater practical utility than that employed by M. Blandin, in his *Anatomie Topographique*, and the following descriptions will, therefore, be based mainly on the accounts furnished by him. In mapping out the regions of the neck, M. Blandin has divided its anterior or Tracheal surface into those parts which are above and those below the os hyoides, and into such as are more or less closely connected with the course of the sterno-cleido-mastoid muscle. Of the portion above the os hyoides, he makes two regions, one the Supra-Hyoid or Hyoglossal region, being the portion near the chin, and the other that about the parotid gland or the Parotid region. The parts below the os hyoides, on the front of the neck, he divides into the Laryngo-Tracheal and the Supra-Sternal regions, whilst those on the sides are designated as the Sterno-Mastoid, Carotid, and Supra-Clavicular regions. The mapping out of any portion of the body being, however, entirely optional, some difference will be found in the descriptions of different writers.

By some of the English anatomists* the disposition has been shown to apportion the neck into regions of a more mathematical

* Surgical Anatomy, by Joseph Maclise, Philada. edit. 1851.

character than those adopted by Blandin. Thus, on the neck being extended, one-half of it is made to take the form of an elongated square, which square is divided by the course of the sterno-cleido-mastoid muscle into two triangles, one near the clavicle and the other near the jaw, in both of which are parts of vital importance. But though upon the subject, such a formation of regions may answer the descriptive purposes of the anatomist, it will not prove as useful to the surgeon as that adopted in the following pages, from the fact that any difference in the extension of the neck must cause the diagonal line to vary, and thus render the relations of the various parts incorrect, unless the utmost possible tension of the muscle is always obtained. As considerable experience has satisfied me of the practical utility of the system adopted by Blandin, it is recommended to the study of those who desire to obtain such a minute knowledge of this important section of the body as will fit them for the duties of the operator.

SECTION I.

THE SUPRA-HYOID OR GLOSSO-HYOID REGION OF THE NECK.

The glosso-hyoid portion of the neck is bounded above by the inferior part of the tongue or base of the lower jaw; below, by the os hyoides, and laterally by an imaginary line drawn from the angle of the jaw to the extremity of the greater cornu of the hyoid bone, or by the expansion of that process of the fascia superficialis cervicis which is attached to the stylo-maxillary ligament and angle of the jaw. (Plate XXIX. Fig. 1.) The skin of this part presents nothing requiring special description. Its muscles consist of a portion of the platysma-myoides; of the anterior belly of the digastric, of the mylo-hyoid, genio-hyoglossus, hyoglossus, and a part of the stylo-glossus, all covered by a fibrinous expansion or fascia. This fascia being the second tegumentary covering of the neck, as of several other portions of the body, is attached in this region to the os hyoides and base of the jaw. It sends a triangular process over the muscles at this part, surrounds the submaxillary gland, and then, by attaching itself to the stylo-maxillary ligament and angle of the jaw, places the submaxillary gland in a kind of pouch, which separates it by a perfect septum from the anterior and inferior por-

PLATE XXIX.

THE SURGICAL ANATOMY OF THE NECK.

Fig. 1. A view of the arrangement of the Fascia of the Neck. 1. Parotid gland. 2. Masseter muscle. 3. Submaxillary gland. 4. Os hyoides. 5. A portion of the fascia superficialis dissected from the side of the face, and held down to show its relations to the stylo-maxillary ligament and angle of the jaw, together with the septum which separates the parotid from the submaxillary gland. 6. Deep process of fascia superficialis which forms the septum just spoken of. 7. Internal jugular vein just beneath the angle of the jaw. 8. Deep cervical fascia. 9. Sterno-hyoid muscle partly displayed.

After Nature.

Fig. 2. A view of the Superficial Vessels of the Neck. 1. Inferior maxillary bone. 2. Lingual artery. 3. Os hyoides. 4. Superior thyroid artery. 5. Descending branch. 6. Position of carotid artery. 7. Sternal origin of sterno-cleido-mastoid. 8. Clavicle. 9. External jugular vein. 10. Its anterior branch. 11. Parotid gland and veins near angle of jaw.

After Bernard and Huette.

Fig. 3. A view of the deep-seated parts of the Neck. 1. The œsophagus. 2. Omo-hyoid muscle. 3. Par vagum nerve. 4. Internal jugular vein. 5. Carotid artery. 6. Digastric tendon. 7. Hypoglossal nerve. 8. Facial artery. 9. Facial vein. 10. Occipital and internal maxillary veins. 11. External carotid artery seen after removal of parotid gland. 12. Masseter muscle. 13. Pectoral muscle and clavicle. 14. Hook holding aside external jugular vein.

After Bernard and Huette.

Fig. 4. A front view of the Veins of the Neck. 1, 1. Base of lower jaw. 2. Os hyoides. 3, 3. Internal jugular. 4. Omo-hyoid muscle. 5. Larynx. 6. Sterno-hyoid and thyroid muscles. 7, 8. Superficial veins. 9. External jugular. 10. Sterno-cleido muscle.

After Bernard and Huette.

Fig. 5. A side view of the Œsophagus and adjacent parts. 1. Facial artery and vein passing on to the face. 2. Lingual artery. 3. Os hyoides. 4. Superior thyroid artery. 5. Œsophagus. 6. Trachea. 7. Inferior thyroid artery. 8. Sterno-cleido-mastoid, cut across. 9. Primitive carotid. 10. Internal jugular. 11. Upper portion sterno-cleido-mastoid muscle.

After Bernard and Huette.

Plate 29

Fig. 1

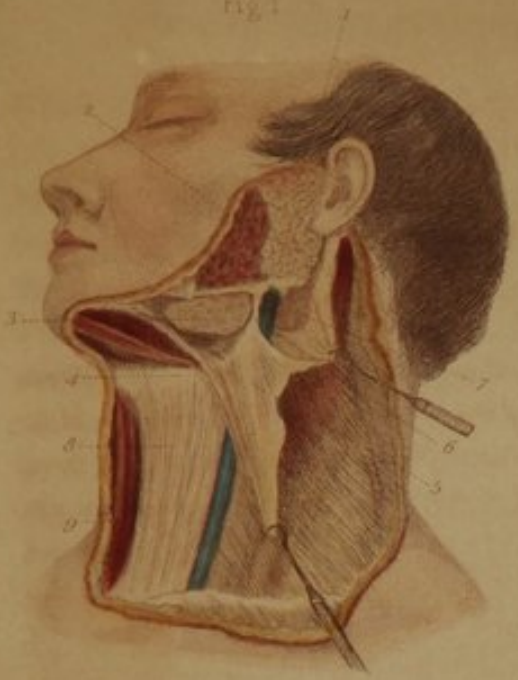


Fig. 3

Fig. 2

Fig. 4

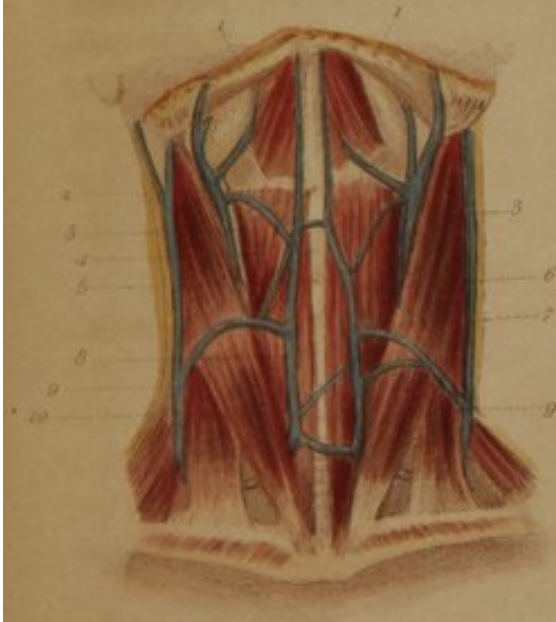


Fig. 5

tion of the parotid. (Plate XXIX. Fig. 1.) This reflection of the fascia superficialis and its attachment to the stylo-maxillary ligament is a valuable point of reference in operating on this and the adjacent regions. It also exercises a material influence on the disorders of the part, by preventing suppurations in the neighborhood of the parotid or submaxillary glands from communicating or traveling either forward or backward; it has also considerable influence on the development of tumors and their subsequent shape and condition.

The principal Arteries found in this region are the facial, lingual, and sublingual.

The Veins generally follow the course of the arteries, except the lingual vein, which, it should be remembered, is separated from its corresponding artery by the hyoglossus muscle.

The Nerves are the hypo-glossal, lingual, glosso-pharyngeal, and their branches. (Plate XXIX. Fig. 3.)

SECTION II.

THE PAROTID REGION.

The parotid region of the neck comprises its superior and lateral portions, and, though limited in extent, is of the highest importance to the surgeon. Bounded in front by the ramus of the inferior maxillary bone; behind, by the mastoid process of the temporal as well as by the meatus externus of the ear; above, by the zygomatic arch; below, by a horizontal line drawn a little below the level of the angle of the jaw; and within, or in its deeper points, by the styloid process of the temporal bone, as well as by the stylo-maxillary and stylo-hyoid ligaments: this region is closely circumscribed by dense tissues, and is generally accurately filled up by the parotid gland and its vessels. The muscles near the gland are the sterno-cleido-mastoid behind, to which, when enlarged, the posterior edge of the gland is often firmly attached; and the posterior belly of the digastric, and the styloid muscles within.

The parotid gland in its normal condition, being seated between the angle of the jaw and the mastoid process of the temporal bone, is limited to these points; but, when diseased, it will be found to encroach considerably upon surrounding parts. Owing, however,

to the expansion of the superficial fascia, and its attachment to the angle of the jaw, as before stated, the parotid is separated from the submaxillary gland, and cannot therefore extend itself to any great degree forwards. The styloid process and ligaments limiting its deeper progress, and the sterno-mastoid muscle resisting its posterior development, nothing is, therefore, left it but to enlarge outwardly or towards the skin, and, as its progress in this direction is resisted by the portion of the fascia superficialis, which covers it and forms its capsule, the engorgement of this gland generally causes severe pain by pressing on the neighboring nerves. The dense character of the fascia and its strong adhesions around the gland have also an important influence upon the blood-vessels connected with it. In two cases which occurred under my observation, it led to the entire obliteration of the carotid artery, and, in one, to that of the internal jugular vein, as well as the artery. When enlarged by scirrhus or similar deposits, the shape of the parotid tumors is always at first more or less flattened from this expansion of the fascia over the surface of the gland, though ultimately they may attain considerable size and a globular form. Having no proper capsule, the parotid gland owes its shape, and the continuity of its structure, to cellular substance; the induration of which, as well as the expansion of the fascia just alluded to, renders the extirpation of the gland much more easy when diseased than it is in the normal condition.

The Arteries of the parotid region are numerous and among the most important of those found in the neck. The external carotid entering at the inferior and internal portion of the gland passes through its substance not far from its internal or deeper-seated surface, and extends between the ramus of the jaw and the ear to near the level of the neck of the jaw, when it gives off the internal maxillary and the temporal arteries. The internal maxillary, winding around the neck of the bone between the pterygoid muscles, is hence difficult to ligate, and sometimes gives rise to considerable recurrent hemorrhage, even after the application of a ligature to the external carotid of the same side, as I have seen in three instances. The Veins follow pretty generally the course and distribution of the arteries; but, owing to their direct connection with the internal jugular vein, caution is requisite in opening them, lest air be introduced into the latter vessel, whence it may readily pass to the heart and cause death.

The principal Nerve of this part is the portio dura, which, emerging at the stylo-mastoid foramen, penetrates the substance of the gland from above downwards and forwards. Lymphatic glands are also found in considerable numbers around as well as beneath the structure of the parotid, and the disease of these glands occasionally renders the diagnosis of tumors in the parotid region difficult, and leads to mistakes in respect to the structure involved in the complaint.

SECTION III.

THE LARYNGO-TRACHEAL AND SUPRA-STERNAL REGIONS.

The middle of the front of the neck presenting points directly connected with the trachea and larynx has been named the Tracheal region, and is formed by that portion which is bounded laterally by the anterior edges of the sterno-mastoid muscles. The part of this surface above the os hyoides has already been spoken of as the supra-hyoid region. The region immediately below it constitutes the laryngo-tracheal, the lower portion of which, or that nearest the sternum, has been called the supra-sternal region.

The Laryngo-Tracheal region presents several useful points of reference, which are apparent outside of the skin. Thus, in passing from the os hyoides to the sternum in the median line, there is the prominence of the hyoid bone, the thyro-hyoid depression or space between the os hyoides and the thyroid cartilage, and indicated chiefly by the notch in the top of the cartilage. Next may be felt or seen the crico-thyroid space; the prominence caused by the development of the thyroid gland; then the rounded surface of the trachea, and lastly the supra-sternal fossa or depression, the depth of which is generally increased when the patient expands the chest, as in taking a full inspiration. On the external or lateral portions of the region, near the anterior edge of the sterno-mastoid muscles, may be felt the pulsations of the primitive carotid arteries; and this, as before stated, has led some anatomists to designate this portion of the neck as the carotid region, instead of viewing it as merely the lateral boundary of the preceding part.

Examining the structures concerned in these portions of the neck, but little time need be given to the skin, which differs in nothing

that is important from the same tissue elsewhere. Beneath it is seen the common fascia superficialis, and beneath this, but separated by sparse cellular substance, is the fascia known as the Cervical Fascia of Allan Burns,* or the fascia profunda, a laminated expansion which exercises a most important influence on the diseases of this region. This fascia, arising from the larynx, forms a thin capsule to the thyroid gland, and being then closely attached to the inferior margin of the gland, descends to the sternum in two lamina, so as to form a perfect sheath for the sterno-hyoid and thyroid muscles. At its inferior extremity it is firmly attached to the sternum, sternal ends of the clavicles, and cartilages of the adjoining ribs, for about one inch below the upper edge of the breast bone, thus forming an elastic and resisting membrane from the top of the sternum to the larynx. Directly above the sternum it surrounds the arteria innominata and brachio-cephalic vein; and beneath it are the trachea, roots of the large arteries of the head and upper extremities, and the trunks of their veins, as well as important nerves.† Between these organs and the fascia there is much loose cellular substance filled with lymphatic glands, the former being liable to serous infiltration, and to extensive suppuration in the disorders of this and the adjacent portions of the neck. The external border of the fascia profundi colli is continuous with the sheath of the carotid arteries, whilst it and the fascia superficialis are united together along the anterior edge of the sterno-cleido-mastoid muscle.

The sterno-hyoid and thyroid muscles, on the median line of the neck, are the only muscles useful as points of reference in this region.

The Arteries are among the most important of the body. Counting from the sternum upwards, we find the innominata passing obliquely from left to right and from below upwards. As it is only about eighteen lines in length, its position is limited chiefly to the supra-sternal fossa. Next to this may be mentioned the carotids which are in the lateral boundaries, and extend usually to a level with the os hyoides without giving off any branches; but, on reaching this level, they give origin to the two superior thyroid arteries. These, in connection with the two inferior arteries of the same name,

* Burns on the Anatomy of the Head and Neck.

† Special Anatomy and Histology, by Wm. E. Horner, vol. i. p. 378, eighth edition.

run to supply the thyroid gland and adjoining parts, and are the only arteries which can be especially referred to as restricted to this region.

The accompanying Veins are very numerous, being both superficial and deep-seated, and bring the blood from the thyroid gland and the surrounding organs into the jugular vein. The deep-seated veins have three principal directions: the superior follow the course of the superior thyroid arteries, and empty into the internal jugular vein; the middle come out at the sides of the thyroid gland, and also enter the internal jugular vein; but the sub or inferior thyroid pass down in numerous anastomoses towards the left subclavian vein, crossing the inferior portion of the trachea in an opposite course from that taken by the arteria innominata, and being also more superficial than this vessel. (Plate XXIX. Fig. 4.)

The superficial veins are more variable, and anastomose in various ways with the deep veins.*

The variable size and direction of these veins renders a minute and accurate description of them impossible, though their position in regard to the operations of tracheotomy and others practiced on this region would render it desirable. The surgeon should, therefore, be upon his guard, in all incisions made upon this part, and especially as he approaches the supra-sternal fossa. The relations of the veins and nerves connected with the course of the carotid artery, or those on the borders of this region, will be referred to hereafter.

The other tissues of this portion of the neck may be briefly mentioned at present in their relations to each other, as well as to those which surround them. Commencing with the skin, there may be noticed, first, a loose cellular tissue, on which it moves readily; a layer of the superficial fascia; an anterior layer of the deep fascia, with some veins; the sterno-hyoid and thyroid muscles; a posterior lamina of the deep fascia; the thyroid gland, covered by each layer of this fascia, and thus placed in a capsule; the larynx and trachea, with the condensed cellular tissue around them, which latter has been designated† as the tracheal fascia; then the œsophagus; and last, the muscles on the front of the vertebræ. In this enumeration, no reference has been made to the great vessels and nerves of the

* Blandin, Anat. Topographique, p. 191.

† Porter, Surg. Anat. of Larynx and Trachea.

PLATE XXX.

INSTRUMENTS EMPLOYED UPON THE ŒSOPHAGUS AND TRACHEA.

Fig. 1. Stomach-pump of Dr. Goddard.

Schiveley's pattern.

Fig. 2. Physick's œsophageal catheter for the evacuation of the contents of the stomach. " "

Fig. 3. Ordinary œsophageal probang. " "

Fig. 4. Œsophageal hook and probang of Dupuytren.

Charriere's pattern.

Fig. 4′. Œsophageal hook of Dr. Nathan Smith

After Smith.

Fig. 5. Blunt hook, made of annealed wire, for the removal of foreign bodies from the œsophagus.

After Bond.

Fig. 6. Œsophageal bougie for dilating stricture, employed by Dr. Horner.

After Horner.

Figs. 7, 8. Bond's œsophageal forceps.

After Bond.

Fig. 9. Sponge for cauterizing the larynx, as advised by Trousseau.

Charriere's pattern.

Fig. 10. Instrument employed by Dr. Green for the same purpose.

Schiveley's pattern.

Fig. 11. Tongue depressor; by which a patient can depress his own tongue without incommoding the operator.

Rohrer's pattern.

Fig. 12. Ring made of watch spring, so as to be readily adapted to any neck, and intended to hold open the sides of the trachea after the operation of tracheotomy.

Schively's pattern.

Fig. 13. Ordinary tracheal tube or canula, intended to be placed in the trachea immediately after the operation of tracheotomy.

Charriere's pattern.

The objections to the employment of this tube have been stated in the text.

Plate 30

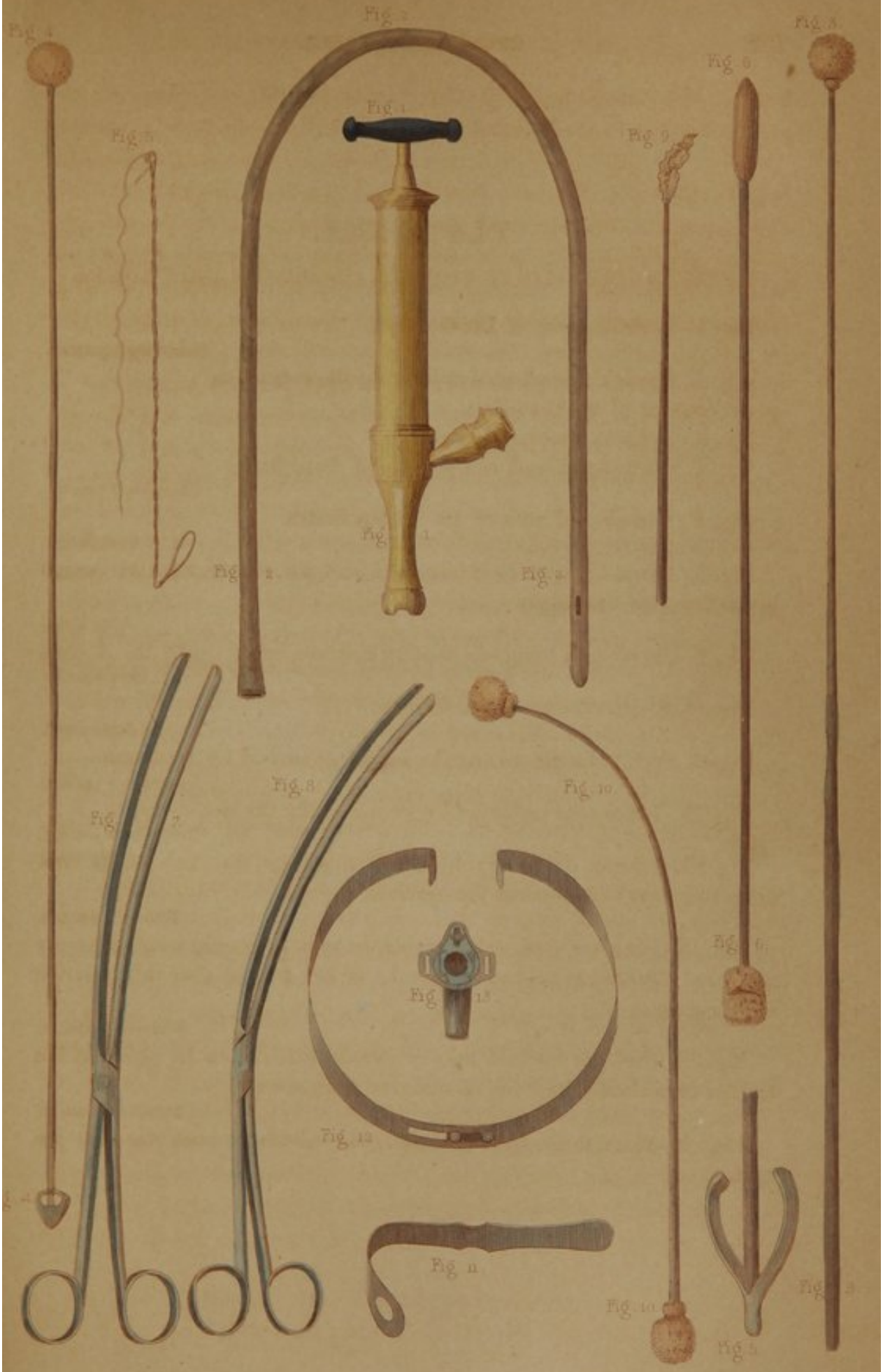


Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 9
Fig. 10
Fig. 11
Fig. 12
Fig. 13

neck, as their relations, variable disposition and arrangement, can be better understood in connection with the special operations practiced upon them.

SECTION IV.

THE SUPRA-CLAVICULAR REGION.

At the base of the neck, immediately above the clavicle, being bounded internally by the posterior edge of the sterno-mastoid muscle, and externally by the anterior borders of the trapezius and splenius muscles, is the region designated as the supra-clavicular. Being triangular in its outline, with the base below, the clavicle, trapezius, splenius, and sterno-mastoid muscles form its three sides. The skin and fascia covering this region, with a small portion of the platysma-myodes muscle, require little notice, as they present nothing of importance, and are chiefly noted by the surgeon as indicating the coverings that he may expect to find on tumors in this neighborhood. Of the numerous lymphatic glands situated about this part, some are superficial, and some deep-seated, as in other regions of the neck. When enlarged, the movable character of the swelling, and its greater development when superficial, will generally enable an operator to tell whether the tumor is seated above or below the fascia, a matter of much importance to decide when extirpation is contemplated.

The Arteries usually found in the supra-clavicular region are such as supply the upper extremities and the adjacent parts of the neck. Among the first is the subclavian artery, which, in the course taken from its origin to its escape through the subclavius muscle, (whence to the edge of the axilla, it is called axillary,) forms a curve, the concavity of which surrounds the cul-de-sac made by the expansion of the pleura above the first rib.* The branches given off by the subclavian artery may be divided into those which run horizontally with, and those whose course is perpendicular to, the line of the clavicle. (Plate XXXIII. Fig. 1.) Among the first are the posterior cervical, which is two fingers'-breadth above the clavicle, the superior scapular, which runs close along the posterior margin of the bone, and is often in the way of the operator in attempting to ligate the sub-

* Blandin, Anat. Topographique, p. 206.

clavian, and transversalis colli, all of which run towards the back of the neck and top of the shoulder, while the vertebral, inferior thyroid and others, coming off within the scaleni muscles, run more or less perpendicularly. The perpendicular arteries, constituting the thyroid axis, arise at the inferior internal angle of this region, or at the space which exists between the sternal and clavicular origins of the sterno-cleido-mastoid muscle.

The Veins follow the course of the arteries, being generally in advance of them, or between them and the skin. The subclavian vein, however, does not pass between the scaleni muscles, but in front of them.

The External Jugular Vein terminates towards the inner side of the supra-clavicular fossa, after receiving the superficial veins from the shoulder, by emptying into the subclavian vein in front of the scalenus anticus. Sometimes, instead of one trunk, there are two or three which unite at variable distances above the clavicle.

The Nerves of this region belong chiefly to the brachial plexus; the four lower cervical and the first dorsal forming a plexus, which is more or less closely connected with the subclavian and the commencement of the axillary arteries. (Plate XXXIII. Fig. 1.)

The other details of these parts will be given in connection with the operations practiced on the artery.

In dissecting upon this region, the layers are usually presented as follows: First, the skin, then the superficial layer of the fascia, as well as the platysma-myodes muscle. Next, loose cellular tissue, containing numerous venous and arterial branches, the principal of which have just been referred to, as connected with the subclavian vessels. Around these vessels is a fibrinous expansion from the deep fascia, which forms for them a sheath, close to which is the cul-de-sac of the pleura, as it rises above the first rib. But the elevation or depression of the shoulder, by moving the inferior boundary of this region, will increase or diminish the apparent depth of the vessels, as well as relax or stretch the various layers which cover them.

CHAPTER II.

OPERATIONS PRACTICED ON THE PORTION OF THE NECK WHICH IS ABOVE THE OS HYOIDES.

In the portion of the neck above the os hyoides we find two regions, the supra-hyoid and parotid, both of which may require surgical operations in order to relieve their different disorders. But as the importance of all the parts contained within the limits of the neck, renders it difficult to make a selection of any one as specially worthy of attention, it has been deemed advisable to refer to these operations in the order which has been adopted as the plan of the work; and, commencing at the portion which is nearest the head, proceed from above downwards, according to the natural arrangement of the tissues. The surgical affections of the skin and fascia in this section of the neck, presenting nothing requiring special operative interference, the disorders connected with the salivary glands become the first subject to which attention should now be directed.

SECTION I.

OF THE DISEASES OF THE PAROTID GLAND.

The diseases of this gland, independently of the affections of its duct, of which mention has been already made in connection with the operations practiced on the face, consist either in such simple departures from a healthy state as yield readily to medical treatment, or in such degeneration of the cellular tissue and proper structure of the gland as may necessitate its removal.

The position of several of the superficial lymphatic glands of the neck, and the enlargement consequent on their diseased condition, sometimes create such a tumor in the parotid region, that any one who is not careful in forming a diagnosis, or who does not accurately examine the anatomical relations of the surrounding structures may readily be led to suppose the enlargement to be due to an affection of the parotid itself.

As caution is necessary in deciding on the structure involved in the tumors of this region, a guarded prognosis should always be given.

Pathology.—That the salivary glands, as a general rule, are less liable to abnormal deposits, or to degeneration of structure than other glands, is a point on which most pathologists seem to agree. Velpeau* expresses the decided opinion that all malignant growths, when seated in the parotid or submaxillary gland, commence either by a deposit in the lymphatic glands incorporated with them, or by a change in the parenchyma of the glands themselves, rather than by a degeneration of the proper secretory portion. Whether this opinion is based upon microscopical examination, or is solely the result of close observation, it has a special value in connection with the question of the propriety of extirpating these glands when diseased, which should be noted; because, admitting that the deposit commences in the parenchyma of the gland, it is evident that it cannot long be limited to its original seat, but must encroach on the surrounding structure, so as either to cause its absorption or disintegration. In the case of parotid tumors, such a change must modify very materially the natural relations of the part, and marked departures from the normal condition may, therefore, be looked for when the removal of the diseased mass is attempted. Particles of a gland, which in the original state were separate and distinct, or very loosely attached, will often, when diseased, be found to be blended in one common mass; and portions which were deep-seated and difficult of access in health, prove to be superficial, in consequence of their close and condensed union with tissues nearer to the surface. It has therefore been found that a diseased parotid is often surrounded with a dense capsule, formed chiefly at the expense of the surrounding cellular tissue and fascia, whilst its conglomerate parts are so fused into one conglobate mass, that the deepest portion of the gland had been pried out from the styloid process in consequence of the attachment of the exterior of the tumor to the muscles and parts about the angle of the jaw, as I have seen in several instances of well-marked scirrhus. That surgeons have been misled in relation to the difficulties of the removal of this gland, from comparing the operation with that attempted in a state of health, is certain, and daily experience is now leading many to place confidence in the views of those surgeons of the eighteenth century who advocated the operation.

When, therefore, circumstances induce the belief that the re-

* Méd. Opératoire, tome 3me, p. 644.

moval of the diseased structure can add to the patient's days, the operation should be performed, the entire gland having been extirpated beyond all doubt, though the patient will only be subsequently placed in the same condition with those who submit to an operation for the removal of a scirrhus or encephaloid deposit elsewhere.

§ 1.—EXTIRPATION OF THE PAROTID.

For many years the removal of this gland entire was a vexed question, the possibility of accomplishing it being denied by high authority, among whom were Boyer, Richerand, and others; and some of the surgeons of the present day yet speak of the matter in terms of doubt, notwithstanding the most positive proofs of its feasibility and execution. To the late Dr. George McClellan, of Philadelphia, is due, I think, the credit of having done more than any surgeon in the United States to demonstrate the reasonable character of this operation; whilst by recalling public attention to the means of treatment which had been warmly advocated by Heister, Von Swieten, Garanget, and others who had preceded him, both in Europe and this country; he secured for the operation a certain degree of confidence which has since led to its more frequent performance.

This operation had, however, been previously performed in the United States, being first done as early as 1798, when Dr. J. Warren, of Boston, removed the entire gland;* in 1805, Dr. McClellan,† of Franklin County, Pennsylvania, did the same thing; and, in 1808, the operation was successfully performed by Dr. S. White, of Hudson, New York.‡

But until the time of Dr. McClellan these operations were overlooked, though several authors had shown that the operation was not only feasible, but that the difficulties of its performance, and the entire removal of the gland in a diseased state, were much less than those experienced in accomplishing the same end, when it was in a healthy condition. Since his first operation, the removal of the entire gland has been successfully accomplished in numerous instances.

Operation of Dr. George McClellan, of Philadelphia.—The patient, Dr. John Graham, at that time a student of medicine in Philadelphia, had a tumor in the parotid region, the removal of

* Dr. John C. Warren, in MS.

† See Bibliography.

‡ Reese, Cooper's Dict., edit. 1849, p. 259. Article on Parotid.

which had been attempted in Dublin, but desisted from, in consequence of the opinion of the surgeons engaged in it, that, as the parotid was involved, the attempt was unadvisable. Dr. McClellan, thinking otherwise, proceeded to the operation, Feb. 27, 1826, as follows:—

Operation.—Two curvilinear incisions were made from a little above the zygoma to a point two and a half inches below the angle of the jaw, so as to include nearly the whole of the old cicatrix between them. After reflecting the integuments from the surface of the tumor, the dissection of the mass was continued down to the zygoma and masseter muscle in front, and to the cartilaginous tube of the ear and mastoid process behind. Being unable to dissect any farther in these directions, progress was made beneath the tumor by burrowing under its lower edge. The posterior belly of the digastric muscle being then divided, the fingers passed readily under the whole body of the tumor, and an effort was made to wrench it from its bed, but without success. Before proceeding further, the trunk of the external carotid was insulated, just as it was entering the tumor together with the descending veins; and then, instead of cutting them across, they were torn out from the body of the tumor with the thumb and finger. An instantaneous gush of blood deluged the eyes and face of the operator; but, before a ligature could be placed around the vessels, the hemorrhage altogether ceased in consequence of the retraction and contraction of the lacerated vessels. After powerful and repeated efforts at wrenching, aided by an occasional use of the knife, to divide the strong bands of cellular substance, and some of the fibres of the styloid muscles which adhered to the tumor, the mass was elevated above the ramus of the jaw and the mastoid process. The trunk of the portio dura, which was very much enlarged, being then seen mounting over the posterior margin of the tumor, to enter its substance, was divided, and the upper portion of the tumor separated from the zygoma by the scalpel, as the layers of fascia were too strong to be lacerated.

In this step, the main trunk of the temporal artery was necessarily cut, and a profuse hemorrhage coming from the recurrent circulation, a ligature was placed on the vessel, this being the only one which was ligated during the operation. The internal maxillary was not discovered, having probably been ruptured in the act of wrenching the deep-seated portion of the tumor from behind the angle and ramus of the jaw. After waiting some time to see if hemorrhage would occur, the edges of the wound were united by three stitches

of the interrupted suture, in order to prevent their being reflected inwards; adhesive strips, a compress and head bandage, completing the dressing. The patient recovered with less deformity than existed before the operation.* The gentleman is believed to be yet alive and residing in the city of New York.†

Operation of Dr. Valentine Mott, of New York.—Determining to ligate the external carotid artery before attempting the dissection the operation of Dr. Mott was commenced by an incision about three inches long, which was carried from the posterior angle of the lower jaw downwards and inwards, so as to lay bare the artery. Owing to the tumefaction, this vessel was found to be nearly three inches from the surface, and was tied immediately below the digastric muscle, or a little above the upper border of the thyroid cartilage.

An incision was next commenced above the jugum temporale, and carried downward in a semicircular direction, until it terminated upon the os occipitis, when the incision on the neck was extended upwards to intersect the one over the tumor.

On detaching the integuments in the form of a double flap, the gland was found in a melanotic condition. In order to free it, the adipose and cellular tissue along the inner edge of the tumor was divided until the masseter was exposed. The finger being then introduced into the mouth and cut upon, in order to avoid the division of the buccal membrane, the tumor was separated for some distance from the masseter, to which it closely adhered, and then separated from the jugum which had become carious from pressure. The mass was next dissected entirely free from the digastric and masseter muscles, as well as from the angle of the jaw; but, as the patient complained of excruciating torture when the tumor was raised from below upwards, the dissection was continued from above downwards, and the adhesions being separated, with a few rapid strokes of the knife, from the capsular ligament of the lower jaw, the bulk of the mass was removed. The portion filling up the space between the styloid and mastoid processes was then cautiously detached with the handle of the scalpel and the portio dura rapidly divided. Several arteries were tied during the operation, and the trunk of the temporal yielded a profuse retrograde hemorrhage. After waiting to see

* New York Med. and Phys. Journ., vol. v. p. 650.

† See also Principles and Practice of Surgery, by the late Geo. McClellan, edited by J. H. B. McClellan, p. 335, note.

if there should be further hemorrhage, the wound was dressed by sutures, adhesive strips, lint, a compress and bandage.*

At first the wound did well, the ligature on the carotid separating on the fourteenth day, but the disease promptly showed itself, and the patient died of constitutional disturbance on the fifty-fourth day after the operation.

Operation of Dr. J. Randolph, of Philadelphia.—The disease being seated in the left parotid, the head was inclined to the right side, and an incision made from the zygoma down to the edge of the sterno-cleido-mastoid muscle; a second one was then made at right angles to this, and the flaps dissected back. The facial artery being secured, an attempt was made to raise the lower edge of the tumor and to secure the carotid artery where it enters the gland; but this being very difficult, in consequence of the close adhesions, the tumor was dissected from its attachments, from above downwards. In doing this, the temporal and internal maxillary arteries with some smaller ones were secured, and the deep dissection being continued, the carotid was divided with the last adhesions of the tumor, and instantly secured by Physick's needle and forceps. The internal jugular vein was also cut and secured at each end. The operation lasted fifty-nine minutes; but little blood was lost; and Drs. Rhea Barton, William E. Horner, Norris, Coates, and others who witnessed the operation, all coincided in the opinion that the entire gland was extirpated.†

The wound healed readily and the patient left the hospital well, but about ten months subsequently I heard of his death from a return of the disease. The tumor is now in the Wistar Museum.‡

Operation of Dr. William E. Horner, of Philadelphia.—A crucial incision over the centre of the tumor being freely continued along the base of the jaw, so as to include some enlarged lymphatic glands, and also down the neck in the course of the carotid artery, the flaps were turned back and the fibres of the platysma-myodes and the fascia of the neck freely divided. Commencing behind, the tumor was then dissected from the anterior edge of the sterno-cleido-mastoid muscle, to which it closely adhered, and, by working gradually forward, the gland, which was surrounded by a firm capsule, was gradually freed from its posterior and inferior at-

* Am. Journ. Med. Sciences, vol. x. p. 17.

† Ibid., vol. xxiii. p. 517.

‡ University of Pennsylvania, Philadelphia.

tachments. The primitive carotid artery being then fairly brought into view by the progress of the dissection, was found to have been so much involved in the disease as to show considerable thickening of its coats, having the appearance of the vessel when injected in the subject. A ligature was therefore placed around it, nearly on a level with the larynx, but not tied, the upper and anterior attachments of the tumor divided, the artery tied, and the tumor removed from its deep adhesions. These were by no means as close as in the healthy condition, the adhesion of the tumor to the angle of the jaw having caused the exit of the gland from its deepest points. The division of the internal maxillary giving rise to considerable hemorrhage, the internal and external carotids were also tied, lest, in their patulous condition, recurrent hemorrhage should ensue through them also. The submaxillary gland, and the lymphatics leading to and adhering to the thyroid gland, were also removed, leaving the deep-seated parts of this region perfectly exposed; but, on a close examination, it was impossible to find either the internal jugular vein, or the par vagum, of this side. The wound was then filled lightly with lint; the flaps closed by sutures, and covered with adhesive plaster, compress, and bandage. On the eighth day all the ligatures separated spontaneously, and the patient started for his home six weeks after the operation.* When last heard from the disease was returning.

STATISTICS.—Of eleven cases in which the parotid gland was extirpated by Dr. George McClellan, one died on the fourth day, from hemorrhage, and one died three years subsequent to the operation.† Three cases have been operated on successfully by Dr. John C. Warren, of Boston;‡ one by Dr. John H. B. McClellan, of Philadelphia, successfully; and one each by Drs. Mott, Horner, and Randolph. From an examination of the account furnished by Velpeau§ it appears that there are over thirty-five cases of this operation in which there is good reason to believe the entire gland was extirpated; making, in all, fifty-three cases of removal.

As regards the possibility of accomplishing the extirpation of the entire parotid gland, there can, therefore, be no doubt; though it is also equally certain that the ultimate result to the patient will

* Medical Examiner, vol. vii., N. S., p. 30, 1851.

† Principles and Practice of Surgery, p. 332.

‡ Dr. Warren in MS.

§ Velpeau, Op. Surg., by Mott and Townsend, vol. iii. p. 443.

be found to correspond with the operations performed for the removal of malignant growths in other portions of the body.

Remarks on the Operation.—In the descriptions of the operative proceedings of the distinguished surgeons just referred to, we see several varieties, each of them being more or less modified by the peculiarities of the case. Certain general precepts may, however, be applied to every instance in which the removal of the gland may be deemed proper.

1st. All external incisions should be free enough, *at first*, to enable the operator to work readily around the tumor.

2d. The tumor should be first loosened at its posterior part, then at its superior and anterior borders, and lastly at its inferior.

3d. The attachments of the tumor to surrounding parts should be stretched or torn as much as possible, instead of being dissected, as the laceration prevents hemorrhage.

4th. The edge of the scalpel should be directed towards the tumor as much as possible.

5th. The external carotid artery should be taken up, as nearly below the tumor as may be necessary, at the moment of removing the gland from its deepest and inferior connections.

The propriety of ligating, or even of passing a ligature around the primitive carotid previous to acting on the tumor, is a question that the majority of operators have decided in the negative; and, when it is remembered that, in some instances, the external carotid alone is cut, whilst the internal remains uninjured, and that, in others, the compression of the surrounding structures by the diseased mass has caused great diminution of the calibre of the vessels, or even their obliteration, this decision seems to be based on sound principles. In three instances, it has fallen to my lot to attend to the hemorrhage during the operation, and in all it was readily controlled by pressure upon the main trunk of the artery when the course of the dissection seemed likely to injure the external carotid, or by the direct application of the ligature to the divided end of the artery, when it was cut free from the tumor.

In the operation performed by Dr. Horner, and in that of Dr. John H. B. McClellan,* the internal jugular vein was entirely obliterated; and in the others that have fallen under my observation, the artery has either been much thickened in its coats, or diminished in its calibre, the most troublesome hemorrhage having been that

* Principles and Practice of Surgery, p. 336.

which arose from the recurrent circulation. The paralysis arising from division of the portio dura, in one case, was very much relieved, and in the others, during the short period when they were under my charge, did not produce as marked deformity as that created by the presence of the tumor. In a case reported by Dr. Warren, it had nearly disappeared a few months after the operation.* That the division of this nerve was the cause of the intense suffering, described by some of the earlier operators, is a point on which every surgeon of the present day must have his doubts, the pain then noted being doubtless due to the division of the branches of the third branch of the fifth pair, or of the cervical nerves involved in the disease.

Upon the whole, there is reason to think that, though this operation is one which involves a high responsibility, it is yet one which every good anatomist may readily succeed in performing. But whether, after accomplishing this much, the patient will be benefited for any long period, is a point which the statistics of operations for malignant growths elsewhere alone can settle. Certain it is, that the removal of the tumor has often relieved the patient of the distressing neuralgic pains and œsophageal difficulties under which he formerly labored; and, as an euthanasial measure, or one capable of prolonging life for even a limited period, its propriety should, therefore, be calmly considered in every case where its performance may be demanded.

§ 2.—RELIEF OF ENLARGEMENT OF THE PAROTID GLAND, BY OBSTRUCTING THE CIRCULATION.

In order to avoid the necessity of resorting to extirpation of the parotid in cases of scirrhus, long-continued compression of the gland, or ligature of the carotid artery, have been occasionally practiced. After ligating the primitive carotid artery, Dr. Alexander E. Hosack, of New York, succeeded in causing the entire absorption of this gland in two cases; and, in a third, absorption had visibly commenced.†

In estimating the value of this operation, one difficulty certainly exists, and that is the utter impossibility of deciding whether the

* Warren on Tumors, p. 290.

† Cooper, Surgical Dictionary. Appendix, by D. Meredith Reese, M. D., Article, Tumors.

tumor is formed by the parotid, or by the adjoining lymphatics. Under ordinary circumstances, any surgeon who could accomplish the ligature of the artery could also remove the tumor, render the removal of the disease certain, and, under the use of anæsthetics, cause his patient but little additional suffering. The selection of either of these operations must, therefore, depend chiefly upon the abilities of the operator.

SECTION II.

OPERATIONS PRACTICED ON THE SUB-MAXILLARY GLAND.

Owing to the remarks made in connection with the degenerations of the parotid gland, there is but little necessity to occupy much space in considering the disorders of this body. Like the parotid, the sub-maxillary gland is rarely, or ever, the starting-point of malignant disease, whilst the lymphatics in its neighborhood are often involved. But, should circumstances induce the surgeon to attempt its excision, he may accomplish it by the following plan:—

OPERATION.—Direct the patient to shut his mouth and throw back his head, inclining it to the side opposite to that which is affected. Then, by any incision which is adapted to the size of the tumor, cut through the integuments, and dissect back the flaps thus created, so as to expose the disease. Applying two ligatures to the facial vein, and dividing the vessel between them, and also ligating the facial artery near its entrance into the gland, or near the jaw, pass a needle and ligature through the tumor, and forming a loop with the ligature, remove the needle. Then drawing upon the loop, either downwards and backwards, whilst the dissection is prosecuted in front of the gland, or outwards and upwards when it is carried below and behind the gland, free the latter from its pouch, avoiding all injury to the surrounding parts, by directing the edge of the knife constantly towards the tumor, and keeping its adhesions upon the stretch, by drawing firmly on the loop of the ligature which was passed through it.

The other tumors of this region will be referred to in the chapter under diseases of the lymphatic glands of the neck, and the treatment of ranula has been placed among the operations of minor surgery.*

* See Smith's Minor Surgery, third edition, p. 373.

CHAPTER III.

OPERATION PERFORMED ON THE LARYNX AND TRACHEA.

THE operations practiced on this portion of the neck, are cauterization of the larynx from the mouth, and the opening of the larynx or trachea, either for the removal of foreign bodies, or in cases of membranous croup.

SECTION I.

SURGICAL ANATOMY OF THE LARYNX AND TRACHEA.

The upper extremity of the Trachea or the Larynx is formed by five cartilages. These cartilages, of which the thyroid, cricoid, and epiglottis (Plate XXXI. Fig. 2) are the most important to the surgeon, as connected with the operations on this part, extend from immediately below the os hyoides and root of the tongue to the first ring of the trachea, being lined throughout by a mucous membrane, between which and the cartilaginous structure is a sparse cellular tissue, liable in certain forms of disease to dropsical or serous infiltration.

The trachea is four or five inches long in its entire length, though not more than two and a half inches in the portion which is situated between the top of the sternum and the cricoid cartilage. It is about nine lines in diameter, and composed of sixteen or twenty distinct rings, each of which is deficient in the posterior third, being completed in this portion of the canal as well as united to each other by elastic ligamentous matter.

The tissues covering the trachea are the skin, superficial fascia, sterno-hyoid and thyroid muscles, and deep cervical fascia, together with the thymus gland, which latter, or rather its isthmus, sometimes extends as low as the fifth ring. Beneath these parts is a cellular tissue immediately around the tube, which has been spoken of by Mr. Porter as the tracheal fascia, and which is liable to become emphysematous when an opening is made into the trachea, unless it is specially attended to. But the most important of the surgical relations of this portion are the numerous blood-

vessels, whose varying position renders them especially troublesome to the surgeon. Between the isthmus of the thymus gland and the top of the sternum are usually found several veins. Of these the superficial veins are found in front of the sterno-hyoid muscles, and cause but little trouble in operating; but the plexus formed by the deep veins, and especially by the inferior thyroid, together with an artery (middle thyroid) all of which are behind the muscles, will be found to be frequent sources of trouble in tracheotomy.

There are also certain variations in the arrangement of the larger vessels of the neck which may embarrass the surgeon when operating on this part. Thus, the suporior thyroid artery occasionally sends a large branch to the crico-thyroid ligament and then turns down to supply the thyroid gland; sometimes the inferior thyroid arteries are given off by the primitive carotid on a level with the thyroid gland; or the left carotid may arise from the innominata and pass across the front of the trachea, as has been seen in several instances, by Blandin.*

As the trachea follows the shape of the vertebral column, it is most superficial at its upper portion, where the vertebræ are convex in front, but becomes deeper as it approaches the chest, so that near the sternum it is over an inch beneath the integuments, or even more in short fat necks; whilst the changes produced by œdema, congestion, and the other consequences of disease of the windpipe, especially in children, frequently add to the depth of this canal from the surface of the neck, at this point.

SECTION II.

OPERATIONS UPON THE LARYNX.

The operations practiced on the upper portion of the trachea, consist in such as are required for the relief of inflammation of the part, and those demanded by the presence of foreign bodies.

§ 1.—CAUTERIZATION OF THE LARYNX.

The introduction of lunar caustic into the larynx is an operation

* Anat. Topograph., p. 196.

which may be demanded in the treatment of various forms of inflammation, and especially in membranous croup.

The credit of suggesting and applying this remedy is due to M. Trousseau, of Paris,* who first introduced a strong solution freely into the canal, both by means of a sponge as well as by a syringe; whilst in the United States, particular attention has been called to the advantages of its employment by Dr. Horace Green, of New York.† The operation is simple, and may be readily performed as follows:—

Operation.—Place the patient before a strong light, with the mouth widely opened, and the head supported, and, depressing the tongue by any means that the operator finds most convenient, pass the sponge directly into the larynx (Plate XXXII. Fig. 2) on either side of the epiglottis, and immediately withdrawing it, much less inconvenience will be caused to the patient than might have been anticipated.

The instruments adapted to this purpose may be seen on reference to Plate XXX. Figs. 9, 10, 11, and include both those of Trousseau and Green, the difference between which is not very marked.

Remarks.—Cauterization of the larynx is an operation of so simple a character, that reference to it in these pages might seem unnecessary were it not that it is an important preliminary step in the treatment of croup, and one that should always be employed before tracheotomy is resorted to. Although this remedy had been known to the profession for several years, incredulity, and a knowledge of the irritation usually created by the presence of even a small particle of any substance in the trachea, prevented very many in this country from attempting it; and there are yet to be found practitioners who deny the possibility of introducing a sponge into the glottis. To Dr. Green of New York is, therefore, due the credit of having done more than any other in the United States towards establishing professional confidence in an operation, which has since proved to be both easy and useful in many instances. The tendency to quackery, (so often observed in the treatment of affections of the windpipe, dependent on chronic inflammation), has, however, shown itself in this as in other rational plans of treatment; and a measure which is capable of doing much good, when judiciously directed,

* Traité de la Phthisie Laryngée et des Maladies de la Voix. Paris, 1836. Mém. de l'Acad., &c.

† Diseases of the Air-passages. New York, 1846.

PLATE XXXI.

A VIEW OF THE OPERATIONS PERFORMED ON THE TRACHEA.

Fig. 1. A front view of the Surgical Anatomy of the Trachea. 1. Os hyoides. 2. Thyroid cartilage. 3. Thyro-hyoid muscles. 4. Crico-thyroid muscles. 5. Thyroid gland and veins in front of crico-thyroid ligament. 6. Rings of the trachea. 7. Common carotid artery. 8. Superior thyroid arteries. 9. Inferior thyroid artery. 10. Carotid artery, as divided. 11. Outline of the top of the chest. 12. Innominata artery. 13. Inferior thyroid vein. 14. Transverse vein. After Bernard and Huette.

Fig. 2. Relative position of the Larynx, Trachea, and Bloodvessels. 1. Os hyoides. 2. Thyro-hyoid ligament. 3. Thyroid cartilages. 4. Crico-thyroid ligament. 5. Cricoid cartilage. 6. Trachea. 7. Internal jugular vein. 8. Transverse vein. 9. End of inferior thyroid vein. 10. Veins. After Bernard and Huette.

Fig. 3. Relative positions of the great vessels concerned in operations near the top of the Sternum. 1, 1. Internal jugular vein. 2, 2. Subclavian veins. 3. Subclavian artery. 4. Transverse vein. 5. Inferior thyroid vein. 6. External jugular vein. 7. Arch of the aorta. 8, 8. Primitive carotids. After Bernard and Huette.

Fig. 4. A view of the operation of Tracheotomy as performed by Mr. Liston. 1. The tenaculum inserted into the trachea. 2. Position of the bistoury in incising the rings. 3. Line and termination of the external incision. After Liston.

Fig. 5. Extraction of a foreign body by Tracheotomy, the head being thrown back and lowered so as to facilitate the gravitation of the object. 1, 1. Blunt hooks holding open the wound. 2. Hand of the surgeon in the act of extracting the foreign body, by drawing it upwards from the bronchia. After Bourgery and Jacobson.

Fig. 6. A front view of the position and mode of retaining a canula in the Trachea as usually practiced. 1. The incision. 2, 2. A tape attached to the wings of the canula and passing around the neck. After Bernard and Huette.

Fig. 7. The appearance of the parts concerned in œdema of the Glottis. 1. The epiglottis cartilage much swollen by serous infiltration of its submucous cellular tissue. After Gurdon Buck, Jr.

Fig. 8. The operation of scarifying the Glottis for the relief of œdema. 1. The forefinger in its position as a director. 2. The knife in the act of scarifying the part. After Gurdon Buck, Jr.

Plate 31.

Fig. 1

Fig. 3

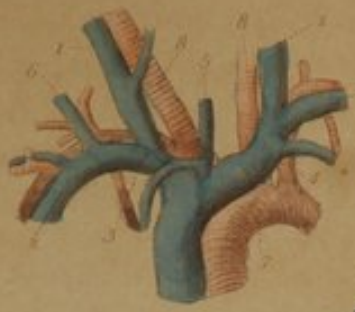


Fig. 2

Fig. 4

Fig. 5

Fig. 7

Fig. 6

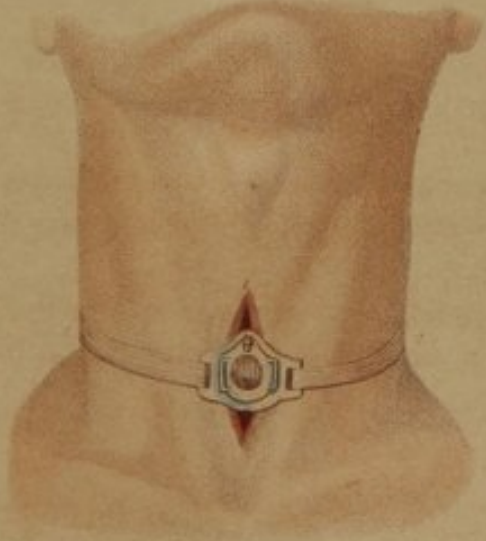


Fig. 8

seems now likely to be cast aside by many, on account of its liability to be misemployed. That this application has been resorted to in cases which did not require it, is doubtless true, but time will soon settle the positive and correct indications which should direct its use, and remedy the evils which always ensue upon the first employment of a *fashionable* remedy.

§ 2.—ŒDEMA OF THE GLOTTIS.

PATHOLOGY.—In the rare form of disease of the upper extremity of the larynx, which has been designated as œdema of the glottis, there is commonly found an infiltration of the submucous cellular tissue of the part, in consequence of the development of such a degree of inflammation, as results either in an effusion of pure serum, or of a gelatinous serum, or lymph, or of pure pus, or of pus mixed with shreds of the membrane consequent on sloughing of the tissue, though this last condition is said to be rare. Owing to these changes, the mucous membrane lining the opening of the larynx becomes distended and formed into folds, or doublings, which rising upwards, and also extending downwards as far as the vocal cords (Plate XXXI. Fig. 7), render the epiglottis thick and stiff, greatly diminishing, or even closing the opening of the larynx, so as to prevent the entrance of air into the lungs.

Originally named by Bayle, in 1808, œdema of the glottis, this complaint has been described as if it were limited to that portion of the larynx which is anatomically described as the glottis, whereas it is really, as shown by Bouillaud and others, rather an œdematous inflammation of the larynx itself, consequent on, or accompanied by, a similar condition of the surrounding parts. In many instances, this infiltration is the result of an inflammatory affection of the tonsils, uvula, or soft palate, which are then seen increased in color, and accompanied by all the symptoms consequent on tonsilitis, though at other times they are unnaturally pale and swollen. Such a condition of parts, it is now believed, existed in the case of General Washington, who, without presenting marked symptoms of croup, yet died asphyxiated. That the difficulty of respiration in his case was not alone due to the angina, must be admitted by all who recall the anatomical relations of the parts; and as œdema of the glottis was not thoroughly understood at the period of his death, the explanation

thus advanced is due to the observation of more modern pathologists, as may be seen by referring to the views of various writers on this subject.*

Sometimes œdema of the glottis, instead of being an acute complaint, is merely a subacute affection, and is, therefore, difficult to recognize solely by inspection, in consequence of the natural appearance of such portions as can be discovered by the eye. Under these circumstances, the sense of touch should be most confided in, as it alone will often enable the surgeon to recognize the condition of the top of the larynx, and enable him correctly to appreciate the diminished state of its orifice, the latter having been sometimes so completely closed, as scarcely to permit the passage of light into the trachea when removed from the body. Without referring to the medical treatment which would be proper as preliminary to, or as an adjuvant of the operation demanded for its relief, and with the simple mention of the utility of tracheotomy as a last resort, this account will be limited mainly to the operation, and especially to the means employed, with great success, in several cases, by Dr. Gurdon Buck, Jr., of New York.

Operation of Dr. Buck.—The patient being seated on a chair, with the head thrown back, and supported by an assistant, should first be directed to keep the mouth as wide open as possible, or if unable to do so, should have it kept open by means of a plug introduced between the molar teeth. The forefinger of the surgeon's left hand being then introduced at the right angle of the mouth and passed down over the tongue till it encounters the epiglottis, the end of the finger may readily be made to overlap this cartilage by being carried above it, as there is usually no difficulty in drawing the epiglottis forwards towards the root of the tongue. The finger thus serving as a guide (Plate XXXI. Fig. 8), a curved knife (Plate XXXV. Fig. 15) should be conducted along it, the concavity of the instrument being directed downwards till its point reaches the finger nail. Then, by elevating the handle so as to depress the blade an inch or an inch and a half further, the cutting extremity will be placed in the glottis between its edges, when the instrument being slightly rotated from one side to the other, so as to give it a cutting movement, may be made to incise the mucous membrane by withdrawing it from the larynx. After repeating this two or three times, on either side,

* See Cyclopædia Pract. Med., vol. iii., art. Laryngitis; Dict. de Science Médicale, tome 17; Pract. of Med., by George B. Wood, M. D., vol. i. p. 743.

without removing the finger, the margin of the epiglottis, and the swelling between it and the base of the tongue, as well as the margins of the larynx, will be freely scarified; or scissors curved flatwise (Plate XXXV. Fig. 16) may be used in the same manner. Though a disagreeable sense of suffocation and choking is at first caused by the operation, the patient soon recovers and submits to a repetition of the incisions after a short interval. In all the cases operated on by Dr. Buck, the scarification was performed twice, and in some instances three times, the hemorrhage which followed it being encouraged by the use of warm gargles.*

Operation of Lisfranc.—The patient being placed in a similar position to that just referred to, a slightly curved bistoury with a long and narrow blade, guarded with lint to within one line of its point, should be held as a pen in the right hand. Then passing the first and second fingers of the left hand through the isthmus of the fauces to the œdematous swelling, pass the bistoury flatwise on the fingers down to the part, and when it has reached the larynx, turn its edge upwards and forwards, elevating or depressing the handle so as to make gentle pressure with its point, and scarify the tissue, when a little pressure of the fingers will readily evacuate the serum.†

Statistics.—Of six cases reported by Lisfranc, five were cured. Of eight reported by Dr. Buck all terminated favorably, though in one, tracheotomy was also resorted to‡ and in six additional cases reported lately§ as occurring in the hands of Dr. Buck, or in that of other surgeons in New York, all were likewise cured, making nienteen cures out of twenty cases.

Remarks.—Previous to the year 1821 there seems to have been no operation practiced for the relief of this complaint excepting tracheotomy, though Dr. Marshall Hall had suggested the idea of scarification at that time. This suggestion was, however, generally discountenanced till Lisfranc, in 1823, resorted to punctures and pressure. His idea seems also to have been forgotten, or at least not generally resorted to, being viewed as a "fantastic operation," until Dr. Buck called the attention of the surgeons of the United States to the result of his operations. When we recollect the serious nature

* Transact. Amer. Med. Association, vol. i. p. 137.

† Malgaignè, Operat. Surg., Philad. edit., p. 369.

‡ Op. cit., p. 145.

§ Transact. Amer. Med. Association, vol. iv. p. 277: 1852.

of the complaint, and the fact that, without opening the trachea, the danger of death is imminent, the benefits conferred upon society by such a paper as that of Dr. Buck, cannot be too highly estimated.

Among many points, on which he lays especial stress, is the means of diagnosis previously pointed out by the French writers, and especially by Tuilier, who proposed it in 1815, in his inaugural thesis.* In seven cases out of the eight treated by Dr. Buck, there was ample evidence to the touch of the puffy condition of the parts, and in the eighth there was no proof that they were not swollen. Of seventeen other cases which Dr. Buck has collected, the œdema was present in fifteen, giving in all of them the sensation of a soft pulpy structure. That a practice so long advised in severe cases of œdema of the limbs, should not sooner have been resorted to in a similar condition of so important an organ as the larynx, can only be explained by the fact that the true nature of the disease has only been accurately known within the last fifty years. As a substitute for tracheotomy, and as a rational means of affording relief from a distressing and dangerous complaint, the operation of scarifying the glottis and epiglottis may be regarded as one of the most useful of those suggested by the surgeons of the nineteenth century.

§ 3.—TRACHEOTOMY.

The perforation of any portion of the trachea by means of a cutting instrument, with the view of affording a new passage for the entrance of air into the lungs, has long been designated as Bronchotomy, though, as the opening is limited to those portions of the trachea which are above the sternum, the term Tracheotomy is now more generally employed. Either may, however, be used to designate the operations practiced on the larynx or trachea proper, the opening of the larynx being, however, frequently spoken of as Laryngotomy. As the operation of opening the windpipe varies a little, according to the point operated on, the steps of each operation may be best described separately.

I. TRACHEOTOMY FOR CROUP.

The operation of tracheotomy dates back to a very early period,

* Dict. des Science Méd., tome xvii.

Antyllus, A. D. 340,* having recommended and performed it in several instances. It has also been performed at various times, and in different manners, solely in order to meet the peculiar views of the operator. To specify all these methods would, however, be a useless task, and I shall, therefore, limit myself to such a general plan of proceeding as may be advantageously resorted to under most of the circumstances which demand this operation.

This plan having been first brought to my notice in a paper by Dr. Joseph Pancoast, of Philadelphia,† and since then frequently repeated by him, as well as tested by myself, has been selected as presenting a methodical course of proceeding, as well as one which opens the trachea perfectly without unnecessarily exposing the patient to risk from hemorrhage, or to the subsequent inconvenience caused by the use of the canula.

Preliminary Measures.—When the operation has been decided on, the surgeon should prepare a sharp scalpel; two curved spatulæ or blunt hooks; a director; straight, sharp, and probe-pointed bistouries; dissecting forceps, and dressing forceps if it is intended to remove a foreign body; a tenaculum or a pair of torsion forceps; threaded needles; ligatures, and several small pieces of sponge attached to sticks or quills as handles, as well as one or two pieces of sponge, cold water, and towels, together with such other articles as may be demanded in the dressing.

Operation of Dr. Pancoast.—Place the patient upon his back, with the head thrown sufficiently backwards over a pillow, yet not so as to stretch it too much, or compress the trachea by contracting the muscles in front of it.

Then, whilst the surgeon stands on the right side of the patient, let one assistant steady the head, another confine the arms and steady the shoulders, a third attend to the lower limbs, and a fourth hand sponges, &c., as needed, after which the operator may place the fingers of his left hand upon the skin near the median line, so as to steady it, and make an incision from the inferior part of the larynx down to near the top of the sternum, so as to cut only through the skin, and raising the fascia puncture it, and divide it upon a director. After finding the line of junction of the sterno-thyroid muscles, let him next separate them with the handle or back of the knife, by

* See History of Surgery, Part I., p. xviii. of this volume.

† Amer. Journ. of Med. Sciences, vol. xvii. N. S. p. 307.

tearing the cellular tissue between them, and have them held back by curved spatulæ so as to expose the parts beneath. The isthmus of the thyroid gland, if found to come so low down as to be in the way of the incision, should now be tied by means of two ligatures passed beneath it by needles, after which it may be divided between them. At this time the venous hemorrhage from several points of the wound will often demand attention, and such vessels as can be seen should therefore be ligated. Then, pushing aside the two inferior thyroid veins, or ligating any anastomosing branches, or the middle thyroid artery if it exists, the surgeon should next divide freely the condensed cellular tissue which has been called by Mr. Porter* the tracheal fascia, and dissect a small portion of it from around the contemplated opening of the trachea, in order to prevent the parts from subsequently becoming emphysematous and closing the orifice. The trachea being now freely exposed, and the bleeding checked, a tenaculum may be inserted in the median line of the rings, and the part thus raised excised by sharp-pointed scissors; or a bistoury may be at once passed in and the trachea slit open from below upwards, to the extent of three or four rings, counting from the second; after which, the wound may either be kept open by means of a dilator, as proposed by Trousseau, or by bending a piece of lead or pewter, so as to enable it to pass round the neck, and be attached to the sides of the wound, as suggested by Dr. Pancoast, of Philadelphia, or by resorting to what I have found to be a neater instrument, viz., an elastic ring of broad watch spring, which may be readily adapted to any neck simply by turning the pivot that holds the two halves together. (Plate XXX. Fig. 12.) The introduction of the old-fashioned canula into the trachea is, I think, so objectionable, that it may suffice at present simply to mention it, though, for the instruction of such as desire to employ it, I have added a figure to show how it is to be retained in the wound (Plate XXXI. Fig. 6.) But whether the cartilages are trimmed so as to leave an opening, as advised by Messrs. Lawrence and Porter, of England, or simply incised, the use of the blunt hooks, or the watch-spring, will always prove serviceable by keeping the soft parts from contracting and closing the orifice in the trachea, and this is especially the case when the rings are merely divided without excising any portion of them; but as

* Surg. Anat. of Larynx and Trachea.

soon as the parts are sufficiently retracted, which is sometimes the case in thirty-six hours, the hooks or spring should be removed.

II. TRACHEOTOMY FOR THE REMOVAL OF A FOREIGN BODY.

The performance of tracheotomy, for the removal of a foreign body, differs in no way from the operation usually resorted to in croup; but the following plan being presented in connection with a case of this kind, and showing the results of a prompt incision into the trachea, has been related in order to enable an operator to make a selection. The chief difference between this and the preceding operation will be found in the fact, that Mr. Liston does not advise delaying the opening into the trachea until the hemorrhage is arrested, as is done in the method of Dr. Pancoast and others.

Operation of Liston.—In a patient, five years old, who had swallowed a small glass seal, the operation of tracheotomy was performed by Mr. Liston, as follows:—

The patient being securely fastened by a large sheet, wrapped several times round the body and arms, and closely pinned, was held by an assistant horizontally with his face upwards, and his head between the operator's knees. The preliminary incisions being made as usual, the blood gushed out freely from the veins, which were greatly distended by the efforts of the child and the difficulty of breathing, but none of these were tied. After waiting a few seconds till the first rush of blood had somewhat abated, the trachea, which was never still for a moment, rising and falling rapidly with the hurried movements of respiration, was seized by means of a small hook, and drawn forwards towards the mouth of the wound. (Plate XXXI. Fig. 4.) The scalpel being then entered at the lower extremity of the incision with its point directed upwards and its back towards the vertebral column, with the handle kept low, and with a light hold of the instrument so as to avoid injuring the œsophagus by any sudden movement of the patient, two or three of the rings were divided, and the assistant immediately directed to turn the child over with his face downwards. For an instant, the little patient seemed on the point of suffocation, as the first inspiration drew in a certain quantity of blood, which could not be prevented from flowing; but the next moment, by the change of position, the blood trickled on the floor, a deeper inspiration was taken, the foreign body was expelled with

force, and, as if by magic, the breathing became quiet and the venous hemorrhage ceased spontaneously.*

Remarks.—In this mode of operating, the great object seems to be to open the trachea promptly; but, unless in cases of threatening suffocation, as from the introduction of a piece of meat into the windpipe, there is no occasion for such haste. In removing other foreign bodies, it sometimes happens that the opening of the trachea produces such violent coughing as ejects the article solely from the efforts of the patient; but in others its escape is by no means so easy or certain as in the case just detailed. Not unfrequently it becomes necessary to remove it by means of narrow forceps (Plate XXXI. Fig. 5), and sometimes it has remained for days and weeks, being subsequently thrown up in a spasmodic attack of coughing. In some of these cases, the performance of tracheotomy has been beneficial; but, in others, the patient has not derived such relief as would justify the operation. Caution in diagnosis and prognosis is, therefore, a matter of much importance with patients who are thus situated.

III. LARYNGOTOMY.

Operation of Desault.—After dividing the skin and fascia superficialis by an incision which extended from the projecting angle of the thyroid cartilage to a little below the cricoid, but not near so long as that required in tracheotomy, this surgeon separated the thyroid muscles, placed his forefinger on the crico-thyroid ligament, and feeling for the artery of the same name, endeavored to depress or raise it out of the line of the incision, and then plunging the scalpel into the ligament, cut it either upwards or downwards, according to the position of the vessel.

When the incision is continued down through the cricoid cartilage and first rings of the trachea, it constitutes the operation which has been designated as laryngo-tracheotomy.

* Lectures by R. Liston, with additions by T. D. Mütter, p. 326.

§ 4.—ESTIMATE OF THESE DIFFERENT OPERATIONS.

Tracheotomy presents so few dangers that are not equalled by the operation of laryngotomy, and has, in several diseases, so many additional points of recommendation, that the latter is but seldom resorted to. In selecting a mode of operating, preference may, it is thought, be justly given to that employed by Dr. Pancoast and others, and described at the commencement of this section. The advantages which I think it possesses are, first, less risk of hemorrhage in consequence of lacerating the parts about the median line of the muscles, instead of dissecting them, as well as from ligating the isthmus of the thyroid gland previous to incising it; second, the preservation of the opening in the trachea without irritating its lining membrane, or resorting to an instrument that exposes the patient to the risk of suffocation by its escape from the wound, or by its clogging with the secretions of the part; and, third, the power of looking into the windpipe, and judging accurately of its condition, or of applying remedies to correct it, if desirable. Indeed, much of the success which has attended this operation in the hands of Trousseau, Dr. Pancoast, and others, seem to have been due to their judicious after-treatment; a few drops of a solution of the nitrate of silver, ten or twenty grains to the ounce of water, being dropped in or applied upon a little probang, or the trachea itself swabbed out by a similar instrument whenever the clicking sound of the respiration led to the belief that false membrane or mucus was collecting at this point.

The excision of even a small portion of the rings of the trachea, in order to aid in preserving the opening, has been objected to by some surgeons as likely to cause a subsequent contraction of the canal when the wound cicatrises. But in the cases which have r eco vered, both in the hands of Dr. Pancoast and in those reported by others, this has not been the case. The points, especially worthy of notice in the performance of tracheotomy, may then be summed up as follows: 1st. To lacerate and stretch, rather than dissect the parts about the trachea; 2d, to check all hemorrhage by the ligature before opening the canal; 3d, to clear away the cellular substance (tracheal fascia), around the proposed opening; and, lastly, either to excise a portion of the rings, or keep the slit distended by a spring or by blunt hooks.

To those not familiar with the details of the operation, it may also

be useful to state, that the puncture of the trachea will generally bring on a most violent and convulsive cough, during which little or nothing can be done. This, however, usually passes off as soon as the first stimulus of the cold air ceases to be felt. When, then, an incision is to be made into the trachea, it should promptly follow the puncture of the knife, or if a tenaculum is inserted, in order to favor the removal of a portion of the rings, their excision should be quickly effected after the hook is introduced, the violence of the cough consequent on the puncture being sometimes so marked as to alarm the by-standers for the life of the child.

Remarks.—It is doubtless apparent, from reading the above estimate of tracheotomy, that I regard it as an operation requiring some skill and preparation on the part of the surgeon, and that it should not be attempted by any practitioner, unless totally regardless of consequences. No matter how simple the operation may appear upon the dead subject, or upon the healthy adult, it will often prove to be a difficult one when the vessels are rendered turgid by dyspnœa, or when it is to be performed on the short fat neck of a child, or when it is resorted to on a patient apparently at the last gasp, whose larynx and trachea are actively raised and depressed at every respiration. To the experienced surgeon such facts are well known, but to those who have judged of the operation solely from its performance in the dissecting-room, such statements should lead them to anticipate difficulties if they are induced to operate, and in all cases special precautions should be taken in regard to hemorrhage. In some instances, the flow of blood has been of the most alarming and intractable kind. Dessault,* whose skill no one can doubt, was, it is said, compelled to give up an operation, on one occasion, in consequence of hemorrhage; and Recamier has advised surgeons to defer opening the trachea for several hours lest the patient should suffer from a flow of blood. Roux also is reported to have saved one of his patients from the suffocation caused by the blood escaping into a trachea which had been promptly opened in hopes of arresting it, only by placing his own mouth to the wound and sucking it out. When, therefore, tracheotomy is spoken of "as an operation not much more difficult than venesection," such cases should be remembered.

Supposing, however, that the operator is aware of these dangers,

* Dict. de Méd. tome vi. p. 58.

and it is admitted that they are not universally encountered, the question which has of late years occupied so much of the attention of surgeons yet remains to be decided; to wit, Should tracheotomy be resorted to for the relief of all patients who are liable to die asphyxiated? That such a recommendation should not be universally admitted requires no argument, and the proposition may therefore be more definitely settled, by showing in what cases the performance of the operation may be advisable.

That an opening may be made into a healthy trachea for the removal of a foreign body, or in order to overcome a spasm of the glottis caused by inhaling a noxious vapor, or in cases of œdema of the glottis, is a point which I cannot but regard as settled by statistics. From an examination of the various papers referred to in the Bibliographical Index,* as well as from a review of many of the works upon Surgery, from a very early period, I am induced to think that tracheotomy, in such cases, is not only a justifiable operation, but also one which furnishes the patient with a ready means of escape from the dangers likely to ensue. And although instances are recorded where even nails and coins have remained in the windpipe for years without destroying life, there are others, well authenticated, where the presence of a small bean, or of a grain of coffee or of corn, have induced laryngeal phthisis, ulceration, and death. In œdema of the glottis, though the operation may be required, I would not resort to it until scarification of the parts had been fairly tried; but this being done, I should anticipate from tracheotomy prompt and permanent relief. In hydrophobia, I should be disposed to try it rather than see the patient die without it.

As to the propriety of advising tracheotomy in cases of membranous croup, there is apparently so much of the result that might be charged to the peculiarity of the mode of operating heretofore employed, and to the delay that has generally preceded its performance, that the decision of the question must be considered as "sub judice." By referring to the statistics hereafter quoted, an opinion of the success of the operation, as usually performed, may be readily obtained, and it is one which has gone far towards diminishing professional confidence in this operation as a means of treating croup. Very many of the best surgeons at different periods have, in their day, doubted its propriety or only advocated it at the last

* See Tracheotomy.

moment. In the United States, the experience of Dr. Physick was adverse to it; and statistics show that the prognosis of the operation, as heretofore performed, should be very guarded.

But, in most of the cases thus reported, tracheotomy was deferred until the complaint had existed some time, and progressed from the larynx into the trachea, or induced congestion of the lungs, or augmented the dangers from the incisions, by causing engorgement of the vessels of the neck, as well as an unhealthy condition of the lining membrane of the trachea at the point operated on. Until then we can acquire such statistics as will show that the cases operated on at an early period after a positive diagnosis of membranous croup has been made, and operated on so as to leave an opening not liable to clog with mucus, as well as free from the continued irritation that has been caused by the presence of a tube, correspond with the mortality under the former mode of operating, the question must be regarded as unsettled. Cauterization of the pharynx and trachea through the mouth, together with early depletion, calomel and emetics, have saved many cases of true membranous croup, and will, consequently, be a strong argument against the performance of an early operation. But when croup occurs in those who are hereditarily predisposed to it, or when other members of a family have died from it, I would advise an early operation, and anticipate more success from it than I should from medical means alone, provided the operation was resorted to before the inflammation had reached the portion of the tube which was to be opened, and the wound in the trachea was kept open, either by the hooks introduced upon its sides, or if that was not sufficient by their being placed upon the edges of the rings themselves. But I would not advise tracheotomy in any case, where the operation had been delayed until asphyxia was threatening, and the blood had ceased to be well aërated. Like the operation for strangulated hernia, tracheotomy, to be successful, should be done before the changes in the part are likely to render it useless.

§ 5.—STATISTICS OF THE OPERATION OF TRACHEOTOMY.

In order to show the data upon which the opinion just expressed has been based, I have collected from various sources the results of the operation, as performed for the relief of croup, as well as for other purposes, and present them in tabular form.

I. TRACHEOTOMY FOR CROUP.

The following table shows the success obtained from the operation of Tracheotomy, as usually performed for the relief of membranous croup, the wound being chiefly kept open by means of a canula in the windpipe.

OPERATOR.	OPERATIONS.	CURED.	DIED.
Amussat,	6	0	6*
Baudelocque,	15	0	15*
Blandin,	5	0	5*
Bretonneau,	18	4	14*
Gerdy,	6	4	2*
Guersent,	9	0	9*
Maslieurat,	2	1	1*
Petit,	6	3	3*
Roux,	4	0	4*
Velpeau,	6	0	6*
Trousseau,	153	41	112†
Pancoast,	7	3	4‡
Page,	1	0	1
Smith,	1	0	1
Thompson,	1	0	1
E. Atlee,	1	0	1
Townsend,	1	0	1
Van Buren,	1	0	1
Buck, Jr.,	1	1	0
Johnson,	1	0	1
	245	57	188

From this it is seen that of 245 cases of tracheotomy performed for the relief of croup, but in which the operation was not resorted to until nearly every other means had been tried, only 57 were cured, whilst 188 died, that is, in more than three-fourths of the cases operated on the patients died.

The next table shows a very different result, the same operation being performed at a period when the trachea was not diseased.

* Condie on Children, edit. 1844, p. 310.

† Lond. Med. Examiner, Aug. 1851, p. 134, from Gazette des Hôpitaux.

‡ J. Pancoast, in MS. Jan. 29, 1852.

II. TRACHEOTOMY FOR THE REMOVAL OF FOREIGN BODIES.

	CURED.	DIED.	SUBSTANCE.
John Newman, N. C.	1		Bullet.
Amassa Trowbridge, N. Y.	1		Bean.
H. G. Jameson, Md.	1		Watermelon seed.
" " "	1		Pebble.
Samuel Cartwright, Miss.	1		Watermelon seed.
H. T. Waterhouse, N. Y.	1		Watermelon seed.
Joseph Palmer	1		Bean.
Richard Burgess		1	
Peter P. Woodbury, N. H.	1		Bean.
Calvin Jewett, Vt.	1		Bean.
" " "	1		Iron nail near two inches long.
Enos Barnes, N. Y.	1		
Abner Hopton, N. C.	1		Grain of corn.
Zadok Howe, Mass.	1		Bean.
J. F. Hardy, N. C.	1		Watermelon seed.
Charles Hall, Vt.	1		Pipe stem.
J. Mason Warren, Mass,	1		Bean.
Twitchell, N. H.	2		Beans.
William Davidson, Ind.	1		Grain of corn.
W. H. Van Buren, N. Y.	1		Plum stem and watermelon seed
J. H. Kearney Rodgers, N. Y.	1		Cherry stone.
Evans, Ky.	1		Vapor of hot water.
N. R. Smith, Md.	1		(Laryngotomy.) Cockle bur.
Liston	1		Glass seal.
Pancoast, Phila.	3		Result not stated.
	Cured 28	Died 1	

From this it appears that, in twenty-nine cases of tracheotomy performed for the removal of foreign substances from the trachea, twenty-eight were cured, and only one died—the trachea being allowed to close and heal as soon as possible after the operation.

From a comparison of the results of these two tables, it is very evident that the dangers which ensue upon incising a healthy trachea are comparatively slight, and that the great mortality which has attended the operation, when performed for the relief of croup, must be due to some other cause than the mere incision of the windpipe. But whether this cause is to be found in the changes produced by the disease, or whether it is the result of an incision in an inflamed instead of a healthy structure—or whether it is not owing to the delay usually attending the performance of the operation, is a point which can only be settled by each operator hereafter specifying the peculiarities of his cases.

CHAPTER IV.

OPERATIONS UPON THE PHARYNX AND ŒSOPHAGUS.

THE Œsophagus, or musculo-membranous canal, which extends from the mouth to the stomach, is liable to various affections, the relief of which often demands more or less interference on the part of the surgeon. Among the more important of these complaints, may be mentioned those resulting from the passage of foreign substances, of a hard and irritating nature, which being inadvertently introduced into the mouth, are thence carried down the œsophagus towards the stomach, and liable to be arrested at various points; as well as the disorders consequent on inflammation in or around the proper structure of the canal itself. From the importance of this tube, and the difficulties of reaching it from the outside of the neck, its relations to surrounding parts should be thoroughly studied by the surgeon before attempting any of the cutting operations sometimes required for its relief.

SECTION I.

SURGICAL ANATOMY OF THE PHARYNX AND ŒSOPHAGUS.

Although, to an ordinary observer, the Œsophagus is one continuous canal, which reaches from the mouth to the stomach, anatomists have usually divided it into the pharynx, or that funnel-shaped cavity, which extends from the base of the cranium to the lower part of the cricoid cartilage, between the cervical vertebræ and the posterior part of the nose and mouth, and into the œsophagus proper, or tube, which extends from this cartilage, or the lower part of the fifth cervical vertebra, to the cardiac orifice of the stomach.

§ 1.—OF THE PHARYNX.

The Pharynx is composed of two coats, a mucous one, which is continuous with the same membrane in the mouth, and a muscular coat, composed of three constrictor muscles, placed one above the other, the contractions of which convey the food from the pharynx into the œsophagus. In the mucous membrane of the pharynx may be noticed a large number of muciparous follicles, which occasionally enlarge and create irritation or inflammation about this region. Beneath or behind the mucous membrane is a sparse layer of cellular tissue, in which are found the bloodvessels and nerves of the part, the arteries being branches from the carotid; the veins emptying directly into the internal jugular, and the nerves being branches of the glosso-pharyngeal, pneumogastric, and fifth pair.

The muscles of the pharynx mainly arise from the surrounding bony prominences on each side, and, being joined to their fellows, are enabled to diminish the transverse diameter of the opening, and force the bolus of food or other substance downwards, till it reaches the œsophagus.

§ 2.—OF THE ŒSOPHAGUS.

The Œsophagus extends from the pharynx to the stomach, is from ten to twelve lines in diameter, about ten inches in length, and, when quiescent, flattened from before backwards. In its descent to the stomach, this canal is between the great vessels of the neck directly upon the muscles in front of the vertebræ, but inclined towards the left side of the middle line. At the lower part of the neck it is yet more to the left side of the trachea than behind it, and is united to adjacent parts by a loose cellular tissue.

The Œsophagus presents three coats, which are designated as the muscular, cellular, and mucous.

The muscular coat has its fibres arranged circularly, internally; and longitudinally, externally. The cellular coat is well developed, adhering more closely to the mucous membrane than to the muscular fibres, presents a filamentous character, and contains numerous lymphatic glands.

The mucous coat, in the undistended condition, presents itself

chiefly in longitudinal folds, thus favoring the passage of substances to the stomach; and is covered by a delicate epidermis, which, under certain circumstances, becomes thickened and very distinct.

SECTION II.

OPERATIONS UPON THE PHARYNX.

Among the diseases of the pharynx requiring surgical treatment, are the formation of polypi, as has been already referred to, in connection with the nose, inflammation of the upper portion resulting in stoppage of the Eustachian tubes, as mentioned in the diseases of the ear, and the formation of abscesses, the treatment of which cannot properly be included in an account of operations, except by saying that their evacuation, when required, is to be accomplished by a simple puncture of the swelling at its most prominent point.

The other disorders, demanding surgical interference, are the hypertrophied condition of the muciparous follicles, and the removal of foreign bodies arrested by its walls.

§ 1.—HYPERTROPHY OF THE FOLLICLES OF THE PHARYNX.

The hypertrophy, or enlarged condition of the follicles of the mucous membrane of the pharynx, is an affection which has lately received a degree of attention that it does not deserve, and were it not that the accounts given of it are liable to lead the inexperienced to regard it in too serious a light, this disorder might justly be passed by without notice. In many instances, and especially in those who smoke tobacco freely, it will be found that these enlarged follicles have existed a long time without attention being directly called to them, until they have been knowingly spied out as the seat of symptoms with which they are by no means certainly connected. But when, after a skillful investigation of the case, the surgeon believes that they really cause the patient any inconvenience, he may do much towards removing it, simply by stimulating the surface of the membrane by the application of the nitrate of silver, dilute nitric acid, strong tincture of iodine, sulphate of copper, or some similar substance, applied either with a camel's-hair pencil, sponge, or swab.

§ 2.—FOREIGN BODIES IN THE PHARYNX.

From the efforts made in swallowing, it occasionally happens that foreign substances of various kinds, but especially those which are sharp and fine, are arrested in the pharynx, and retained there in such a manner as enables them to be reached with the finger or forceps. Generally, the most serious part of their removal is found in the difficulty of recognizing their position. When the foreign body is small and sharp-pointed, like a pin, needle, or fish-bone, it may be looked for about the posterior half arches, or near the tonsils; as these articles, from their small size and pointed character, are more apt to lodge in the line of the superior constrictor muscle than those which are larger, and which, being more readily seized by the muscles, are carried further into the œsophagus. Thus, in eating fish, the softer portion of the bolus may pass, but the constriction of the mass forcing the point of a bone into the upper part of the pharynx, it will nearly always be seen presenting itself transversely to the pharynx, or be found about the points just designated. The same is true of pins or needles, of which one escaping from the mouth, suddenly induces an effort to swallow, in which effort the pharynx, being contracted laterally, the point pricks the walls of one side, induces further spasmodic effort, and, at last, is found to have been buried by its point in the mucous coat, or, perhaps, a little deeper. When foreign substances penetrate deeply through the pharynx, there is, in addition to the inconvenience caused by their position, also some risk of their inducing such inflammation of the tissues as may result in an abscess, or they may cut their way into the larynx, or injure the arteries of the neck;* for these reasons, they should be promptly removed, if possible.

Operation.—Place the patient in a strong light, depress the tongue with the forefinger of the left hand, and look for the foreign body, or, if it cannot be seen, pass the same forefinger into the throat, and feel for it. Then, using the finger as a guide, pass a pair of suitable forceps along it, and endeavor to seize the substance so as to extract it lengthwise and not transversely, lest its escape be

* See Bibliography, article Œsophagus, from a paper by Paul F. Eve, M. D., Georgia.

resisted by the contraction of the half arches consequent on the gagging which the presence of the instrument will induce.

SECTION III.

OPERATIONS UPON THE ŒSOPHAGUS.

The Œsophagus being the principal channel by which substances enter the system, is liable to various complaints in consequence of the improper character of the articles introduced into the mouth. Particles of food taken at a high temperature, or imperfectly masticated, or foreign bodies intended to be held temporarily in the mouth, but which are suddenly swallowed, or a diminution of the caliber of the passage, owing to various causes, are all instances of the evils to which a patient may be exposed in the daily use of this part. Two specifications will, however, embrace all the operations required by this structure independent of wounds, to which it is liable, in connection with other parts of the neck; to wit, the removal of foreign substances from it, or from the stomach, and the restoration of its natural caliber, in cases of stricture.

§ 1.—REMOVAL OF FOREIGN SUBSTANCES FROM THE ŒSOPHAGUS AND STOMACH.

In order to estimate correctly the principles especially applicable to the removal of foreign substances from the œsophagus, some attention should be given to the anatomical relations of this part, as well as to its functions.

In a well-written paper upon this subject, by Dr. Henry Bond, of Philadelphia,* may be found some sound views of the physiological action of the part, as well as of the means required for the extraction of foreign bodies from the canal; and from this paper many of the following facts have been extracted.

* North Amer. Med. and Surg. Journ., vol. vi. p. 278.

I. EFFECTS OF THE INTRODUCTION OF A FOREIGN BODY INTO THE ŒSOPHAGUS.

The general anatomical relations of this canal having been already stated, it is sufficient, at present, to mention that the posterior surface of the trachea and larynx, as far as they are in connection with the œsophagus, present to it a yielding ligamentous structure capable of being impinged upon by any substance which may be arrested in the latter. As the anterior wall of the œsophagus is that which is chiefly expanded in the effort of swallowing, the foreign article is generally brought more immediately in contact with the back of the larynx and trachea, at those points where there is merely a ligamentous structure, where, by exciting the muscles of the glottis, it causes irritation and efforts to cough, which occasionally become spasmodic. If, then, an article should remain in the œsophagus, at a point sufficiently high to enable it to impinge upon this portion of the trachea, coughing or threatening of suffocation must ensue. Cause it to pass either above or below the larynx and trachea, and the most annoying symptoms will disappear. Two plans of treatment in these cases have, therefore, been resorted to, the selection of either being guided by the judgment of the surgeon at the moment, to wit, either to carry or force the substance into the stomach, which answers very well when the article is an innocuous one, or to remove it by some suitable means, such as the efforts of the patient when excited by vomiting or by manual interference on the part of the surgeon. For the accomplishment of the latter, various means have been suggested, as forceps, hooks, and sponges. But, without entering into the details of these inventions, it may be sufficient merely to direct attention to such as will be found in Plate XXX., among which can be seen the admirably adapted forceps of Dr. Bond, and a hook, brought to the notice of the profession in the United States, by the late Dr. Nathan Smith, of New Haven.* An instrument, very similar to this, is also represented as copied from the European plates, the invention of which is assigned to Dupuytren; but, as no date is given to it, I have found it difficult to establish the priority of either, the difference in the character of the two being very slight. Dupuytren has claimed the hook as his; but whether he followed Dr. Smith, or

* New York Med. and Phys. Journ., vol. iv. p. 576. 1825.

preceded him, the latter states explicitly that "his hook is unlike anything which he has known to be employed for a similar purpose;" and he, therefore, furnishes a drawing of it in the paper referred to,* deeming it especially suited to the removal of coins. Both hooks, though adapted to a certain class of foreign bodies, are not applicable to all, and, as compared with the gullet-forceps, are thought to be inferior to the instrument of Dr. Bond. The latter is capable of taking hold firmly, and extracting safely any foreign substance, no matter how fine or small, which is within the length of the instrument, that is, two or three inches below the top of the sternum, measuring from the mouth, and yet, not liable to pinch the internal coat of the canal, whilst the hooks are only adapted to larger objects.

Operation with the Forceps of Dr. Bond.—Place the patient in a strong light, with the head thrown back, if the foreign substance is small, but if large, with the chin approximated to the sternum, so as to relax the sterno-hyoid and thyroid muscles, lest, by compressing the trachea against the bodies of the vertebræ, the foreign article be caused to impinge on the larynx, and such a spell of coughing induced as will materially interfere with the operation. Then, placing a plug between the molar teeth, depress the tongue with the forefinger of the left hand, pass the forceps into the œsophagus with the right hand, when the substance, if high enough to be seen, may be readily extracted. But if lower down, the tongue should be depressed by an assistant by means of the instrument (Plate XXX. Fig. 11), when the surgeon opening and shutting the blades of the forceps, should carry the handles from left to right, or the reverse, so as to sweep the œsophagus with the points of the instrument. Should it be a coin, or a similar article, the dilatation of the walls of the œsophagus will render the passage of the blades on each side easy; but if it is a smaller body, as a pin or fish-bone, the operator need not fear an injury to the walls of the canal, as the instrument is so constructed as to render such an event almost impossible.

Dr. Constantine Weever, of Michigan, has also published† the description of a pair of forceps, consisting of a two-bladed whalebone stylet, which being inserted in a flexible catheter, is passed

* See Plate XXX. Fig. 4.'

† Am. Journ. Med. Sciences, vol. xiv. p. 111. 1834.

PLATE XXXII.

OPERATIONS PRACTICED ON THE ŒSOPHAGUS AND LARYNX.

Fig. 1. A front view of the application of the Œsophageal Hook of Dupuytren, as represented upon the subject, by a section of the mouth. 1. A longitudinal section showing the left half of the tongue. 2. A vertical section of the lower jaw. 3. Top of the epiglottis cartilage as applied over the glottis in the effort of swallowing. 4. The upper end of the Œsophageal Hook. 5. Its lower extremity with the basket attached to it. 6, 6. Dotted lines showing the course of the Œsophagus.

After Bourgery and Jacobson.

Fig. 2. A front view of a section of the Mouth and Throat, showing the application of the sponge to the Larynx, as advised by Trousseau and Green. 1. Longitudinal section of the tongue. 2. Inferior maxilla. 3. Os hyoides. 4. Section of the epiglottis cartilage. 5, 5. Sections of the thyroid cartilage. 6. Point to which the sponge may be introduced. 7. Upper end of the instrument. 8. Its lower end with the sponge in position.

After Bourgery and Jacobson.

Fig. 3. A view of the relative position of the Surgeon and Patient in the operation of washing out the stomach by means of the Stomach Pump and Œsophageal Catheter, as suggested by Dr. Physick of Philadelphia. The patient is represented as reclining with the head thrown back, and the jaws distended by a plug of wood introduced between the molar teeth. The Œsophageal Catheter of Physick has been introduced into the stomach, and then attached to the nozzle of the pump which is placed in a basin close alongside of the patient. The surgeon is represented in the act of drawing the liquid into the pump from the bowl. 1. Physick's Œsophageal Catheter. 2. The Stomach Pump of Dr. Goddard.

After Nature.

Plate 32

Fig 1.

Fig 2.

Fig 3.

down to the substance pushed out of the catheter so as to expand on each side of the article to be removed, and then made to seize it by pressing the catheter upon its blades. This instrument, which acts on a principle similar to that of the litholabe of Civiale, may prove useful where the foreign substance is very far down, and yet of such a nature as should forbid its being pushed into the stomach by a probang. If the article to be removed is barbed and sharp-pointed, like a fish-hook and line, no expedient will probably answer better than that suggested, under similar circumstances, by Dr. Brite, of Kentucky,* to wit, the slipping of a sufficiently large and perforated bullet over the line and point of the hook, by directing the patient to swallow the bullet.

When the dangers that may result from the perforation of the aorta or trachea,† as the result of the continued presence of irritating articles in the œsophagus is recollected, it may be well for the surgeon to be as unceasing as is prudent in his efforts to carry the article either upwards or downwards.

Where the foreign body is so placed in the œsophagus that its position can be distinguished by the touch externally, the propriety of performing œsophagotomy is a question worthy of consideration. Many substances of a durable nature have, however, been known to remain for years in the œsophagus without creating intolerable inconvenience, one of which is reported by the late Dr. Dorsey, of Philadelphia,‡ and the possibility of such a condition should always, therefore, be recollected. In this case, a copper coin remained thirteen years in this tube without destroying life. On the other hand, very small substances, especially when presenting sharp edges, have ulcerated through into the trachea, or penetrated the vessels or injured the important nerves about this region, though they have also occasionally created abscesses, and thus been discharged externally.

§ 2.—EXTRACTION OF NOXIOUS SUBSTANCES FROM THE STOMACH, THROUGH THE ŒSOPHAGUS.

The introduction of the œsophageal catheter, and the extraction of any substance capable of passing through its channel, is so simple an operation as to require but a few words.

* See Bibliography, article Œsophagus.

† See Ibid., by Paul F. Eve, M. D.

‡ Bibliographical Index.

Operation.—After placing a plug between the back teeth, so as to protect the fingers or the tube from being bitten by the patient, pass the forefinger of the left hand to the root of the tongue, and gently depress this organ. Then pass the catheter rapidly backwards till it reaches the back of the pharynx, when, if the resistance that it meets with is not sufficient to depress its point, it may be readily turned down by the forefinger previously introduced. By carrying the point of the catheter towards either half arch, there will be little risk of introducing it into the larynx, as the latter will be closed in consequence of the gagging induced by the presence of the finger in the pharynx. The introduction of the liquid, when it is necessary, to wash out the stomach, may then be effected by the stomach-pump, (Plate XXX. Fig. 1),* or by a large rectum syringe. In withdrawing the catheter, its free end should always be closed by the finger, in order to prevent the escape of any drops of liquid into the trachea.

Remarks.—The performance of this operation is so simple an affair that the evacuation of the contents of the stomach has more than once been done by a good hospital nurse. Within about fifty years, the extraction of poisons from the stomach, except by emesis, was, however, an operation quite unknown. To Dr. Physick, of Philadelphia, is due the merit of first employing the now well-known stomach-tube, or œsophageal catheter, the benefits resulting from which have been so great that the profession in the United States may well be jealous of the credit of the invention and application of such a simple contrivance. In support of this assertion, I would mention the following facts: In the *American Medical Recorder*,† Dr. Caleb B. Matthews published a paper, in which he showed very satisfactorily the origin of this instrument, Dr. Philip Syng Physick, in 1800, having recommended it in his annual lectures in the University of Pennsylvania. Dr. Dorsey, who was in Paris in 1803, also states that he had a gum-elastic tube, or catheter, made to Dr. Physick's order, for the purpose of evacuating the contents of the stomach, the length of which was so great as to excite considerable curiosity among the Parisian manufacturers of catheters, who could not divine for what purpose it was intended. In 1809 this instrument was employed by Dr. Dorsey,‡ and, by

* See Bibliography. Paper by P. B. Goddard, M. D.

† Am. Med. Record, vol. x. p. 322. Philad. 1826.

‡ Eclect. Repertory, October, 1812.

others subsequently, an indefinite number of times. From a claim afterwards made for the priority of this invention by Dr. Alexander Monroe, Jr., of Edinburgh, it seems that this gentleman had also conceived the same idea, and in an inaugural thesis, published in 1797, proposed similar means for extracting poisons, though he does not appear to have ever brought his suggestions into practice. Dr. Physick, though admitting at a later period the coincidence of this suggestion, always stated his ignorance of the thesis in which it was published; and being the first person who had one constructed and employed, is certainly entitled to the credit of the operation, though willing to share the originality of the suggestion with another.

In the paper advocating the claims of Dr. Physick, will also be found a reference to the apparatus of Dr. Ewell, of Washington, as proposed in 1808, and of Mr. Jukes, of London, who contrived similar means in 1822, as well as the testimonials of the distinguished practitioners of that period, who by common consent seem to have awarded the merit of the original manufacture and application of the tube to Dr. Physick, he having, in the paper referred to, also furnished drawings of the stomach-pump, to which it was adapted.

§ 3.—STRICTURE OF THE ŒSOPHAGUS.

PATHOLOGY.—The analogy existing between strictures of this canal, and that of the urethra, has always attracted the attention of surgeons when referring to this complaint. From the difference, however, which exists between the surrounding tissues in these two structures, a special description of the effects of the complaint, as developed in the œsophagus, is essential to a correct appreciation of the value of the various modes of treatment proposed for its relief.

In an able article, written by Velpeau,* will be found much valuable information, and to it I am mainly indebted for the following details:—

The condition of the œsophagus, under the various causes producing stricture, is very varied; but, however excited, the constriction will generally be found to exist either near the upper or lower extremity of the tube, and to be due to certain deposits around, or changes in the mucous coat of the canal. Sometimes

* Dictionnaire des Sciences Médicale, tome 21me, p. 397. Paris, 1840.

this coat is simply thickened, though it has also been found to be decidedly hypertrophied. When the stricture has existed for some time, or has commenced in the cellular coat of the œsophagus, the induration of the part is so marked as to present a mass closely analogous to scirrhus, whilst it has occasionally been found to have changed or entirely destroyed the ordinary characters of both the mucous and muscular coats, thereby rendering it difficult to decide in which tissue the disease had commenced.

The extent of a stricture in the œsophagus is very variable, usually it is not more than a few lines, though it may reach to the length of several inches. At the seat of stricture there is often found a central contraction, or bandlike thickening, above and below which the indurated part is less constricted, whilst the portion of the canal immediately around the seat of the stricture, has been known to be dilated into a pouch capable of holding a quart of liquid. Below the stricture, the œsophagus is occasionally more contracted than natural, and its parietes are also found to be thicker than in the normal condition. Frequently, on the contrary, it has presented no marked alteration. Ulcerations have also been found in the strictured portion of the canal, though they are believed to be more common above it, either in consequence of the particles of various substances remaining in the dilated portion, or from the efforts of the muscular coat of the canal to eject them, inducing increased inflammatory action.

In many instances, the adjacent lymphatic glands are either engorged or degenerated; and when the stricture has been seated in the neighborhood of the thyroid gland, the latter has been seen to be either hypertrophied, or very materially changed in its structure. In some instances, adhesions have formed between the posterior face of the trachea and the front of the œsophagus, or between the latter and the carotid artery or the aorta, under which circumstances, a perforation of the œsophagus at these points is inevitably fatal.

From this statement of the changes in the structure of the part, every surgeon must see the dangers attending any attempt to overcome old strictures of the œsophagus; and he should, therefore, be especially cautious, not only in his prognosis, but also in the employment of the various means that have been suggested for the relief of the complaint.

The operations that have been recommended for the cure of œsophageal contraction consist in dilatation of the stricture, in the ab-

sorption or destruction of the diseased substance, or in a direct incision through the constricted portion, so as to restore the permeability of the canal.

I. DILATATION OF THE STRICTURE.

Instruments.—Without entering upon an account of the various instruments that have been suggested for the purpose of dilatating the stricture, this account will be limited to the operation as accomplished by means of bougies. As originally suggested by Sir Everard Home, these bougies were made of waxed linen in the manner that will be referred to under the head of operations on the urethra, and being passed into the œsophagus, by the manœuvre directed for the introduction of the stomach-tube, were either held for a few minutes against the seat of the disease, or gently pressed through the stricture, so as to dilate the canal as they advanced. The ordinary condition of these bougies, when made entirely of linen, does not, however, afford sufficient firmness to prevent the pressure upon them causing a lateral deviation of the instrument, in consequence of which the surgeon cannot tell accurately upon what point of the œsophagus his force is applied. An instrument which I have found to answer better, is one employed by Dr. Wm. E. Horner, of Philadelphia, and represented in Plate XXX. Fig. 6. It is formed by rolling a piece of waxed linen, about three inches long, and cut bias so as to give it a conical shape, around the end of a flexible piece of whalebone, like that employed for the probang.

Operation.—After smearing the instrument either with molasses or oil, pass it into the seat of the stricture, and make gentle pressure at the obstruction until it yields, directing the point of the bougie to the part that seems most constricted.

Remarks.—In all attempts at dilating strictures of the œsophagus, it should be remembered that gentle and continued pressure answers better than violent efforts. In fact, the principles that would direct the dilatation of a strictured urethra, are also those which should guide the operator in relieving this complaint in the œsophagus. But as before mentioned, the canal about the seat of stricture is liable to dilatation, and to softening or ulceration, and if the bougie should be made to bear too forcibly on such a point, perforation of the canal must ensue, and the patient be exposed to all the risks of suffocation or

infiltration of the surrounding parts on the first attempt that is made to swallow liquids. In the lighter forms of permanent stricture, in which the tissues are not much changed, and in the spasmodic variety, dilatation presents many chances of success; but, like strictures in the urethra, dilatation of those in the œsophagus will prove but a temporary means of relief if the surrounding parts are much indurated. Under these circumstances, the application of caustic may be advantageous, if judiciously and carefully directed.

II. APPLICATION OF CAUSTIC.

The caustic applied for the relief of strictures of the œsophagus, may be either the Kali purum or caustic potash, or the nitrate of silver. From the difficulty of regulating the action of the potash, and the peculiar advantages resulting from the application of the lunar caustic to the mucous membranes generally, the latter is decidedly preferable. It may be employed in the following manner:—

Operation.—Pass a simple or unarmed bougie down to the stricture, and mark accurately the distance of the disease from the mouth. Then arm another bougie, by scooping a little hole in the end of the waxed linen, and fitting in this a small piece of the nitrate of silver: be careful to fasten it accurately in its place, so that it may project a little beyond the level of the point of the instrument. Mark upon this bougie the distance of the stricture from the teeth, as shown upon the former instrument, and passing it rapidly to the seat of the disease, retain it in contact with the part from one to three minutes. On withdrawing it examine the caustic, in order to judge how much has been dissolved, and if it is deemed to be too much, or such as might act upon the surrounding parts, cause the patient to swallow some strong salt and water in order to neutralize it and prevent its continued action.

Remarks.—The application of the nitrate of silver in this disease is beneficial in two ways. 1st, by repeatedly creating a superficial eschar on the surface of the stricture, it gradually destroys it; and 2d, by stimulating the absorbents, and modifying the action of the mucous membrane, it does much towards the radical cure of the complaint. After a few applications of it, the simple bougie will often be found to pass readily, whilst the relief will be more permanent than that which ensues upon the simple dilatation of the part,

except in the spasmodic form of the complaint. It need hardly be said that the application of the caustic should be restricted to the diseased portion of the canal, by placing it in such a position in the bougie as will prevent its action elsewhere.

III. ŒSOPHAGOTOMY.

Under peculiar circumstances, as when it is necessary to remove a foreign body from the canal, or when, in cases of impervious stricture, there is a necessity for the introduction of food in order to sustain life, it has been advised to incise the œsophagus from the outside of the neck. Although a rare operation, and one which offers but slight chances of permanent relief in cases of stricture, this operation has been successfully resorted to, an example of which has been reported by Taranget,* where the patient was thus nourished sixteen months.

Nearly equal success has, however, been obtained by a direct opening into the intestines or stomach, while the injection of nutritive substances into the rectum presents a very good substitute for such a hazardous means of treatment.†

In a paper by Dr. John Watson, of New York, may be found the history of a case in which the patient's life was considerably prolonged by this operation, though he ultimately died from the extension of the disease to the bronchia. Œsophagotomy is, however, very rarely resorted to, having only been performed five times, two of which were reported more than a century since.

Three modes of operating have been suggested, to wit, that of Guattani, who incised the left side of the neck, and dissected to the œsophagus, between the trachea and the sterno-hyoid and thyroid muscles (Plate XXXVI. Fig. 6); that of Eikholdt, who made his incision between the two origins of the sterno-cleido-mastoid muscle; and that of Boyer, who cut between the sterno-hyoid and sterno-mastoid muscles. Boyer only opened the œsophagus for the extraction of foreign bodies, and was, therefore, guided by the projection of the substance. Giraud and Vacca Bellingheri first introduced a silver sound, so as to render the œsophagus prominent; and Begin trusted entirely to the anatomical relations of the part.‡

* Dict. des Science Méd., tome xxi. p. 412.

† Bibliography, art. Œsophagus, paper by Dr. D. J. Cain, of Charleston.

‡ Malgaigne, Philadelphia edit., p. 376.

Without further reference to these various plans of treatment, it may suffice, as illustrative of a successful method of operating, to state the manner in which it was accomplished by Dr. Watson, in February 1844.

Operation of Dr. Watson, of New York.—The patient being placed on a cot near a window, with his back well supported by pillows, and his head thrown gently backwards, the incision was commenced on the left side of the neck, midway between the os-hyoides and the upper border of the thyroid cartilage, just in front of the sterno-mastoid muscle, and carried down parallel with the edge of this muscle to within an inch of the sterno-clavicular articulation, dividing the skin, superficial fascia, and platysma-myodes muscle.

A second incision, nearly an inch in length, was now made nearly parallel with the upper edge of the thyroid cartilage, terminating posteriorly at the upper extremity of the first and extending to the same depth. After turning up the flap at the angle of these cuts, a glandular tumor, about the size of a hazlenut, was exposed and removed from among the layers of the deep fascia. It proved to be very hard, and contained a yellowish concrete pus in the centre. The dissection being then continued through the deep fascia, the omo-hyoid muscle was exposed and divided; the superior thyroid artery brought into view, secured by two ligatures, and divided between them and the loose cellular tissue between the carotid and the trachea, separated by the handle of the scalpel until the lower portion of the pharynx and part of the œsophagus were fairly exposed, this structure being put upon the stretch at every effort of the patient to swallow. The edges of the wound being then dilated by curved spatulæ, an attempt was made to seize and puncture the wall of the pharynx, but owing to the difficulty of accomplishing it without endangering other parts, a silver catheter was introduced through the mouth to the stricture, and, its point being cut upon, the œsophagus was opened.

On passing an instrument into the opening, the seat of obstruction was found to be just below the incision but within reach of the finger; and, as there was danger of wounding the ascending thyroid artery, in an attempt to divide it from within, it was found necessary to open it from without. In order to obtain room, the sterno-mastoid muscle was therefore divided transversely, and the upper border of the thyroid gland turned down.

The recurrent nerve being now brought into view, one of the

branches of the superior thyroid artery was divided as it entered the gland, giving rise to the only hemorrhage during the operation that required attention, and this being arrested, the division of the stricture was effected by an incision through it of at least an inch and a half in length, the obstruction depending apparently on a simple induration and contraction of the part not over five or six lines wide. A stomach-tube being now introduced through the wound, wine and arrow-root were administered. This tube was then secured to the side of the head by its free extremity, the transverse portion of the wound closed by a single suture, and the remainder allowed to remain open. At the end of six days, the tube being removed, a second one was introduced through the nostril, down through the stricture, and worn twenty-five days, the wound being closed by adhesive plaster. Several changes in the catheters being made from time to time, the patient continued wearing them for nearly seven weeks, the wound having healed around it. At the end of this period, the tube was withdrawn on account of the irritation in the throat, the obstruction in the œsophagus re-appeared, so as to require the re-opening of the wound in the neck, and the patient died about three months subsequently.

Remarks.—That Œsophagotomy is an operation requiring much deliberation on the part of an operator, in connection with its results, is a point that has long been regarded as settled, and that it is a formidable operation must, it is thought, be apparent to all who read the account furnished by Dr. Watson. The question, therefore, naturally presents itself whether, in order to prolong life, it may be right to advise a patient to submit to it. Deeming the relief afforded by it dearly purchased at the risks of the operation, except in very skilful hands, I cannot but think that the dangers of making an opening directly into the stomach, as subsequently referred to by Dr. Watson, in the paper before quoted, is certainly not greater than that incurred in œsophagotomy. The number of instances in which wounds and openings into this organ have not proved fatal will, on examination, be found to be much larger than might at first sight appear probable.* The well-known case of St. Martin, and the case reported by Etmüller, where a fistula in the stomach remained open ten years, together with nume-

* See Bibliography, art. Abdomen.

rous other facts collected by Dr. Watson's extended research, will at least warrant the assertion that an opening into the stomach is an operation as justifiable in urgent cases of stricture of the œsophagus, and probably quite as favorable to the recovery of the patient, as that of œsophagotomy. But no surgeon, it is presumed, would attempt either operation, unless especially urged thereto by the peculiar circumstances of his patient.

In the event of the distribution of property, or to accomplish some great moral good, or in order to fulfil an important duty to another, a patient might desire to prolong life, if possible, even for a few weeks, and, under such circumstances, it may become imperative on a surgeon to resort to such means as will enable him to obtain the desired time.

CHAPTER V.

OPERATIONS DEMANDED FOR THE RELIEF OF DEFORMITIES IN THE NECK.

THE affections of the neck which lead to such deformities as demand direct surgical interference in the way of an operation, being due usually to contractions either of the skin, fascia, or muscles, it is generally necessary to employ some mechanical means either to extend the contracted tissue, or to prevent the re-appearance of the deformity after the operation. In most instances, therefore, the assistance to be derived from proper dressings and mechanical contrivances should be remembered, and proper preparations made, before any incision is commenced.

The deformities of this region may be subdivided into those affecting the skin and fascia, which are usually the result of burns, and those confined to the sterno-cleido-mastoid muscle, the latter being consequent on various causes.

SECTION I.

DEFORMITIES FROM BURNS.

The destruction of the skin and cellular tissue, consequent on burns of this region, occasionally produces such a contraction of the features as results in hideous deformity, or in an inability on the part of the patient to perform many of the motions of the neck, thus interfering with the action of the head, and preventing the proper execution of such movements as are required in various daily occupations. Among the most serious of these injuries, is such an adhesion of the skin of the neck to that of the chest, as results in an inability to elevate the head, or such a contraction of the integuments about the chin as renders it impossible to close the mouth, or draw up the lower lip. Under these circumstances, operative surgery is capable of adding much to the comfort and happiness of the sufferer, and, even in very marked cases, has produced results that have been of the most gratifying kind.

In order to appreciate the value of the operations that have been, at different periods, suggested for the relief of deformities from burns, whether on the neck, or elsewhere, it is important that attention should be given to the changes produced in the tissues affected, as well as to the almost unvarying tendency of the structure involved, to reproduce similar contractile tissues, unless the diseased portion is removed, and the space filled in by healthy structure, the latter being usually obtained by some means similar to those before referred to, in connection with the class of plastic operations upon the face.*

In an excellent paper upon Cicatrices and Cicatrization, by S. Laugier, in the *Dictionnaire de Médecine, ou Repertoire des Sciences Médicales*, vol. vii., is an extended reference to the pathological changes produced by destruction of the skin, as the result of wounds and similar injuries; and from this and other sources, the following account has been condensed.

Pathology of the Cicatrices from Burns.—Delpech having shown that, in all wounds which suppurated freely, or did not unite by the first intention, the granulations resulted in the formation of

* See Part II. p. 136.

a fibrous tissue unlike the ordinary structure of the part, and which structure he named the "Inodular," all cicatrices, and especially those resulting from burns, are often spoken of simply as the "Inodular Tissue."

This tissue is always the result of suppurative inflammation; is manifestly fibrous in its character; of a dull white color; without the shining appearance of fascia, or the satin-like character of the surface of a tendon. In consistence and hardness it has been compared to the strongest ligaments of the joints; but its fibres, unlike these ligaments, run in all directions.* The contraction of this structure, although, at first, highly useful in closing any wound, may, by its continuance, create such traction upon surrounding parts as will result in the evils just referred to in connection with burns; and, as it continues to contract for various periods after its formation, Dupuytren established three rules of practical value in the selection of such cases as could be relieved by a surgical operation.

1st. He advises the surgeon not to attempt to correct the deformity resulting from these cicatrices, until many months, or even years, have elapsed after their production.

2d. Never to operate unless certain of obtaining a larger cicatrix than that which it is wished to correct.

3d. To be certain that the operation can restore the parts to their shape; consequently, in cases of anchylosis of a joint, the operation would be improper.

In relation to the different modes of operating, he also gives directions of much value.

1st. In a long narrow cicatrix, he recommends the operator to make several incisions so as to divide the cicatrix transversely through its entire thickness, without ever removing any part of it, in order to facilitate its stretching.

2d. To stretch the parts, and bring them into a direction different from that which the complaint had caused, in order to obtain a cicatrix by the production of new skin. This extension must, however, be practiced with judgment, lest violent pain, inflammation, and gangrene result, as in a case reported by Delpech.

In salient cicatrices, unaccompanied with retraction, he advises:—

1st. To remove the prominence by a subcutaneous section, the

* Dict. de Méd., tome 7me, p. 579, et infra.

knife being introduced flatwise, and made to shave the skin from the cicatrix as far as its extremities, in order to loosen the latter.

2d. To keep the edges of the wound open.

3d. Frequently to cauterize the surface, so as to keep it a little below the level of the integuments.

DELPECH, on the contrary, advocates the removal, as far as possible, of the entire cicatrix, and says that, when this is done, there will generally be found sufficient skin to draw upon, in a direction opposite to that which caused the deformity, thus enabling the operator to obtain immediate reunion.

When it is possible to gain sufficient skin to permit this immediate reunion of parts, the method of Delpech will be found preferable; but, in other cases, a large gaping wound would be formed, which would create even greater trouble than the original complaint.

The decision of either operation will, therefore, necessarily depend chiefly upon the peculiarities of the case presented to each operator at the moment.

In extensive cicatrices about the neck, where it is of great consequence to obtain free motion, without being liable to a modified reproduction of the difficulty from the newly-made cicatrices, some of the various autoplastic operations will prove especially serviceable.* In these operations, the ordinary principles of plastic surgery must be followed out, and the flap, which should if possible be taken from a part of the skin where it is healthy, made of such a size as may be demanded to fill up the wound left by dissecting out the cicatrix, or by destroying its adhesions. This flap should be closely attached to the edges of the wound by numerous points of the interrupted suture, and then the sore left by the removal of the flap, either united, or allowed to heal by granulations.

In a paper by Dr. Thomas D. Mütter, upon the relief of deformities from Burns,† these principles have been well illustrated, and, from among several of the cases there reported, the following has been selected as applicable to the more severe injuries of this character.

OPERATION OF DR. MÜTTER FOR THE RELIEF OF CICATRICES FROM BURNS ON THE NECK.—The patient, a young woman, aged twenty-eight years, had been burnt twenty-three years previously upon the face, throat, and upper part of the thorax, from her dress taking

* See Plastic Operations on Face, Part II., page 136.

† See Bibliography. Deformities of the Neck.

PLATE XXXIII.

OPERATIONS PRACTICED ON THE NECK.

Fig. 1. A view of the Lymphatics, together with the Bloodvessels and Nerves found on the side of the Neck. 1. Carotid artery. 2. Par vagum nerve. 3. Internal jugular vein. 4. Subclavian artery. 5. Subclavian vein. 6. Brachial plexus of nerves. 7. Lymphatic vessels and glands. 8. Phrenic nerve. 9, 9. Sterno-hyoid and sterno-thyroid muscles. 10. Thyroid gland. 11. Superior thyroid artery. 12. Lymphatic gland, situated on temporal vein. 13. Lymphatic, at angle of jaw, imbedded in parotid gland, and liable, when diseased, to be mistaken for enlarged parotid. 14. Three superficial lymphatic glands on course of sterno-cleido-mastoid muscle. 15. Deep-seated lymphatic at lower part of jaw. 16. Facial artery and vein. 17. Lymphatic gland in advance of submaxillary. 18. Submaxillary gland. 19. Three superficial lymphatics behind sterno-mastoid muscle. 20. A large lymphatic gland situated outside, but adjacent to sheath of bloodvessels. 21. A chain of lymphatic glands which extend from side of neck to beneath the clavicle between the trapezius and sterno-mastoid muscles. All the lymphatic glands above referred to are the occasional seat of tumors in the neck. After Bonnamy and Beau.

Fig. 2. Effects of a Cicatrix from a Burn of the Neck. After Nature.

Fig. 3. Myotomy as practiced for the relief of Torticollis. 1. Right hand of surgeon in the act of inserting the tenotome beneath the skin. 2. His left hand raising the muscle. After Bourgery and Jacobson.

Fig. 4. A view of the position and development of a Carotid Aneurism. 1. Common carotid artery. 2. Aneurismal sac. 3. Par vagum nerve displaced by the tumor. 4. Hypo-glossal nerve forced downwards and forwards by the growth of the tumor. 5. Internal jugular vein. 6. Sterno-cleido-mastoid muscle and skin drawn to one side by 7, a curved spatula. After Nature, and John Bell.

Fig. 5. Ligature of Arteries about the Neck. L. Ligature of the lingual artery. 1, 1. Ligature passed beneath the artery. 2. Stylo-hyoid muscle. 3. Hypoglossal nerve. 4. Digastric muscle. 5. Incision through skin and fascia. 6. Platysma-myoides muscle. After Bourgery and Jacobson.

C. Relative position of the parts concerned in Ligature of the Primitive Carotid. 1. Upper end of incision. 2. Skin and fascia. 3. Abnormal arterial branch from arch of aorta to pharynx, running parallel to carotid artery. 4. Common carotid. 5. Descendens noni nerve. 6. Par vagum. 7. Internal jugular vein drawn aside. 8. Sterno-cleido-mastoid muscle held back. 9. Blunt hook. After Auvert.

A. Ligature of Axillary Artery. 1, 1. Line and extent of incision. 2. Pectoralis major as divided. 3. Axillary artery. 4. Ligature placed beneath it. 5. Axillary vein. 6. Brachial plexus. 7. Pectoralis minor muscle. After Bourgery and Jacobson.

Plate 33

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

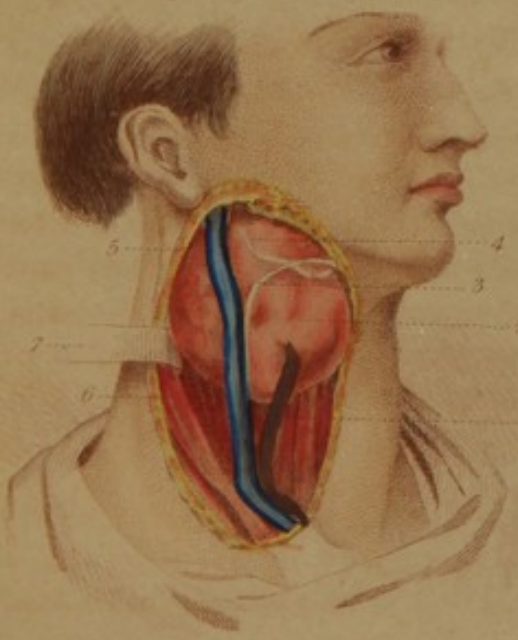


Fig. 5.

fire. She had been unable to throw her head to the left side, or backwards, or to close her mouth for more than a few seconds during the whole time. The right eye was also drawn down some distance below the other, and when an effort was made to turn the head, the eye became closed. The chin was drawn to within one inch and a half of the top of the sternum, and this place was so filled up by the cicatrix, that no depression existed in front of her neck.

Operation.—The patient being placed in a strong light, on a low chair, with her head thrown back as far as possible and sustained by an assistant, an incision was commenced on the outside of the cicatrix in the *sound skin*, and carried across the throat into the *sound skin* on the opposite side. This incision penetrated through the integuments as near the centre of the cicatrix as possible, and was about three-fourths of an inch above the top of the sternum, the object being to get at the origin of the sterno-cleido-mastoid muscles, which, in consequence of the long-continued flexion of the head, were not more than three inches long.

After exposing the muscles, a director was passed under that of the right side, and both its origins divided. The sternal origin of the left muscle was next divided in a similar manner, when it was found that the head could be placed in a proper position. The elevation of the chin now left a wound six inches long by five and a half wide, to fill which, a flap was formed from the shoulder by an incision which, commencing at the left end of the wound in the neck, extended downwards and outwards over the deltoid muscle, so as to furnish an oval piece of integument six inches and a half long by six wide, which was left attached by its base at the upper part of the neck. On dissecting this flap free from the shoulder, it was twisted by a half turn on its pedicle, brought round into the wound on the front of the neck, and retained there by numerous twisted sutures and adhesive strips; after which, the wound on the shoulder was closed as far as possible by sutures and strips. The head being now carried backwards, and maintained in this position, the patient was put to bed, and union by the first intention took place throughout the entire wound, with the exception of one small point which healed by granulation.*

Some additional steps relieved the eye and mouth; and, twelve months subsequently, the cure of the patient was complete.

* Am. Journ. Med. Sciences, vol. iv., N. S., p. 69; also Op. Surg., by J. Pancoast, M. D., p. 359.

SECTION II.

TORTICOLLIS, OR WRY NECK.

By the term torticollis, or wry neck, is usually designated such distortion of the head, from muscular contraction, as brings the back part of it forwards, downwards, and sideways, so as sometimes to turn the chin upwards and over the opposite shoulder, the former being raised in proportion as the occipital bone is drawn down. Although disease of the vertebræ, injuries of the skin, or other causes, may create this deformity, the present account will be limited to the consideration of such cases as are mainly dependent on an unnatural and permanent contraction of the sterno-cleido-mastoid muscle.

Among the various causes that excite this deformity, there is sometimes seen an unnatural contraction of one muscle, in consequence of the partial paralysis of that of the opposite side, the contracted muscle being generally felt like a tense prominent cord, or, if not distinct, readily made so by any effort to turn the head towards the sound side. To relieve this condition of things, and bring the chin again to its natural line, the operation of myotomy, or the subcutaneous division of the muscle or its tendon, and the application of a suitable apparatus for making moderate extension of the muscle, and preventing the future contraction of the new tissue formed in the line of the incision, is especially calculated.

When, after an examination of the origin of the complaint, its existence is found to be mainly due to a contraction of the muscle, stimulating frictions, electricity, galvanism, and manual efforts to restore the head to its proper position may be first resorted to; but when, after a trial of these and similar measures, little progress is made towards a cure, the division of the muscle or its tendon will materially expedite the result.

Operation.—Various modes of operating have been suggested by different surgeons, in order to accomplish the accurate yet safe division of a muscle, which is known to be so closely connected with important bloodvessels and nerves throughout most of its course, as the sterno-cleido-mastoideus. These suggestions differ, however, mainly in the shape of the knife or in the point at which the muscle may be most advantageously incised; but, as the subcutaneous divi-

sion is preferable to the old plan of dissecting down to the muscle, the description of the operation will be limited to this mode of operating.

In the United States, the simplicity of the operation, or its frequent performance, has apparently prevented the publication, by surgeons, of such details as would be most serviceable to an inexperienced operator, and the two papers published by the gentlemen hereafter quoted will therefore be found to furnish the principal exposition of the views of surgeons, in this country, of an operation, the utility of which has been doubted.

Operation of Dr. J. Mason Warren, of Boston.—A boy, sixteen years of age, having fallen from a height when four years old, was shortly afterwards found to labor under Torticollis. At the time of the operation, the head was drawn to the left side, the ear usually resting on the left shoulder, though it could be slightly raised, the inclination to one side being accompanied by such a rotation of the head as caused the face to regard the right shoulder. There was also a lateral curvature of the spine, the left shoulder being the highest. The sterno-mastoid muscle of the left side, on being examined, was found to be strongly retracted, whilst the deep-seated muscles of the neck, the scaleni, especially, could also be distinguished in an unnatural state of rigidity, the sterno-cleido-mastoid being, however, the chief obstacle to the proper position of the head. In addition to these changes, the whole of the left side of the face was atrophied, and each of its component parts much smaller than those of the opposite side. This alteration of the features has been attributed by M. Guérin to the distortion which the great vessels of the neck experience in consequence of the deformity, whilst the curvature of the spine is regarded as due to the inclination of the cervical vertebræ on the dorsal; of the dorsal on the lumbar, and the lumbar on the sacral, in order to obviate the displacement of the head and bring it within the axis of the body.

In consequence of this condition of things, Dr. Warren determined to divide the sterno-mastoid muscle at its sternal origin, the opinion being entertained, as suggested by Guérin, that the complaint was mainly due to the retraction of this portion of the muscle. Accordingly, its division was accomplished as follows:—

Operation.—The head being well supported and carried a little forward, so as to throw the muscle outward from the subjacent parts, a puncture was made with a lancet through the skin about six

lines above the clavicle, between the sternal and clavicular origins of the muscle. A narrow blunt-pointed knife (Bouvier's) was then introduced with its flat side towards the muscle, carried behind the sternal origin, its edge turned towards the muscle, and the section completed by a slight sawing motion, the effects being indicated by a distinct cracking sound and by the partial restoration of the head to its natural position. The little wound in the skin being then closed by plaster, a cap was placed on the head, to the back of which, opposite the right mastoid process, was attached a strap, which, being drawn tight, was secured over the breast of the same side. A stiff stock was also subsequently added to the dressing, and, in the course of a fortnight, a great change in the position of the head was perceptible, though it yet remained somewhat inclined to the left, the clavicular origin of the muscle having become more prominent since the division of its sternal attachment. To remedy this, it was, therefore, decided to divide the clavicular origin also, which was accomplished as follows: The head being well supported, and the muscle sufficiently relaxed by inclining it to this side, the body of the muscle, just below the union of its two origins, was readily seized between the thumb and fingers, and completely isolated from the subjacent parts. A sharp-pointed knife was then carried beneath the muscle, until it could be felt under the skin by the finger on the opposite side, when the patient being directed to contract the muscle its section was readily accomplished. In forty-eight hours the wound was healed, and, nine months after the operation, the patient's appearance was so much improved that his former friends could scarcely recognize him.*

Operation of Dr. J. C. Warren, of Boston.—A little girl nine years of age, also much distorted, was operated on as follows:—

The head being supported, and the muscles rendered tense, a narrow sharp-pointed bistoury was passed flatwise between the skin and the sternal origin of the muscle from without inwards (Plate XXXIII. Fig. 3), and the edge of the knife being then directed upon the muscle, its division was accomplished. The knife being now withdrawn and again entered at the same orifice, was carried in front of the clavicular origin of the muscle, which was divided in a similar manner. Bandages, similar to those in the preceding case, were then applied, and two months after the operation her head was so nearly straight as not to be perceptible to ordinary observers.†

* Boston Med. and Surg. Journ., vol. xxv. p. 123.

† Idem., p. 124.

Dr. John W. Brown, of the Boston Orthopedic Infirmary,* after dividing the muscle, employed a simple yoke to which bands from a cap were attached, and has published in a paper on the subject an expressive drawing of the apparatus, of which my present limits forbid a description. In Plate XXXV. Fig. 14, may, however, be seen a contrivance, made by Rorer, of Philadelphia, which I have found to be well adapted to the object in view.

Remarks.—Having formerly followed closely the practice of M. Guérin in Paris, and also noted the results of such patients as have been presented to me in the United States, I am induced to think that more or less benefit will be derived from the section of this muscle in most of the cases which are unaccompanied by deformities in the bones, whilst, in those solely dependent on a contracted condition of the muscle, a perfect cure may be anticipated. Of the various modifications, suggested in the performance of the operation, there are none of great consequence; though the section of the muscle from before backwards, as practiced by Dr. John C. Warren and others, is, I think, the safest. In operating in this manner, attention should be given to the position of the external jugular vein as it approaches the subclavian vein; and when the knife is upon the muscle, the division of the latter will be most safely accomplished by holding the knife firmly against the muscle, and causing the latter to press against the knife by carrying the head in such a position as will make the muscle prominent. A narrow straight bistoury, or a knife, like that in Plate XXXV. Fig. 13, makes so small a wound, that, if care is taken to exclude the air, but slight inflammation will ensue upon the operation.

Much of the success of this operation will, however, depend on the proper employment of mechanical means subsequently. The apparatus (Plate XXXV. Fig. 14), before referred to, is simple and efficient; but a night-cap and bandage, a tin frame, or any other contrivance, which will enable the surgeon to draw the head into the proper position, will often be found to answer quite as well. The division of the muscle, it should be recollected, only facilitates the cure; the mechanical treatment accomplishes the most important part of it, and also prevents that reproduction of the deformity which is likely to ensue, when means are not taken to obviate it.

* Idem., vol. xxvi. p. 58.

CHAPTER VI.

TUMORS OF THE NECK.

THE word Tumor (*tumeo*, I swell) has been employed by Boyer to designate "any preternatural eminence developed in any part of the body;" by Hunter as expressive of "a circumscribed substance produced by disease, and different in its nature and consistence from the surrounding parts;" whilst by Professor Miller, of Edinburgh, it is applied "to any morbid growth or new structure which is the result of perverted nutrition in a part, independent of the inflammatory process otherwise than as an exciting cause; and possessed of a power of formation and increase distinct from those of the original tissues." These definitions, though not universally applicable, are, however, sufficiently correct to present any one with a good idea of the most general characters of this class of disorders, and in that of Mr. Miller may also be found a brief account of their physiology. As the changes of structure which result in tumors may happen in all parts of the body, and as the account of the pathology of the various kinds has been found sufficient to occupy entire volumes, no attempt can possibly be made in the present limits to investigate the subject in all its details. In the excellent volume by Dr. John C. Warren, of Boston,* may be found the results of many years of study, combined with the experience furnished by a long life of observation, and to this work, as well as to the article on Tumors, to be found in Miller's *Principles of Surgery*, the reader is referred for such an account of the general pathology of these formations as would extend these pages beyond their proper bounds. Without, therefore, doing more than mention some of the different species of tumors found in the neck as well as elsewhere, I shall at present confine myself to a few general remarks on such of the varieties found in the neck as require operative interference, and to a brief allusion to the means of diagnosis applicable to most of them.

* Surgical Observations on Tumors, with Cases and Operations. Boston, 1839.

SECTION I.

GENERAL PATHOLOGY OF TUMORS OF THE NECK.

No matter what may be the peculiar characteristics of the tumors found in this region of the body, no one can for a moment regard their growth, without being curious to know in what way they have originated, and what tissue has been made the nidus for their development.

The causes of tumors of the neck may, like those seen elsewhere, be very varied, thus a blow, strain, cut, burn, or chronic inflammation, may all, under proper conditions of the system, result in the development of a tumor. In most instances, it may justly be presumed that these causes only produce a modification of healthy inflammatory action, and that the abnormal growth originates, therefore, like the healthy tissues, in the deposit of a blastema, which, instead of being reparative in its character, or proceeding to the production of a healthy structure, results in the formation of one whose character is dependent on various circumstances. Thus, a very slight modification of the primitive cell may result in the production of what has been justly designated as an Analogous tumor or a growth bearing considerable resemblance to the ordinary textures, whilst the influence of constitutional causes may lead to the formation of a Heterologous growth, or one which differs widely in its appearance, general arrangement, and subsequent progress from that which usually results from healthy or eu-plastic lymph.

In the neck, as in other portions of the body, the changes in the nutritive action of a part may result in simple induration, hypertrophy, or increased formation of normal textures, or in the deposit of caco-plastic lymph and morbific matter in the lymphatic glands, or in the reticulated structure which is so freely developed throughout this region. Whether the new growth be Benignant or Malignant, it generally produces some change in the surrounding parts; thus, in most tumors, the surrounding cellular tissue becomes indurated, lamellated, or cystiform, so as to surround them with a perfect sac; the muscular structure atrophied or hypertrophied, the first being the more common; the fascia either increased or

diminished in density; the larger vessels thickened or contracted; the capillaries engorged and augmented in size, whilst the whole arrangement of parts will be more or less displaced in proportion to the tension of tissue created by the growth of the tumor. So varied, however, are the positions, structure, character, and modifying influences seen in different cases of tumors, that it is impossible to lay down concisely anything like a general law of progress. Usually, the surgeon will not widely err in prognosticating the changes that he will meet with in removing tumors of the neck, if he bears in mind the facts that, with the exception of the dermoid class, all tumors of this region are covered by a fibrinous expansion which limits their external development and causes pressure on adjacent parts; and that the progress of the inflammation excited around the mass will necessarily produce all the changes likely to result from this process elsewhere, such as serous or fibrinous effusions, adhesions, increased or diminished vascularity, and a general matting together of parts usually distinct.

In the various attempts that have been made to group the different kinds of tumors, writers have always found it difficult so to arrange them that the classification would be accurate; the varied degrees of departure from healthy structure exhibited by different cases preventing anything more than an approximation to their character. Among the older writers, the terms fleshy, fatty, pulpy, honey-like, or encephaloid, designated their appreciation of the sensible characters of each class; whilst Abernethy and Laennec described them as pancreatic, mammary, medullary, tuberculated, melanotic, and carcinomatous sarcoma. Müller has more recently divided them according to their chemical nature, microscopic character, and mode of development, into fatty, jelly-like and albuminous tumors, such substances being a principal characteristic in all of these growths, though the proportions in each may be very varied.

"The chemical constitution of tumors shows that the principles chiefly found in them are fat, gelatine, and albumen, and according as any of these predominate the nature of the tumor is found to vary. Those which consist chiefly or wholly of fat contained in a cellular parenchyma, are analogous, simple, and non-malignant. Those which, by long boiling, are reduced almost entirely to gelatine are also non-malignant, and those which consist mainly of albumen include both analogous and heterologous formations; some being

malignant and others benignant, the carcinomatous being almost entirely composed of albumen.*

All tumors of the soft tissues are either solid, or contain solid and liquid matter, more or less combined and variously arranged, consisting either of a more or less compact fleshy growth, whose enveloping cyst is entirely a secondary formation,† being formed chiefly at the expense of the surrounding cellular tissue, or of a cyst, which is the original structure, and maintains the bulk and increase of the tumor by its secretory power.‡

The solid tumors embrace those known as sarcomatous, adipose, fibrous, cartilaginous, osseous, and cysto-sarcomatous, all of which are benignant; the tubercular or scrofulous, which is specific in its nature; and the carcinomatous, melanotic, medullary, and fungoid, which are malignant.

In studying merely the surgical treatment of tumors, many may be disposed to say that the peculiarities of each of these classes are a matter of little importance, provided the tumor is causing such a train of symptoms as renders it essential to the patient's safety or comfort that it should be removed. Though unwilling to admit the truth of such an assertion, the character of the present volume renders it inexpedient to spend more time on matters which are truly within the province of the principles of surgery. Attention will, therefore, now be directed to the means of diagnosticating the probable constituents of the tumor as well as its relations to surrounding parts.

§ 1.—DIAGNOSIS OF THE CHARACTER AND POSITION OF TUMORS OF THE NECK.

In diagnosticating these growths, the senses of sight and touch are those mainly required to arrive at a correct conclusion, though that of hearing may occasionally be called into play, in order to detect vascular disorders or connections.

* Miller's Principles of Surgery, p. 388. Philad., 1845.
† Miller, p. 392. ‡ Loc. cit.

I. THE CHARACTER OF TUMORS.

On looking at a tumor in the neck, the general shape and position of it should first be noticed. Tumors involving the glandular structures, and especially those of the lymphatic glands, will generally be seen to be nodulated or irregular, provided effusions into surrounding parts have not created such changes in the integuments as would equalize their surface. Those which are encysted or fatty are, on the contrary, more smooth on the surface and globular. Pulsation, change in the color of the skin, as blueness or redness, together with a turgescence of the superficial veins, are also points that should attract the eye in this primary investigation.

On feeling the tumor, a judgment should be formed of its solid or fluid character, of its hardness or softness, of its attachments to surrounding tissues, of its pulsations and of its sensibility. Hardness will generally characterize albuminous deposits, the majority of which are malignant; elasticity, amounting almost to a sense of fluctuation, characterizes the fatty class, whilst, unless the sac is very full, or the contents decidedly jelly-like, fluctuation and the presence of liquid may be readily told. Occasionally, the position of a tumor, and its confinement by the fascia, give to it a sense of pulsation that might lead to the supposition of its being a vascular enlargement. Under these circumstances, an effort should be made to elevate it from the subjacent artery; or the circulation be stopped in the latter by pressure and the change in the size of the tumor noted; or the ear may be applied and the peculiar aneurismal whir listened to. Some surgeons, in addition to these means, aid their diagnosis by introducing a grooved or cataract needle into the tumor, and noticing the character of what escapes, or the sensation of solidity given by the passage of the needle. When other means have failed, and a consultation are in doubt, or when the operator is prepared to remove the tumor at an early period, it may be useful to resort to this instrument; but personal experience has induced the opinion that, as a general thing, this aid to diagnosis is liable to abuse and to the production of injury. If the tumor prove to be malignant, its development will frequently be rapidly accelerated by such an application. To assist such as are not familiar with the general aspect of different tumors, and thus diminish the necessity for the use of the lately fashionable

grooved needle, the following brief account of their external characters is presented as collected from various sources, but especially from Miller's *Principles.**

The simple Sarcomatous Tumor has a smooth surface, a tolerably firm doughy feel; does not fluctuate or give any sensation approaching fluctuation; is not painful even when freely handled; is loosely attached, and does not implicate adjacent parts; increases slowly and without pain; possesses no more vascularity than a similar bulk would naturally have, and varies from the smallest to the largest size, weighing often many pounds. An example of this kind of tumor may be seen in Plate XXXIV. Fig. 1.

The Adipose Tumor, often designated as the Lipomatous tumor, may be either lobulated or non-lobulated, flat, globular, oval, or cylindrical, and either smooth or studded on the surface with small nodules. When touched, it is occasionally so elastic as to give a sensation closely resembling fluctuation, and requiring considerable skill to avoid an error in this respect. When handled, it is free from pain; the skin is pale, loose, and movable at first; but it and the tumor may become adherent by time and increased development of the complaint. The growth is slow and steady, and if the tumor is pedunculated, the skin will be stretched and elongated, so as to resemble the neck of a sac. (Plate XXXIV. Fig. 3.)

The Fibrous Tumor is the most dense and firm of the benignant class, being composed chiefly of dense fibrous matter. Its shape is generally globular, the surface often nodulated, and the investing cyst thick, strong, and slightly adherent to the tumor. It is generally perfectly circumscribed, movable, independent of adjoining tissues, painless, and slow of growth; but it often causes trouble by degenerating into the malignant structures, or by compressing adjacent vessels and nerves.

Examples of the lymphatic and encysted tumors may be seen well delineated in Plate XXXIV. Figs. 2 and 4.

II. THE POSITION OF TUMORS.

The large number of lymphatic glands found in the neck, and the knowledge of their ordinary position, render a diagnosis of many

* Principles of Surgery, by James Miller, F. R. S. E., p. 393, *et suprà.*— Phila. edition.

PLATE XXXIV.

APPEARANCE AND POSITION OF SOME OF THE TUMORS SEEN ABOUT THE NECK.

Fig. 1. Large Steatomatous Tumor of the right parotid region, caused by the devolopment of a sebaceous follicle in consequence of a blow upon the part. Commencing as a lump the size of a nut, this tumor gradually increased to nearly the size of the head; gave exit at one time to sebaceous matter; had a broad base; was nearly immovable; had the veins enlarged upon its surface, and showed a small ulceration in front, from which fetid, acrid, and bloody sanies had escaped. As the tumor enlarged, the jaw became closed; sensation of the face diminished, and there were all the other symptoms due to pressure on the vessels and nerves of the part. The tumor differs in appearance from scirrhus of the parotid gland in its size and period of development. It was readily removed, and is represented as an example of one of the class of tumors of the parotid region not involving the parotid gland. After Auvert.

Fig. 2. Large Tumor of the Neck dependent on degeneration of the lymphatic glands of the neck. Arising as a small swelling caused by an enlarged gland below the angle of the jaw, it gradually increased until it occupied the entire side of the neck, involving many glands, and reaching from above and behind the ear to below the clavicle, so as to turn the head to the opposite side. Its appearance was that of an irregularly lobulated mass: it was unaccompanied by pain, was perfectly firm and hard, and gave no sense of fluctuation at any point. Under the use of chloroform, it was successfully removed by Dr. Mott. After Mott.

Fig. 3. Appearance of an immense Lipomatous Tumor of the Neck. This tumor was not painful; had no pulsation; was formed of numerous large lobes, with the superficial veins distended over them, and was attached to the neck by a large pedicle which extended from the angle of the lower jaw on the right side, down to the sterno-clavicular articulation; its weight being so great that the patient could hardly retain the erect position. The tumour was found to be covered by a strong capsule formed of the surrounding cellular tissue, and to have originated in a hypertrophy of the surrounding adipose tissue. After Auvert.

Fig. 4. A large Encysted Tumor of the left Parotid and Submaxillary Regions, which was to the touch semi-elastic, unequally lobulated, and due to a chronic irritation of one of the sebaceous follicles, the duct of which had become closed, and thus caused a retention and degeneration of its secretion. After Auvert.

Plate 34.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

of the tumors of this part more easy than might at first sight be supposed. According to the views of Allan Burns, nearly all the glandular tumors of the neck may be referred to two classes, those which are without and those which are beneath the fascia, the existence of either being recognized by their mobility, or the ease with which they can be drawn from their ordinary position.

On examining the structures mainly concerned in this class of tumors, it will be found that the great chain both of the superficial and deep-seated lymphatics of the neck follow the course of the superficial and deep-seated veins (Plate XXXIII. Fig. 1). In the healthy condition, these glands are for the most part flattened and oval, varying from two to nine or ten lines in length. Of the superficial glands there are, between the skin and the insertion of the sterno-mastoid muscle, from four to six; in the interstice between the clavicular origin of the sterno-cleido-mastoid and the anterior edge of the trapezius, just above the clavicle, and bordering on the external jugular vein, are half a dozen; between the skin and the parotid gland there are two, one above or near the zygoma, and the other below near the angle of the jaw. Disease and enlargement of the latter are very apt to be mistaken for an affection of the parotid itself. In the early stages of this tumor, its movable character will, however, prevent such an error in connection with the parotid. Around the submaxillary gland, especially at its anterior and posterior extremities, there are eight or nine, and in it as well as in the parotid, are lymphatic vessels and smaller glands which are the primary points from which the disorder of these structures originates. The deep lymphatic glands of the neck are also very abundant; they are placed along the sheath of the carotid artery and jugular vein, and between them and the anterior edge of the trapezius are about twenty. When enlarged, these glands project beyond the sterno-cleido-mastoid muscle at its posterior edge, and in the removal of some of them a section of the muscle may be required. Between the inferior edge of the thyroid gland and the sternum, on the trachea, are four, and a chain of them extends from these around the œsophagus, trachea, and bloodvessels towards the heart* (Plate XXXIII. Fig. 1).

The tumors, formed at the expense of the deep lymphatics, are exceedingly liable to contract adhesions, especially to the sheath of

* U. S. Dissector.

the vessels, so that their extirpation will involve these parts so directly as to lead to danger unless caution is exercised. As a class, these tumors are more fixed, and the finger cannot be passed around them in the same manner as is often the case in the superficial glands. When a tumor in the neck of a solid, or apparently semi-solid consistence, is seated nearly on a line with the upper portion of the larynx or towards the angle of the jaw, or close to the posterior edge of the sterno-mastoid muscle, and seems to elevate the muscle, or is rendered more movable by relaxing the latter, it will often prove to be directly over the course of the great vessels if not attached to their sheath. When a tumor in the neck is large, pediculated, or shows a tendency to extend and elongate the skin, so as to become pendulous, its attachments will generally be superficial. But if the size of the tumor is not large (say not larger than a lemon), if it is round or flat, hard, bosselated, and not easily moved, or excites doubts as to its mobility, especially if its attachment is near to, and in the line of the sterno-cleido-mastoid, it may be taken for granted that it is deep-seated. A small tumor not larger than a walnut, and apparently upon the edge of the sterno-mastoid muscle, and whose removal seemed to be a very simple affair, was undertaken by a fellow practitioner. Having noticed the liability to error of diagnosis in such cases, I was prepared for hemorrhage, and, in a very few minutes, was compelled to tie the internal jugular vein with two ligatures, the vein and sheath of the vessels being so adherent to the base of the tumor as to mislead the operator as to its actual position. So deceptive are the attachments of all tumors of the neck that it has been justly said "that no one can tell how far he may be compelled to go in order to remove them, until he has completed the operation."

SECTION II.

OPERATIONS FOR THE REMOVAL OF TUMORS OF THE NECK.

In the treatment of the morbid condition of structures as varied as those connected with tumors in the neck, it must evidently be impossible to lay down any general mode of operating, that would be applicable even to a majority of the cases that may be met with. Surgical writers have, therefore, generally been satisfied with furnishing directions in regard to the form of the external

incision, or in recommending that, in all operations for the removal of tumors, the skin should be cut so as to create as little deformity as possible, whilst, at the same time, the deep-seated attachments of the structure to be removed are freely exposed. In the neck the latter recommendation is especially serviceable, as too much stress may be laid on the deformity likely to arise from the cicatrix. When compared with the increased difficulty liable to be caused by a limited incision, the inconvenience created by the deformity from a cicatrix does not deserve a moment's consideration. Wounds of the skin, it is well known, generally unite with great facility, whilst a free incision, by enabling the operator to see distinctly the structures upon which he is acting, will greatly accelerate the accomplishment of his object, and save the patient much unnecessary risk and suffering. From the importance of the parts connected with tumors in the neck, the first object of the operator should certainly be to accomplish the removal of the disease with safety and certainty, and nothing will aid this purpose so much as a free external incision; the subsequent dissection being, if necessary, more limited in its extent. The choice of the shape of an incision will also often exert considerable influence upon the success of the operation; and a brief reference to the adaptation of each of them to special cases may, therefore, prove serviceable.

The straight incision is especially applicable to the removal of small and superficial tumors, or those situated directly beneath the skin. The elliptical incision exposes a part more freely, and is chiefly resorted to when it is desired to remove an excess of integument, as in the case of large or pendulous tumors. The V incision is more free and adapted to tumors of moderate size, so situated as to render it necessary to insure the safety of particular parts; whilst the crucial or the T, and especially the former, will be found the best in all cases where the tumor is large, and likely to require a free dissection. But no matter what line of incision is selected, it is essential that the external or primary cut should extend at least to the very circumference of the base of the tumor, as seen through the skin, and in many instances it will be found advantageous to carry it a few lines beyond this point. After incising the skin there are certain rules which are applicable to the removal of the majority of tumors, and the observance of which will prove highly useful to those who have yet to gain their experience. Thus

Dr. Alex. H. Stevens, of New York, in an able lecture on the removal of tumors, directs the operator first to cut down to the tumor before commencing its dissection; and, second, to remove the whole of the tumor, and nothing more.

Malgaigne also advises that the dissection should be made by extensive cuts (by which I understand the sweeping motion of a good dissector, and not the hacking and pricking of tissue occasionally seen), the edge of the scalpel being directed as much as possible from those parts which it is important to leave untouched, whether they be in the tumor or in the healthy structure. In connection with the dissection, conducted in the neighborhood of important organs, whether nerves, vessels, or muscles, he also directs that they should be drawn or put to one side by means of blunt hooks, the fingers or forceps. When the principal portion of the tumor is removed, especially if it is of a suspicious character, the surgeon should endeavor to satisfy himself that no particle is left behind, lest it serve to reproduce the disease; and when any of the remnants are thus found, they should be removed either with the knife or scissors, the wound being left undressed until all the vessels are tied and the flow of blood arrested, when an effort may be made to heal it by the first intention.* On this latter point surgeons have always differed, and in this case I must dissent even from such good authority as Mr. Malgaigne is generally admitted to be. In tumors of any size above that of a walnut, union by the first intention will not usually be possible, especially if ligatures have been required, and individual observation has rather led me to the observance of the practice of the late Dr. Physick, in the introduction of a little slip of linen at the inferior angle of the wound, so as to insure a vent for any pus that may be secreted. The surface of an incised wound generally unites without difficulty; but the deeper-seated parts are more obstinate, and in the neck it is especially important that pus should be prevented from burrowing, and that a free vent should be guaranteed it by other means than those furnished by bringing the ligatures out at the lower angle of the incision.

In the extirpation of tumors about the neck, Langenbeck† proceeds as follows. He first makes a free division of the integuments, dissects the muscles from over the tumor, but avoids cutting through

* Malgaigne, Op. Surg., Philad. edit., p. 104.

† Cooper's Surg. Dict., by Dr. D. M. Reese, N. Y., p. 377.

or injuring them if possible, thus making the tumor sufficiently movable, whilst by preserving the muscles he is enabled to know accurately the place of the chief bloodvessels. Then, when the surface of the tumor has been cleared, its separation is to be commenced on that side which presents the least risk, or where the least considerable vessels are, and the dissection carried from thence towards the more hazardous portions. This distinguished surgeon has also recommended that the knife should not be introduced deeply where there are any large bloodvessels, but that the tumor should be strongly pulled outwards, so as to separate it from the vessels, and put the cellular substance around them on the stretch. The latter recommendation will be found especially serviceable, and the operator will be well able to carry it out if he takes the preliminary step of passing a strong ligature deeply into any solid tumor immediately after incising the skin.

Directions like those of M. Langenbeck, though of a general kind, should be firmly impressed on the mind of every surgeon, when operating on tumors of this portion of the body, or indeed elsewhere. But though sufficiently useful, as far as they go, they do not furnish such an accurate account of the best mode of overcoming the difficulties likely to be met with in the removal of tumors from the course of the great vessels of the neck as is desirable, and I have, therefore, made a selection of a few difficult cases, with a view of furnishing the best possible substitute for the individual observation of any young operator, viz.: the experience of those whose skill and lifelong practice have enabled them to contend with difficulties in every shape. As these cases contain important practical precepts, they are furnished in full, in order that nothing of the details of the extirpation of tumors in this region may be overlooked.

§ 1.—EXTIRPATION OF A LARGE MALIGNANT TUMOR OF THE LYMPHATIC GLANDS OF THE NECK.

OPERATION OF DR. JOHN C. WARREN, OF BOSTON.*—In this case the tumor had existed over a year; occupied the whole of the left side of the neck from the ear to the clavicle, and from the trachea to the spine; the mastoid muscle and all the arteries, veins, and

* Warren on Tumors, p. 175.

nerves of the neck being presumed to be included in its substance, whilst a process extended under the jaw into the pharynx, and filled the left half of this cavity with a red tumor which greatly impeded deglutition, the whole structure being very hard, knotted, uncolored, and insensible.

Operation.—In commencing the operation, an incision was made from behind the ear to the anterior third of the clavicle; the surface of the tumor uncovered, and the mastoid muscle sought for, but found to be partly absorbed and partly buried in the tumor. After clearing the latter from the ear, the jaw, larynx, and dorsal muscles, an attempt was made to get under the tumor just above the clavicle, and then the difficulties of the operation appeared, the carotid artery, internal jugular vein, and par vagum nerve being covered by it and connected with processes of the mass in such a manner as to render it difficult to distinguish them. This being at last accomplished by breaking down the lower part of the tumor, the vein was found to be obliterated and the artery diminished in size, but pervious. A ligature being then applied on the latter, the par vagum nerve was separated as carefully as possible, though not wholly cleared of the tumor, and the separation of the latter from the nerves at the upper part of the neck next attempted and successfully accomplished, with the exception of the sub-lingual nerve, which so barred the access to the pharyngeal part of the tumor that it was determined to divide it. This being done, the operation was finished by breaking down such parts of the tumor as could not be separated from the other nerves, when the parts were brought together, and the patient put to bed, there being but little hemorrhage, a fact stated by Dr. Warren as common in large and hard tumors. The patient, at first, did well after the operation, but died about a year subsequently of an ulceration of the throat, which created a difficulty in swallowing.

A yet more complicated and severe operation was performed in another case by Dr. Warren.* "In this patient the tumor extended from the spinous processes of the cervical vertebræ to the lower jaw, pharynx, œsophagus, and larynx, running upwards behind the ear and downwards to near the clavicle. This tumor, which had existed for thirty years, had turned the face to the opposite side, impeded the motions of the head and neck, and caused dizziness, headache, and

* Warren on Tumors, p. 177.

dyspnœa. After examining and considering the case, Dr. Warren was induced to think that the tumor had originated in the lymphatic glands behind the posterior edge of the sterno-cleido-mastoid muscle, had extended backwards under the trapezius to the spine, and forwards under the mastoid muscle to the pharynx; that it adhered to the splenius, complexus, and trachelo-maistoideus muscles, and also involved the digastricus, as well as all the styloid muscles; that the external carotid artery, with all its branches, excepting possibly the superior thyroid, were involved; and that the jugular and smaller veins, together with the three or four superior cervical nerves, the par vagum, sublingual and its descending branch, the glosso-pharyngeal, laryngeal, and great sympathetic, were also connected with it.

After a full consultation and statement to the patient of the dangers of the operation, and the impracticability of disengaging the whole tumor, the propriety of submitting to it was left to the patient's decision, and the latter deciding to do so, the operation was performed at Lincoln, near Boston.

Operation of Dr. J. C. Warren.—"The patient being seated in a chair with his head supported, an incision was made from the spine to the angle of the jaw, to meet another incision which was carried from this point downwards to near the clavicle in the direction of the anterior edge of the sterno-cleido-mastoid muscle. This flap of integuments being turned down after a laborious dissection, in consequence of its close adhesion to the tumor, the posterior half of the latter was exposed from the spine to near the trachea, showing the mastoid muscle firmly imbedded in the scirrhous mass. Having dissected the muscle from its inferior adhesions, the carotid artery was exposed and tied. The superior flap of the integuments being then raised, an attempt was made to disengage the mastoid muscle from the furrow it occupied in the upper portion of the tumor, in order to pursue the dissection beneath it; but this being found impossible, it remained either to divide the muscle and the accessory nerve, or to divide the tumor through its middle behind the muscle. The latter course being chosen, the mass was cloven in two, the posterior half dissected out, and the anterior then disengaged by great care from the posterior face of the sterno-mastoid and digastric muscles as well as from the nerves, bones, parotid and sub-maxillary glands; but some portions remained adherent to the fore part of the bodies of the vertebræ and to their transverse processes, and could not be wholly dissected without exhausting the patient's

strength. The actual cautery was, therefore, applied to them without causing much complaint.

"In the latter part of the operation, the patient was occasionally seized with a spasmodic cough produced apparently by the division of some of the branches of the accessory nerve. The internal jugular vein, being buried in the tumor, was compressed between it and the clavicle, and then divided and tied, a few bubbles of air which entered the open mouth of the vessel being arrested and forced back again by a finger applied below the opening. The principal branches of the first and second cervical nerves were now seen and divided, and others in the substance of the tumor were also divided, as indicated by the patient's sensations, although they were not seen.

"The integuments being then laid down on the face of the wound, and moderately secured so as to protect it without too much confining the parts destroyed by the cautery,"* the operation was completed, and the patient is believed to have recovered.

The details and symptoms after the operation, as well as the subsequent treatment, may be found in the valuable volume from which so much has now been quoted, that my limits prevent their being further referred to.

Removal of large Lymphatic Glandular Tumors, by Dr. Valentine Mott, of New York.†—A little boy, five years old, had a tumor on the neck which had resisted every plan of treatment. It occupied the entire side of the neck, reaching from above and behind the ear to below the clavicle, going underneath and also lapping this bone. In front, it passed beyond the central line of the larynx and trachea, crowding these parts to the opposite side; and behind, it passed under the trapezius muscle, so as to turn the head also towards the opposite side. In appearance, the tumor was irregular and lobulated, whilst to the touch it was firm and without fluctuation at any point. (Plate XXXIV. Fig. 2.)

The patient being placed completely under the influence of chloroform, the operation was then commenced.

Operation of Dr. Mott.—In order to command the whole tumor, a crucial incision was made in the integuments, the first cut extend-

* Warren on Tumors, p. 182.

† Transact. New York Acad. of Med., vol. i., part i., p. 90. New York, 1851.

ing from behind the ear to the clavicle, and the second a little obliquely to this from the anterior to the posterior edges of the tumor, so as to traverse the longest axis of the whole mass. These incisions being carefully conducted through the skin, platysma myoides and under layer of the superficial fascia so as fairly to denude the tumor, the dissection of the lower flap was first commenced, the veins and arteries being tied as they were divided. In dissecting off this flap, the mastoid muscle was found to be so incorporated with the tumor as to make it necessary to divide the muscle about two inches from the sternum and clavicle. This division exposed the lower portion of the tumor, and showed the internal jugular vein running through its substance. On the inner side of the mass, the common carotid artery could be dissected bare for several inches, but the vein was so imbedded in the tumor that it was totally impracticable to save it. Being, therefore, seized with a pair of forceps, it was divided, and a ligature instantly placed beneath the forceps, the upper end being held by the fingers of an assistant, whilst the dissection was continued. The tumor being separated from the vein was found to have destroyed by its pressure the sterno-hyoid and sterno-thyroid muscles, and was now detached from the upper and inner edge of the clavicle as far as the anterior edge of the trapezius muscle. Getting under the mass in this way, the tumor could be more readily and safely detached from the parts below, and, on dissecting it from over the scalenus anticus, careful attention was given to the phrenic nerve. The posterior and upper part being then dissected from over the mastoid process and turned down, a portion of the diseased structure was seen to pass beneath the muscle, and to be so incorporated with it as to require the division of the muscle at this point, the middle third of it being left attached to the tumor.

The anterior and upper part being then separated from the side of the pharynx and larynx, it was found, after dissecting the tumor from the common carotid artery, opposite the thyroid and cricoid cartilages, that the deep jugular vein could not be safely detached. A second ligature was, therefore, applied to this vein about an inch below the angle of the lower jaw, and the vessel divided below it, leaving several inches of the vein in the tumor, after which the whole mass readily came away. More than twenty ligatures being applied to different arteries and veins, and the effects of the chloroform being allowed to pass off, the wound was closed by

stitches, adhesive strips, lint, and a bandage. When the parts had sufficiently healed, care was also taken by resorting to bandages and position, to prevent the head becoming awry, and the patient recovered without inconvenience, notwithstanding the loss of the middle third of the mastoid muscle.

Remarks.—From the details furnished in the preceding accounts of the removal of a most dangerous class of tumors of the neck, a good idea can be obtained of the anatomical as well as operative skill requisite for their execution. In fact, no surgical operations require a nicer discrimination of structure than those arising from the removal of tumors in this region, muscles, nerves, arteries, and veins being all liable to be displaced and changed in character to a greater or less extent, yet all requiring to be accurately recognized at each step of the dissection. But, though an operation for the removal of large tumors is important and highly dangerous, it does not really deserve as much consideration and caution as those in which the disease is less developed. In a case of the magnitude of those above cited, danger is so evident that prudence and forethought are ready to contend with it, the presence of skillful assistants, together with all the adjuvants likely to prove serviceable, being naturally prepared by the operator.

The truly dangerous cases, in my estimation, are the small and apparently inconsiderable tumors of the neck, the removal of which seems to be so simple and easy that they might almost be designated as traps to catch the inexperienced and foolhardy, or those in whom boldness takes the place of discretion. The younger surgeon cannot, therefore, be too much upon his guard when consulted in reference to small tumors of the neck. In these cases, when he has decided to attempt their removal, let him always think that, before his operation is completed, he may be compelled to open the sheath of the vessels and ligate the carotid artery, and, with such a prospect before him, his operations will not only be well performed, but acquire a simplicity of character that will be mainly due to his thorough preparation for all the contingencies that may arise, in consequence of the difficulty of settling a question that can only be decided by his operation, to wit, the attachments of a tumor in the neck.

SECTION III.

BRONCHOCELE OR GOITRE.

In the preceding section, the account of the operative proceedings requisite for extirpating tumors of the neck has been limited to such as are sanctioned by the highest authorities, and therefore presumed to be fit cases for such operations. There remain, however, a class yet to be described, the propriety of removing which is extremely doubtful, and seldom now thought of, except in cases where the patient's sufferings from suffocation are most urgent.

§ 1.—BRONCHOCELE OR GOITRE.

PATHOLOGY.—Bronchocele (βρονχος, trachea; and κηλη, a tumor), is a well-known disease, which consists in the enlargement of either one or both lobes of the thyroid gland, though the same name has been occasionally applied to a degeneration of the surrounding cellular structure and lymphatic glands. According to Dr. John C. Warren,* "the thyroid gland is subject to two kinds of enlargement, one of a temporary nature, known as goitre; the other a permanent scirrhus."

True goitre exists at all periods of life, especially in the female sex, and consists in a chronic inflammation of the thyroid gland itself, which, beginning at some one point, is apt to extend until, as in a case related by Alibert, it reached to the thighs of the patient. The changes within a goitre vary with its development; presenting sometimes a soft gelatinous matter, or a more hardened structure interspersed with cysts containing a serous, glairy, or melicerous substance, and occasionally pus, fibrin, calcareous concretion, or pure blood.† Vascular derangement being here very evident, the thyroid arteries are commonly found to be much enlarged. In some cases, the swelling seems to consist almost entirely of a congeries of varicose veins, and, under these circumstances, there may be considerable sanguineous effusions, the blood being poured into the enlarged vesicles,

* Warren on Tumors, p. 302.

† Pathological Anatomy, by Samuel D. Gross, p. 407.

or into the connecting cellular substance of the gland.* Besides the hypertrophy of the parts consequent on chronic inflammation of this gland, the thyroid body is also sometimes the subject of scrofulous, lymphatic, or scirrhous degeneration.

In the Scrofulous Goitre, the cellular tissue enveloping the gland and prolonged throughout its structure is thick, compact, and resisting, so that each portion is transformed, as it were, into a cyst which is filled with a matter of varied color and consistence, though all the elements of the gland may yet be recognized.

In the Lymphatic Goitre, certain fluctuating points are readily recognized, the cysts being found to contain serous, albuminous, lactescent or puriform matter, or the points which appear to fluctuate consisting of a spongy structure analogous to that of the placenta.†

The Scirrhous Goitre presents a tumor covered by a firm fibrous capsule, and consist of a spongy texture, in which appears a considerable number of cells, some of which are of large size, and contain a bloody fluid. Its consistence is often firm, but not scirrhous, except at the upper part, which sometimes has the texture, consistence, and white color of true scirrhus.‡

Diagnosis.—The Goitrous tumor has a smooth surface, a somewhat elastic feel, follows all the motions of the larynx, especially in swallowing, and gives no sensation of crepitation, fluctuation, or pulsation.

Cysts of the thyroid region, unless enormously distended or multilocular, give the sensation of fluctuation. Tumors similar to these have been described by Maunoir as "Hydrocele of the Neck."

Scrofulous enlargement about the thyroid gland tends to suppuration, and the patient shows the marks of a scrofulous diathesis.

In Scirrhus, the tumor grows very slowly, is small, and its surface is hard, lobulated, or tuberculated; it is accompanied by pain, and is liable to ulceration. In Fungoid degeneration, there is the ordinary constitutional disturbance of the complaint, as seen elsewhere.

Owing to the position of the thyroid gland, it has occasionally happened that its proximity to the carotid artery has led the observer to regard it as an aneurism, a case of which has been published by Dr. Samuel Griffiths, of Philadelphia.§ In this case, dissection

* Opus citat

† Dict. de Méd., tome xiv. p. 172.

‡ Warren on Tumors, p. 307.

§ Eclectic Repertory, vol. ix. p. 120.

alone revealed the disease. As a general rule, however, the pulsations of an aneurism give a motion to the whole tumor; and Boyer has facilitated the diagnosis of one from the other, by directing the relaxation of the muscles by inclining the head to one side, by which means the impulse will be checked, if it is a goitrous tumor.*

The propriety of operating on these tumors is a point on which most surgeons are very decided, the opinion being very general that any attempt to extirpate them is most hazardous. It is presumed, therefore, that any surgeon who may be called on to treat a case will first resort to every remedial measure, and especially to the use of iodine internally and externally for many months, before entertaining for a moment such an idea. To those who desire more detailed information of the pathology of this disease than is to be found in most of the general works which treat of this tumor, I would recommend the articles in the volumes above quoted; an extended article by Dr. William Gibson, of Philadelphia,† reference to which has been accidentally omitted in the Bibliographical Index; and the memoir of Dr. Benjamin Smith Barton, of Philadelphia, published in 1800.

Although the extirpation of a goitre cannot be regarded as a justifiable operation in most instances, the distress of breathing and swallowing which it sometimes causes may render it imperative on the surgeon to attempt some means of affording relief; but even then local depletion, iodine, and similar means should be first fully tried before resorting to so dangerous an operation.

Treatment of Goitre.—In a tumor which has presented such varied pathological changes as those seen in this gland, and in which many points have not been described with the accuracy that might be desired, it is not surprising that various plans of treatment should have been recommended, in addition to the general remedial measures just spoken of, surgeons having at different periods advised the use of a seton, or of caustic, as well as the ligature of the whole tumor, or of a ligature upon the thyroid arteries, compression, and extirpation. That some of these means are better adapted to the mere cystic tumors of this region than to the cure of a true goitre, cannot be doubted, and such suggestions can therefore be regarded only as indicating the

* Dict. de Méd., tome xiv. p. 177.

† Philadelphia Journ. Med. and Phys. Sciences, vol. i. p. 44, 1820.

different views in relation to the condition of the diseased part held by those who have suggested them. Any operation upon a true goitre being usually regarded as inadmissible, except as a dernier resort, I shall only refer to such means as have been employed in the United States, and of these the operation of compression will be first mentioned, as being that which may be most readily and safely tried.

§ 2.—TREATMENT OF GOITRE BY COMPRESSION.

Operation of Dr. Wm. C. Dwight, of New York.*—After preparing "three straps of good glazed brown cambric, spread with emp. ol. lini cum plumb. sem. vit. oxid. (diachylon), each of half the width of the tumor, and of a length sufficient to reach from the lower edge of the scapula of one side obliquely up the opposite side of the neck and across the lower part of the tumor, and passing thence around the neck and across the shoulder, down to the lower edge of the opposite scapula, he warms and applies them to the part in the line mentioned, so that each strap may cross behind the neck like suspenders. The first strap, being drawn quite tightly, produces very considerable turgescence of the bloodvessels of the face, and causes the patient to shrug his shoulders for a few minutes, until the thyroid vessels become sufficiently compressed to enable him to breathe more comfortably, when the countenance usually resumes its natural appearance, as is often the case in less than five minutes. The second strap being then passed in the same manner across the upper part of the tumor, or from half an inch to an inch from the first, according to the size of the tumor or length of the neck, this strap should also be drawn as tightly as the first, and the same time allowed for the change in the countenance, when the third strap being applied over the intermediate space, the operation is completed.

"Ordinarily, these plasters adhere to the part for ten days, or a fortnight, if the weather is cool, and, on becoming loose, ought to be removed, when, if the pressure has been well applied, the tumor will be found to have become slightly less, and the skin somewhat reddened and tender. When this is seen, it will be better to wait till

* Transact. Am. Med. Association, vol. iv. p. 248, 1851, from Buffalo Med. Journ., Jan. 1851.

the integuments assume their natural appearance, when the application may be renewed.

"The first application of these strips has, in one case, been sufficient to effect the cure, but the average repetition of them has been as high as four times in each case. When the bronchocele becomes diminished to half its size at the time of the first application, the tumor will continue to disappear without further care, Dr. Dwight in twenty cases having had no failure from this mode of treatment. The iodine had not succeeded with him in several instances. In two patients, the disease returned at the end of two years, but disappeared on a new application of the strips."*

§ 3.—LIGATURE OF ONE OF THE THYROID ARTERIES.

OPERATION OF DR. HORATIO G. JAMESON, OF BALTIMORE.†—An incision about an inch long being made parallel with the trachea, and about midway between it and the inner edge of the sterno-mastoid muscle, and having reached the thyroid artery by a very cautious dissection so as to avoid dividing any considerable branch of the nerves, an animal ligature was applied to the vessel and the wound allowed to heal over the ligature. Several months subsequently, the tumor by actual measurement was considerably less.

The ligature of all the thyroid arteries would only be a repetition of this operation, but would certainly increase the patient's danger, and require a perfect anatomical knowledge of the structures concerned. Four cases of cure from the use of the ligature have been recorded by European surgeons.

§ 4.—SUBCUTANEOUS LIGATURE OF GOITRE.

OPERATION OF BALLARD AND RIGAL DE GAILLAC.‡—"The goitre being very large was tied in three portions, each being strangled by a separate thread, as follows: Two long waxed ligatures each armed with three needles, viz.: one *straight and cutting* being applied at one end of the thread; the second *round and pointed* in the middle

* Opus citat.

† See Bibliography.

‡ Malgaigne, Philad. edit., p. 378.

of the thread to be drawn double across the tumor, and the third armed at the other end of the thread with a *curved* needle, were each properly arranged. Then a vertical fold of the skin, being raised opposite the superior part of the tumor, was traversed by the straight needle at one end of the thread, and the fold being let go, the ligature was made to describe a curve round the upper part of the tumor, so that an end hung out on each side of the goitre. Through the same punctures, but beneath the tumor, the round and pointed needle was then passed and directed from one side to the other, so as to draw with it the middle of the ligature, which when passed was removed by cutting across the loop, so that there was now a complete loop surrounding the superior third of the tumor at its base, with its two ends hanging out of one puncture, whilst the other thread, or that passed across and beneath the upper third, was destined for its middle portion. The second and third ligatures being then passed in like manner, it was only requisite to form round the middle third a complete and subcutaneous loop, which was effected by using the remaining curved needle, when all were tightened by a serre-nœud."

A reference to the diagram accompanying the account will render this operation easy of comprehension.

Febrile reaction followed, and on the fifth day a puncture with a lancet was necessary to give exit to a little pus and gas which had accumulated under the skin, but the patient was subsequently cured with only a slight trace of the affection.

I. DISSECTION OF THE SKIN AND LIGATURE OF THE TUMOR.

Operation of Mayor.—The tumor being exposed by a double elliptical incision, which turned back the skin to the right and left, the base of the tumor was traversed by two ligatures, the two ends of the same ligature being tied so as to strangulate separately each half of the tumor.

A somewhat similar operation has been successfully performed by the late Mr. Liston, of London, and is represented in Plate XXXVII. Fig. 1.

Extirpation of a Scirrhous Thyroid Gland, by Dr. J. C. Warren, of Boston.*—The patient being in the upright position,

* Warren on Tumors, p. 305.

an incision nearly four inches long was carried along the anterior edge of the sterno-mastoid muscle, so as to expose the platysma-myoides, which was incised so as to present the edge of the sterno-mastoid. On turning this aside, the sterno-hyoid and thyroid muscles were perceived to cover the tumor in such a way that it was necessary to separate them and dissect between them. The surface of the tumor, being then brought into view, was fully exposed by dissection and separated from the sheath of the carotid artery by the handle of the knife. This apparently loosened its attachments, but a solid adhesion being found to the trachea for one or two inches, and also to the œsophagus for a small extent, which required the use of the knife, the dissection was pursued upwards and backwards, in order to extract the superior corner of the gland. The superior thyroid artery being divided in so deep a position as to prevent its ligation between the muscles, the common carotid was therefore tied. The inferior thyroid did not bleed, or was supposed not to exist, and the patient, after serious symptoms, recovered in about one month.

Remarks.—Of the different operations just detailed, compression is certainly the safest, and judging from the account furnished by Dr. Dwight, the most successful. Ligature of the thyroid arteries, although successful in a few cases, is so hazardous and difficult an operation that few will probably be disposed to attempt it; in addition to which there would certainly be good reason to fear a return of the circulation through the numerous anastomosing branches. As the ligatures must also be placed near the origin of the thyroid arteries, there has not always been a sufficient amount of the vessel left to prevent secondary hemorrhage, a case being on record, where, from the proximity of the carotids, the loss of blood has been most alarming, nothing but compression by the fingers of assistants, during eight consecutive days, having rescued the patient.

Although I have placed among the preceding operations an account of the extirpation of the thyroid body as performed by Dr. Warren, it has been done rather to complete the record than from a wish to lead any one to its repetition, even when sanctioned by such excellent authority. Though occasionally performed, an attempt to extirpate a goitrous tumor is so liable to cause immediate death from hemorrhage, that few, as before stated, deem the operation justifiable, more than one patient having died on the table. The ligature, both by the subcutaneous method, and also after the exposure of

the tumor has succeeded, yet the obstruction of the circulation through the part by this method has also been followed by alarming symptoms of suffocation and congestion of the brain. Every surgeon, therefore, should avoid operating on any case of true goitre, unless fully prepared to encounter great difficulties, or with the view of relieving *certain* suffocation. In the operative treatment of this tumor, it may well be said that "discretion is the better part of valor."

SECTION IV.

HYDROCELE OF THE NECK.

PATHOLOGY.—The term Hydrocele (ὑδωρ, water; and κηλη, tumor), though generally limited to collections of fluid within the tunica vaginalis testis, has also been applied by Mr. Maunoir, of Geneva, to encysted tumors of any portion of the neck which are filled with liquid contents. "These tumors are met with at various periods of life and in both sexes; their progress is slow, and they arise without any appreciable cause, being occasionally congenital. Though seldom larger than a walnut, they may acquire the size of an orange, and impede respiration and deglutition. The contents of the tumor vary from a thin serum or oily liquid to a thicker consistence, the cyst itself varying in thickness from the fourth of a line to a quarter of an inch or more. The skin covering the tumor seldom undergoes any change except when attenuated by the size of the tumor, when the subcutaneous veins may become apparent. The tumor is free from pain or tenderness on pressure, fluctuates slightly, and if seated over an artery might be mistaken for an aneurism, or, if over the thyroid gland, be supposed to be a goitre."*

OPERATION.—These cysts may be treated on the same principles with those seen elsewhere, that is, evacuated by a simple puncture, or with a trocar, or cured by exciting inflammation within the cyst itself by means of a seton, or by acupuncturation, or by injecting iodine, or wine and water, or a solution of sulphate of zinc, or by excising the cyst.†

* Liston's Surgery, by S. D. Gross, M. D., Louisville, p. 386.

† See Bibliography.

REMARKS.—From the similarity of these tumors with those seen in other regions, they are generally regarded as belonging merely to the encysted class; and the application to them of the term Hydrocele of the Neck is, therefore, liable to lead to error. In the opinion of Percy, those found over the thyroid gland were simply "softened bronchocele." I have seen these tumors twice in this position, and once over the parotid gland, in both of which they were nearly of the size of an orange. The fluctuation being evident, puncture and the introduction of a seton effected the cure.

CHAPTER VII.

ANEURISMS IN GENERAL.

THE term Aneurism (ανευρυνειν, to dilate) has been long employed to designate such tumors as were caused by dilatation, or rupture of the coats of an artery, in consequence of which the patient is sooner or later liable to sudden death from hemorrhage, by the giving way of the sac, or diseased portion of the vessel.

In addition to certain constitutional means which, by diminishing the force of the circulation, prevent too great distension of the sac, these tumors have been cured by mechanically obstructing the circulation of the blood through the diseased portion of the vessel, thus compelling it to pass by collateral branches until it could again enter the main trunk beyond the seat of the disorder, or by retarding it until the more fibrinous portion was deposited in and about the sac on the weakened side, so as to enable these parts to sustain the force of the current passing through the main channel of the artery. Without, however, entering into the details of the various kinds of aneurism, as well as the modifications of treatment suggested and practiced at different periods, it must suffice at present merely to show the diagnostic signs of the tumor, and the different operations applicable to its treatment, many entire papers having been occupied in demonstrating the pathology of the complaint.

SECTION I.

DIAGNOSIS OF ANEURISM IN GENERAL.

When an aneurism has occurred in an artery, which is so situated as to permit the use of the sense of sight, and has not attained any very great size, there may often be noticed, when pressed upon near the usual course of the vessel, a round or ovoid tumor. This tumor gives the sensation of elasticity to the fingers, disappears more or less under the pressure, reappears when the force is removed, softens and diminishes when the main trunk is compressed between the tumor and the heart, and may be felt pulsating with each contraction of the ventricles. The skin at first preserves its natural appearance, but in the progress of the disease furnishes signs of venous congestion, then of inflammation, and lastly, of ulceration or sphacelus. Most frequently the swelling increases slowly and without much pain, though sometimes the latter is very acute, especially if a sentient nerve is put upon the stretch, or compressed by the development of the tumor. When the complaint has existed some time, the swelling becomes more firm from the fibrinous deposits going on in its interior, or from the formation of clots, and, in consequence of these changes, the pulsations, which were before felt in it, now become less distinct, so that in some cases it may be necessary to resort to the aid furnished by auscultation, either by applying the ear directly to the tumor, or where it is wished to circumscribe the part that is to be examined, by employing the stethoscope. By ausculting the tumor, in either of these methods, the surgeon will hear either a sawing or bellows' sound, or the peculiar noise which has been designated as "whirring."

Apparent pulsation in the part is, however, liable to lead to grave errors. If, as has been before stated, a solid or firm tumor should be seated over the course of an artery and bound down to it by fibrinous or muscular expansions, pulsation may apparently be perceived in the tumor, and yet be caused solely by the proximity of the vessels; but if such a tumor be drawn to one side, or the muscles be relaxed by change of position, then the pulsation will cease, which is not the case in aneurisms. The diagnosis in these cases is, however, often one of great difficulty, and many instances have been recorded where the most experienced surgeons have been mistaken.

Several years since, I saw, in the Blockley Hospital, a large abscess in the iliac region pulsate so as to simulate an aneurism, and the difficulty of diagnosticating it was so great that an eminent surgeon spoke of it as a decided example of vascular enlargement.

In all cases of doubt, palliative measures alone should be resorted to until the character of the complaint can be more positively established. But if delay does not elucidate the case, and the pain and other urgent symptoms require a prompt decision, the practice of Guattani may be repeated, and an exploratory puncture made, the hemorrhage, if it be an aneurism, being arrested by pressure. The opening of the aneurismal sac, under these circumstances, has not, however, been attended by the serious results that might at first be anticipated. Several instances of its having been done, without causing serious difficulty, have been mentioned by surgical writers, among which is one by Dr. John Rhea Barton, of Philadelphia,* where an empiric plunged a lancet into the tumor under the supposition that the disease was an abscess. Fainting arresting the hemorrhage at the time, the patient lived six weeks, and afterwards died of mortification of the limb; when, on a post-mortem examination, the inguinal tumor and femoral artery were found in such a condition that Dr. Barton expressed the opinion "that, if the patient (aged seventy years) had had a little more vigor of constitution, the opening of the aneurismal tumor would have cured the complaint." Lest, however, such fortunate results should not always ensue, it will be safer for the surgeon, when compelled thus to test the character of the tumor, to be prepared to ligate the main trunk of the artery immediately.

SECTION II.

GENERAL PRINCIPLES TO BE OBSERVED IN THE LIGATURE OF ARTERIES.

The accumulated experience of the profession in the application of the ligature to an artery has established certain general rules, which are mostly regarded as essential to the proper performance of the operation, although some few surgeons have modified them,

* Philad. Journ. Med. and Phys. Sciences, vol. i., N. S., p. 127. 1825.

or substituted others, either to meet particular difficulties, or because they were more in accordance with their individual experience. As the object to be attained in every ligature of a vessel is a direct change in the course of the natural circulation, all rules in reference to this subject may be condensed into two, and on these two all surgeons it is believed agree, to wit: 1st, to expose the vessel without opening it; and 2d, to ligate it with as little disturbance as possible of surrounding parts. These two general principles may be carried out in various ways; but I shall adopt the views of Lisfranc in relation to the details, not only as being the soundest, but also because personal experience has enabled me to test their value to a considerable extent upon the subject as well as upon the patient.

In ligating any artery, Lisfranc advises the surgeon—

1st. To make sure of the position of the vessel. Special anatomy, as usually taught, presents every medical man with accurate information in regard to the ordinary position of the arteries; but, as these vessels are liable to various anomalies, to irregular distribution as well as to the changes consequent upon disease, special attention should be given to the position of the vessel upon each patient at the time of the operation.

To do this, notice should be first taken of the position of such muscles as usually indicate the course of the artery, or of those which have been termed "muscles of reference." By causing these muscles to contract and become prominent, the surgeon may readily recognize any deviation of the artery from its natural relations with these parts; or he may feel for the pulsation of the artery; or, if the tissues are too much thickened, or the vessel lies too deep to admit of this, lines may be drawn from such fixed points of the skeleton as normal anatomy teaches us will cross or follow the usual course of the artery.

After recognizing the position of the vessel, its exposure becomes the next point for consideration; and, in order to prevent any variation from the proper line of incision, as well as to fix the skin, Lisfranc advises the operator to bring the four fingers of his left hand to the same level, and then, placing them perpendicularly on the skin, to be careful not to draw the latter to one side, whilst he incises the integuments by drawing the scalpel close along the edges of the nails. Malgaigne, however, objects to this direction as being likely to displace the integuments over the vessel, though my own experience is favorable to it.

2d. When the artery is superficial, the incision through the integuments should be parallel to its course; but, when it is deep-seated, an oblique incision, by affording a greater line for any variation, will add much to the facility with which the vessel may be found. When the aponeurosis of the part is directly in contact with the sheath of the vessels, it is generally safer to open it on one side and then slit it up upon a director. On reaching the sheath of an artery, or the artery itself, the vessel may generally be told by its yellow or dull-white color, by its pulsation, and by its becoming flattened and collapsed when the circulation is interrupted between it and the heart.

3d. In order to isolate the artery with as little disturbance as possible of surrounding parts, the relative position of the adjacent veins and nerves should be recollected, and the adhesions of the sheath and other tissues only loosened sufficiently to permit the passage of the ligature. To do this, it is important that a good needle be selected, that is, one which is neither so sharp as to expose the vessels to perforation, nor so thick and dull as to render it difficult to pass its point through the cellular tissue of the part. When, in passing the needle around the vessel, the point appears beneath any dense cellular structure, the latter should be supported by the pressure of a finger in order to facilitate its perforation by the instrument.

Another rule, which is an excellent one, and which Malgaigne* has designated as "the rule of the guiding points," is the following:

"The surgeon should not at the commencement of his operation occupy himself with looking for the artery, but should seek the first marked point of reference, then the second, then the third, if there be one, and so on to the vessel."

Dr. Mott, of New York, whose experience in ligating arteries has probably been greater than that of any other surgeon in the United States, advises† that in every operation upon a large artery, after the edge of the muscle of reference is laid bare, but little use should be made of the scalpel; the fingers, director, or handle of the knife being capable of separating the parts quite as readily as its edge, without at the same time exposing the surgeon to the troublesome oozing which is apt to ensue on the division of the minute vessels. By pursuing this plan the main artery can also be more distinctly seen.

* Operat. Surg., Philad. edit., p. 140.

† Mott's Velpeau, vol. i. p. 301.

PLATE XXXV.

INSTRUMENTS EMPLOYED IN THE LIGATURE OF ARTERIES; WRY NECK; ŒDEMA OF THE GLOTTIS, AND HERNIA.

Fig. 1. Parrish's knife for dissecting about the sheath of arteries. Rorer's pattern.

Fig. 2. The Philadelphia aneurism needle, as employed by Drs. Parrish, Hewson, and Hartshorne. " "

Fig. 3. Another form of this needle. Each needle has two eyes, and the ligature is passed through the one nearest the handle. " "

Fig. 4. Another needle, very much curved. " "

Fig. 5. Blunt points, adapted to a common shaft, and intended to be detached in order to pass the ligature around the artery. " "

Fig. 6. Sharp point, intended to be similarly attached and detached. " "

Figs. 7, 8. Needles of other curves and lengths, adapted to deep arteries in confined points. " "

Fig. 9. A hook to be inserted into the eyes near the points of Figs. 5 and 6, when unscrewed from the shaft, in order to draw them around the vessel. " "

Fig. 10. Knot-tiers, to tighten deep-seated ligatures. " "

NOTE.—The above set comprise the instruments included in the operating case of the late Dr. Jos. Parrish, for the use of which I am indebted to the politeness of Dr. Isaac Parrish. The full account of the investigations of Drs. Parrish, Hewson, and Hartshorne may be seen in the *Eclectic Repertory*, vol. iii. p. 229, 1813.

Fig. 11. Horner's aneurism needle. Schively's pattern.

Fig. 12. Gibson's aneurism needle. A watch-spring is passed beneath the vessel, and the ligature being attached is thus drawn round it. " "

Fig. 13. Tenotome or knife adapted to the section of the sterno-cleido-mastoid muscle. " "

Fig. 14. Apparatus to bring the head into position in cases of wry neck, especially after the division of the muscle. Rorer's pattern.

Fig. 15. Gurdon Buck's knife for scarifying the glottis in cases of œdema. After Buck.

Fig. 16. Curved scissors for the same object. " "

Fig. 17. Enterotome of Dupuytren. Charriere's pattern.

Fig. 18. Blandin's enterotome. " "

Fig. 19. Cooper's Hernia bistoury. Schively's pattern.

Fig. 20. Small, blunt-pointed Hernia bistoury. " "

Fig. 21. Straight-pointed Hernia bistoury. " "

Plate 36.


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.
Fig. 15.
Fig. 16.
Fig. 17.
Fig. 18.
Fig. 19.
Fig. 20.
Fig. 21.

The late Dr. Joseph Parrish, of Philadelphia, in connection with Drs. Joseph Hartshorne and Thomas Hewson, also of Philadelphia, was accustomed to employ a knife which was rounded at the end (Plate XXXV. Fig. 1), for the purpose of dissecting about the sheath of the vessel.*

In order to hold the parts asunder, Dr. Mott employs curved spatulæ (Plate II. Fig. 10), and divides the sheath of the vessels perpendicularly, and only upon the front of the artery, never dissecting or using the blade on the sides of the vessel, but introducing the knife-handle, and separating the structure on each side, so as to denude the artery only to such an extent as will permit the aneurismal needle to pass. He has generally employed the Philadelphia needle (Parrish, Hewson, and Hartshorne, Plate XXXV. Fig. 2), and always introduces it so that its point will pass from the vein, and not to it. This last rule is equally applicable to the introduction of any instrument which is intended to pass a ligature around an artery.

CHAPTER VIII.

ANEURISM OF THE CAROTID ARTERIES.

SECTION I.

ANATOMY OF THE BLOOD-VESSELS OF THE NECK.

THE great points of reference in ligating the arteries of any portion of the body are, as has been stated, the course of the muscles of the part, after which the operator may seek for the adjacent bony prominences, or be guided by the position of the nerves of the part. In the arteries of the neck, such points may be readily found, and a brief reference to the normal anatomical relations of each of them will, therefore, prove sufficient for the general rules of operating upon these vessels.

The Common Carotid Artery arising from the innominata on the

* Eclectic Repertory, vol. iii. p. 229, 1813.

right side, about the level of the top of the sternum, and from the arch of the aorta on the left about one inch and a quarter below the top of this bone, ascends the neck on the outer side of the trachea and larynx as far as the inferior cornu of the os hyoides in the male, though a little lower in the female. In the lower part of the neck, the right artery inclines more outwardly than the left, the latter ascending almost vertically.

In this course, each artery, together with the internal jugular vein and par vagum nerve of each side, is enclosed in a firm sheath, which is connected with the fascia of the neck, the vein being on the external side of the artery, and swelling in front and above it, whilst the nerve is situated between the two vessels or a little behind them.

Directly above the sternum and clavicle, the vessels and nerve, arranged as just described, are covered by the sterno-hyoid and thyroid muscles, as well as by the sternal origin of the sterno-cleido-mastoid. On a line with the lower part of the thyroid cartilage the artery is crossed obliquely by a ribbon-like muscle, the omo-hyoid. Behind the vessels and outside of their sheath may be felt the transverse processes of the cervical vertebræ, covered by the longus colli muscles, and upon these muscles, but exteriorly to the course of the vessels, as well as behind them, is the great sympathetic nerve. Along-side of the larynx, the carotid artery is very superficial, being covered only by the skin, superficial fascia, and platysma-myoides, though it is here also crossed by the omo-hyoid muscle. Having reached the space between the os hyoides and the larynx, the common carotid divides into the internal and external carotids, the latter being generally the smallest in children. No branches come off from the common carotid in the normal condition of the parts, though occasionally the inferior thyroid or the inferior pharyngeal arteries may be in the way of any incisions upon the main trunk, at the upper part of the neck.

The Internal Carotid in the adult is smaller than the external, and extends from the level of the larynx to the brain, being between the external carotid and the vertebræ of the neck, in front of the internal jugular vein, and having the par vagum nerve at its external margin. Near the base of the lower jaw, it is crossed externally by the digastric and stylo-hyoid muscles, and is immediately afterwards concealed by the ramus of the jaw.*

* Horner's Anatomy.

"The External Carotid extends from the termination of the primitive carotid to the neck of the lower jaw. In the early part of its course, it is in front of the internal carotid and between the pharynx and sterno-mastoid muscle, where it is only covered by the skin, superficial fascia, platysma-myoides, and its own sheath. Just above this, it is crossed internally by the hypoglossal nerve, which sends off the Descendens Noni branch, the latter nerve being found upon the sheath as far as below the omo-hyoid muscle. Somewhat above this nerve, the artery is crossed by the digastric and stylo-hyoid muscles, and lies on the superior constrictor muscle of the pharynx near the tonsil gland. About its middle, it is crossed internally by the stylo-glossus and stylo-pharyngeus muscles, and then ascends through the substance of the parotid gland to the neck of the jaw, where it gives off the internal maxillary and temporal arteries."

"The Superior Thyroid Artery arises from the external carotid about a line from its root, and the Lingual comes off about six to twelve lines above this."* The anastomosis between the arteries of the two sides, through all their branches, is also exceedingly free.

The course of the artery, from its origin to the level of the os hyoides, may be designated by a line drawn from the mastoid process to the inner edge of the clavicle, or by the course of the sterno-mastoid muscle, when it can be recognized.

SECTION II.

LIGATURE OF THE CAROTID ARTERIES.

The ordinary position of an aneurismal tumor of the arteries in the neck, rendering it a difficult matter to keep up a steady pressure upon the main trunk, without also exposing the patient to the dangers of congestion of the brain from the proximity of the jugular vein to the carotid artery, has prevented any attempts to cure these aneurisms by compression from being generally resorted to. The ligature has therefore been employed, whenever direct surgical interference was demanded.

The object of all the applications of a ligature to the carotid being the same, to wit, to cut off the circulation through the artery,

* Opus citat., vol. ii. p. 207.

it is unnecessary now to mention the complaints which, in addition to aneurisms, may call for this operation, further than to say that wounds, and erectile or other tumors, constitute the greatest number. Some of the various instruments employed for passing the ligature around arteries may be seen by referring to Plate XXXV., and are of course applicable to the carotid, as well as elsewhere; but to a dexterous operator, the selection of an aneurismal needle will prove a matter of but little moment in this artery, and any of them may therefore be taken, the choice being guided mainly by individual predilection.

§ 1.—LIGATURE OF THE PRIMITIVE CAROTID.

OPERATION OF VELPEAU.—The plan recommended by Velpeau,* and by him designated as the ordinary operation, from its being pursued by nearly every surgeon, when circumstances admit it, is substantially as follows:—

OPERATION.—The patient being placed upon the back, with the chest slightly raised, the neck a little stretched, and the face inclined to the side which is opposite to the tumor, the surgeon should stand on the side of the aneurism, and feel for the anterior edge of the sterno-mastoid muscle, or for the depression which shows its border. Then placing upon it, as directed by Lisfranc, the four fingers of his left hand, all brought to the same level, let him make in this direction an incision about three inches in length, commencing on a line with the cricoid cartilage, and terminating near the sternum, if he desire to tie the artery in the omo-tracheal triangle, that is, below the omo-hyoid muscle. But if the disease permits the artery to be tied in the omo-hyoid triangle (above the muscle), the incision should be carried a little higher up and not so low down. A second cut of the scalpel should then divide the platysma-myoides and superficial fascia, and lay bare the fibres of the sterno-mastoid muscle, when an assistant may draw the inner edge of the wound towards the trachea, and the operator push its external edge outwards by means of the first and second fingers of his left hand. The patient's head being then turned so as to relieve the extension and inclination of the neck, and relax the parts, the fibro-cellular layer which extends from the sterno-hyoid and thyroid muscles to the posterior surface of the

* Med. Opératoire, tome i. p. 240.

sterno-mastoid (layer of deep cervical fascia), should be divided by raising and nicking in it a little opening, through which a director may be passed.

The omo-hyoid muscle, being now seen as a reddish ribbon, may be divided upon the director, if it should be in the way of the operator, though generally it may be avoided by being drawn to one side. Above and below the line of the muscle will now be seen the yellow-looking sheath of the vessels, on the anterior surface of which is the descendens noni nerve. The sheath being then picked up in the forceps over the artery, and not over the vein, and slightly nicked, the director should be introduced and the sheath opened upon it to the extent of an inch. If the jugular vein swells up in expiration, so as to embarrass the operator, it should be compressed, as advised by Mr. Hodgson, near the superior angle of the wound, when it will soon empty itself and shrink.

When the sheath is opened, the artery, par vagum, and vein, in the order mentioned, counting from the trachea, will be exposed; when the aneurismal needle should be introduced between the vein and artery, so as to keep its point close to the artery, in order to avoid the par vagum, and being, by a slight rocking motion, made to pass round the vessel, its point should be made to perforate any cellular tissue that opposes its exit by the pressure of the fingers of the left hand.

After the ligature is withdrawn, the artery may then be very slightly raised upon it, and tied by a double knot, both ends being left attached in order to favor the escape of any suppuration that may subsequently supervene. The wound should next be lightly dressed, and the patient placed in bed in such a position as will relax the parts, until the ligature separates, this happening sometimes in ten days, though often not till much later.

To avoid error in the first incisions, it has been advised to cut directly upon the belly of the sterno-mastoid, and then draw the wound towards the trachea, instead of cutting upon the inner edge of the muscle, as this in the lower part of the neck is liable to throw the operator upon the tracheal muscles instead of the sterno-cleido-mastoid. Mr. Chassaignac* has advised the surgeon, in case of difficulty, to feel for the tubercle or projection made by the anterior branch of the transverse process of the sixth cervical vertebra,

* Malgaigne, p. 155.

which is in front and a little inside the artery, if, in operating for the inferior third of the vessel, he finds the parts so infiltrated as to prevent their being recognized. I have tried this rule repeatedly upon the subject, and seldom failed to find the artery simply by the touch.

§ 2.—EFFECTS RESULTING FROM LIGATURE OF THE CAROTID.

When the circulation is cut off from one side of the head by the application of a ligature to the carotid artery, it is useful to know by what means nature remedies this obstruction to the natural course of the supply of blood intended for the head, and especially for the brain, as well as its effects upon this organ. From the free anastomosis found between the vessels supplying the head and upper part of the neck, it might readily be surmised that their enlargement would be the chief means employed by nature to compensate for the temporary loss occasioned by the operation, and such has been accurately found to be the result. From a dissection made by Dr. Mott,* of New York, of a subject whose arteries were injected after a death consequent on a pulmonary affection, three months and nineteen days subsequent to the operation, it appeared that the carotid, which had been tied (right side), had been entirely obliterated from the innominata to the angle of the jaw, leaving a firm ligamentous cord divided into two parts where the ligature had been applied. The vein and nerve were found to be perfectly natural; the right subclavian artery enlarged to a size equal to that of the innominata; the left carotid enlarged to twice its natural size, and its branches increased in the same ratio. The branches arising from the right subclavian artery were also enlarged. The inferior thyroid was enlarged in the ramus thyroidea and the thyroidea ascendens to twice their natural size, but the transversalis cervicis and transversalis humeri, though arising from the same trunk, retained their natural dimensions. The thyroidea ascendens was found mounting up the neck in a zigzag direction, forming many communications with the vertebral artery, and with the mastoid branch of the occipital. The left carotid artery was also equal in size to the innominata and furnished the greatest part of the blood to the right side, the superior thyroid, lingual, pharyngeal, and internal maxil-

* Amer. Journ. Med. Sciences, vol. viii. p. 45, 1831.

lary, inosculating with those of the opposite side, so as to have the appearance of continuous trunks. The mental, inferior labial, coronary, and facial were also found to anastomose freely with the same arteries from the right side. Although no direct mention is made of the condition of the right vertebral artery, there can be no doubt that it also participated in the enlargement seen in its parent subclavian, and thus materially aided the supply of blood to the brain by means of the circle of Willis.

Notwithstanding the numerous facts cited to show that, in most instances, no serious disturbance of the function of the brain ensues upon ligature of the carotid,* yet the reverse has been noted, the failures having been ascribed to some disorder or anomalous arrangement of the arteries chiefly concerned in equalizing the circulation after the operation. In a patient operated on by Mr. Key, who died almost immediately, the left carotid was found to be nearly obliterated at its origin from the aorta. In a case treated by Langenbeck, the patient suddenly presented alarming symptoms, and died thirty-four hours after the operation, in consequence, as is *supposed*, of some abnormal condition of the arteria communicans. Three patients in the hands of Molina, of Mayo, and of Sisco, suffered more or less, in the sight and hearing of the side operated on. A patient of Magendie, one of Baroven, one of Macauley, of Cooper, of Vincent and others, suffered from hemiplegia of the opposite side to that on which the artery was tied, thus indicating a lesion in the side of the brain corresponding with the artery.† It is better, therefore, in all cases to watch the effect upon the patient after tying the first knot before forming the second, so that, if requisite, the ligature may be removed from the vessel. The application of a ligature to both carotids, at intervals, varying from two to six weeks, has, however, been successfully accomplished by Drs. McGill, Mussey, Mason Warren, Ellis, and Blackman in the United States,‡ and by several surgeons in Europe, and in these cases it is to be presumed that the vertebral arteries were in good condition. In a case in which both carotids were ligated simultaneously by Dr. Mott for extensive disease of the parotid gland, the patient died in twenty-four hours.§

Death also ensued upon a ligature of the primitive carotid by

* Chelius, by South and Norris, vol. ii. p. 507.

† Dict. de Médecine, tome vi., article Carotides.

‡ See Bibliography.

§ Am. Journ. Med. Sciences, vol. xiv. p. 530. 1834.

PLATE XXXVI.

OPERATIONS UPON THE NECK.

Fig. 1. Ligature of the Carotid, Lingual, and Facial Arteries. C. Ligature of primitive carotid. 1. Lowest point of incision. 2. Fascia profunda. 3. Internal jugular vein. 4. Carotid artery raised on the aneurismal needle. 5. Par vagum nerve. L. Ligature of Lingual Artery. 1. External incision. 2. Fascia. 3. Lingual artery. F. Ligature of Facial Artery. 1. External incision. 2. Fascia. 3. Facial artery. After Bernard and Huette.

Fig. 2. Surgical Anatomy of Subclavian and Axillary Arteries. 1. Subclavian artery; as it passes from beneath the clavicle, it becomes axillary. 2. Axillary vein. 3. Brachial plexus of nerves. 4. Supra-scapular artery passing across the neck. 5. Omo-hyoid muscle. 6. Phrenic nerve. 7. External jugular vein. 8. Clavicular portion of sterno-cleido-mastoid. 9. Its sternal origin. 10. Clavicle sawed across. 11. Deltoid muscle. 12. Cephalic vein. 13. Pectoralis minor muscle. 14. Section of pectoralis major muscle. After Bernard and Huette.

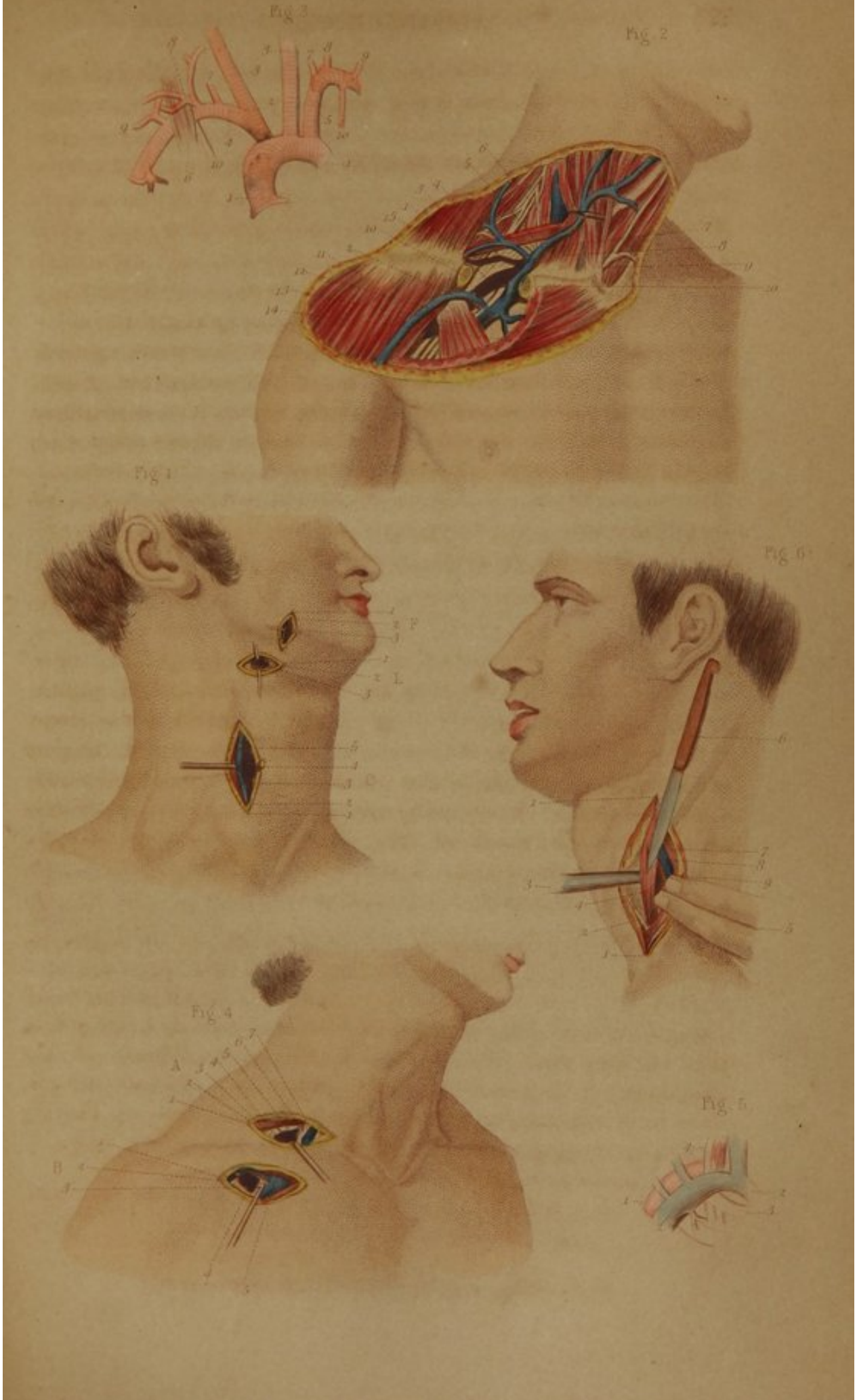
Fig. 3. Origin of Carotid and Subclavian Arteries and Branches of the Subclavian. 1, 1. Aorta. 2. Innominata. 3. Primitive carotids. 4. Right subclavian. 5. Left subclavian. 6. Scalenus anticus muscle. 7, 7. Vertebral arteries. 8, 8. Thyroid axis. 9, 9. Posterior scapular arteries. 10, 10. Internal mammary. After Bernard and Huette.

Fig. 4. Ligature of the Subclavian and Axillary Arteries. A. Ligature of subclavian. 1. Incision in skin. 2. Deep fascia. 3. Omo-hyoid muscle. 4. Brachial plexus. 5. Subclavian artery raised on the needle. 6. Scalenus anticus muscle. 7. Subclavian vein. B. Ligature of axillary below the Clavicle. 1. Incision in skin. 2. Deep fascia. 3. Fibres of pectoralis major cut across. 4. Axillary artery raised on the needle. 5. Axillary vein. After Bernard and Huette.

Fig. 5. Relative Position of the Subclavian Vessels. 1. Subclavian artery. 2. Subclavian vein. 3. First rib. 4. Scalenus anticus muscle. After Bernard and Huette.

Fig. 6. A view of the operation of Œsophagotomy. 1, 1. Incision in skin. 2. Deep fascia. 3. Blunt hook drawing trachea inwards. 4. The œsophagus. 5. Fingers of the surgeon drawing the bloodvessels outwards, so as to protect them during the incision in the œsophagus. 6. Bistoury incising the œsophagus. 7. Sterno-cleido-mastoid muscle drawn aside. 8. Internal jugular vein. 9. Primitive carotid artery. After Bernard and Huette.

Plate 36.



Dr. A. C. Post, of New York, one month after the operation, in consequence of phlebitis of the corresponding vein, pus being also found between the meninges of the brain.*

§ 3. STATISTICS OF THE OPERATION OF LIGATING THE CAROTID ARTERY.

The attention of surgeons having been closely bestowed upon the results of this operation, we are now able to form a tolerably correct estimate of the consequences of the application of a ligature to the carotid artery, and without specifying the diseases which required the operation, the following table will show the data from which an opinion may be formed:—

TABLE.

	CURED.	DIED.	UNSUCCESSFUL.	DOUBTFUL.
Of 137 cases reported by Velpeau† . . .	82	40	13	2
Of 128 cases reported by Dr. Norris, of Philadelphia‡ (in reference to the cure of the disease), ...	69	50	9	
Of 21 cases reported by Dr. E. Crisp§ . .	10	11		
Of 7 cases reported by Dr. Lente, of New York‖	5	2		
Of 30 cases collected by myself,¶ from the operations of surgeons in the United States	22	8		
Total of cases, 323	188	111	22	2

From this table it appears that the proportion of the cures is more than one-half of those operated on.

From an examination of each account it appears that the success, as reported, is as follows:—

Velpeau	0.59 cures.
Norris	0.54 "
Crisp	0.48 "
Lente	0.71 "
Smith	0.72 "

* See Bibliography.

† Med. Opératoire, tome 2me, p. 232.

‡ Amer. Journ. Med. Sciences, vol. xiv., N. S., p. 13.

§ Lond. Med. Examiner, vol. ii. No. 3.

‖ Transact. Amer. Med. Assoc., vol. iv. p. 326.

¶ Bibliographical Index.

Of the cases reported by Velpeau, 32 were by surgeons in the United States, of which 27 were cured.

Of those reported by Norris, 38 were performed in the United States, of which 28 were cured; and Lente and myself report only those performed by American surgeons, being 37 in all, of which 27 were cured.

Total of cases in the United States, 107; of which there were cured, 82.

Total of those in Europe, 216; of which there were cured, 106; showing a decided result in favor of the surgeons of the United States, either in consequence of their subsequent treatment of the case, or, what is more probable, the better constitution and habits of the patients operated on.

The operation of ligating the lingual or facial arteries is sufficiently shown in Plate XXXVI. Fig. 1.

CHAPTER IX.

LIGATURE OF THE INNOMINATA AND SUBCLAVIAN ARTERIES.

As a remedy for the relief of aneurismal tumors of the carotid, or of the subclavian close to the clavicle, ligature of the innominata or of the subclavian within the scaleni muscles has been practiced. Before showing the plans that have been resorted to for the accomplishment of this object, a brief reference must be made to the relative position of the parts concerned.

SECTION I.

SURGICAL ANATOMY OF THE INNOMINATA AND SUBCLAVIAN ARTERIES.

The Aorta, in forming the arch which permits it to pass from the heart downwards into the thorax, rises to within eight or twelve lines of the superior edge of the sternum, and at this point gives off the Innominata and left carotid and subclavian arteries.

§ 1.—THE INNOMINATA.

The trunk of the Innominata, which is from an inch to an inch and a half long, or rarely two inches, arises from the arch of the aorta as just stated, and extends to near the level of the sterno-clavicular articulation, where it gives off the right subclavian and right carotid arteries. In this short course it passes obliquely from below upwards, from within outwards, and from before backwards; is very nearly in contact on its outer side with the top of the pleura; rests against the front and right side of the trachea; is crossed on its anterior face by the left transverse vein, and lower down by the vena cava descendens which is parallel to it, but more and more distant as it approaches the heart.* It is covered by the skin, superficial and deep cervical fasciæ by cellular tissue, by the origins of the sterno-hyoid and thyroid muscles, and by a portion of the sterno-clavicular articulation. (Plate XXXVII. Fig. 3.)

§ 2.—THE SUBCLAVIAN ARTERY.

The Subclavian artery of the right side arises from the Innominata, and that of the left from the arch of the aorta. Each crosses the first rib of their respective sides in the interval between the scalenus anticus and medius muscles, and, passing between the subclavius muscle and the rib, escapes from under the clavicle, and is thence known as the Axillary artery. The right subclavian is much shorter and more superficial than the left from its origin to the scaleni muscles. Near these muscles, both arteries are covered in front by the sternal end of the clavicle; by the sterno-hyoid and thyroid muscles, and by the subclavian vein of the corresponding side; behind them is the longus colli muscle; below them, the pleura, the left artery being in contact with it for its whole length in the thorax, and on their internal side is the primitive carotid artery. Near the scalenus anticus, the right subclavian artery is crossed by the par vagum nerve, whilst the phrenic is found in front of it, but on the internal edge of the scalenus.

The Left Subclavian artery runs nearly vertically from its origin

* Dict. de Méd., tome xxviii.

to the interval in the scaleni; is nearly parallel with, but behind the left primitive carotid; has the phrenic nerve in the same relative position as the artery on the right side, though the left par vagum goes parallel with and in front of the artery for some distance along its root. At the inner margin of the scaleni muscles on both sides is found the thyroid axis or cluster of five branches.* The sympathetic nerve is generally behind the root of the artery on the right side, whilst on the left the thoracic duct is very near its posterior face, and usually crosses it above before emptying into the left subclavian vein.

Having become horizontal, the subclavian arteries present the same relations on both sides, and lie directly on the first rib, the insertion of the scalenus anticus muscle separating them from the subclavian vein. All the nerves of the brachial plexus form a network around the arteries resembling the plaiting of a whipcord.

Outside the scaleni, the subclavian artery corresponds to the supra-clavicular fossa, and rests upon the first intercostal space. The subclavian vein, which covers the artery while descending towards the clavicle, receives at this point the subscapular vein, external jugular, and sometimes the acromial veins. The brachial plexus accompanies the artery thus far, but soon afterwards passes behind it. The artery is, therefore, generally found in a triangular space formed by the omo-hyoid muscle on the outside, the scalenus anticus on the inside, and the clavicle below.†

"To expose the artery on the first rib, it is necessary to divide the skin, subcutaneous cellular tissue, superficial fascia and platysma-myoides muscle; the fascia profunda colli, and a loose cellular tissue full of venous branches and lymphatic ganglia, in which run two important arteries, the transversalis cervicis being placed some lines above the subclavian and the superior scapula, running along the posterior border of the clavicle. Sometimes the sterno-mastoid muscle, from its wide origin along the clavicle, requires division, whilst the external jugular vein, from running more outwards than usual, requires to be avoided."‡ A test of the position of the artery, which I have never known to fail, is one suggested originally by Dr. Jos. Parrish, of Philadelphia,§ and that is the position of the tubercle

* Horner's Anatomy, vol. ii. p. 215.

† Dict. de Méd., tome xxviii. p. 448.

‡ Malgaigne, Philadelphia edit., p. 148.

§ Eclectic Repertory, vol. iii. p. 240. Philada., 1813.

or prominence on the first rib into which the scalenus anticus muscle is inserted. The artery is invariably found on the outside of this tubercle.

Remarks.—In the directions usually given by the French surgeons for the ligature of this artery, much stress is laid upon the importance of recognizing the prominence of the first rib into which the scalenus anticus muscle is inserted as a point of reference during the operation. In a course of operations pursued at Clamart, and the Ecole Pratique of Paris, in 1839, I had frequent occasion to notice this, and supposed the suggestion to be due either to Lisfranc, Velpeau, or Malgaigne, the latter of whom also mentions it particularly in his Manual of Operative Surgery. Subsequent reading has, however, induced me to think that this valuable direction originated in the United States, with the late Dr. Jos. Parrish, of Philadelphia, though, as I am unable to find any date in connection with the accounts of the French surgeons, I cannot be positive on the subject. A perusal of the paper of Dr. Parrish* will, however, show that he published the description of this important landmark to the position of the artery in the year 1813, four years after Ramsden's operation, and this, I think, is the earliest notice taken of an infallible rule for finding the artery. In the paper referred to as the result of Drs. Parrish, Hewson, and Hartshorne, Dr. Parrish says "that it is not essential for the operator to bring the edge of the scalenus into view (as was advised by Ramsden and others), as he has another and more certain guide to conduct him to the precise point for securing the artery. To fix this point was a subject of considerable importance, that required and received very deliberate attention, and was decided for the superior edge of the first rib. In addition to this, the operator has a guide to conduct him precisely to the part he is seeking for, which it is believed had never been noticed by any preceding surgeon. Just at the insertion of the anterior scalenus muscle into the upper edge of the first rib there is a roughness, or rather process of the bone which is very perceptible to the touch, being in the generality of subjects so clearly defined that it cannot be mistaken. Now, instead of the operator depending on his vision, he may get at the exact spot that he is in search of by a reliance on the sense of touch."

The high estimate generally entertained of the accuracy of this

* Eclectic Repertory, loc. citat.

rule in ligating the subclavian artery renders it desirable to credit correctly the author of the suggestion, and in claiming it for Dr. Parrish, there is every reason to think that nothing more than justice is done to the memory of a surgeon whose experience as an operator is well known in this locality.

SECTION II.

LIGATURE OF THE INNOMINATA.

This operation, the difficulties of which may be readily understood when its anatomical relations are considered, as well as the changes likely to be created in the surrounding parts by such a condition as would lead to its execution, has been performed ten times, and in every instance resulted in death: to wit, first by Dr. Valentine Mott, of New York; second, by Græfe, of Berlin; third, by Bland; fourth, by Dr. J. Wilmot Hall, of Baltimore; fifth, by Kuhl, of Leipsic; sixth, by Lizars, of England; seventh, by Arendt, of Russia; eighth and ninth, by Bujalski, of St. Petersburgh; tenth, by Hutin, for a wound.*

Various plans of proceeding have been recommended; but this account will be limited to that of Dr. Mott, which is generally admitted to expose the parts as freely as is safe, and which is also sanctioned by the experience of Malgaigne as the best, if the operation should be again resorted to.

The appearance of the tumor, and the incisions required in the operation, are shown in Plate XXXVII. Fig. 2, for a special drawing of which I am indebted to the politeness of Dr. Mott, it being believed by him to do justice to the appearance of the parts.

Operation of Dr. Mott, of New York, May 11, 1818.—The patient being placed in a recumbent position upon a table of the ordinary height, a little inclining to the left side, so that the light might fall obliquely on the upper part of the thorax and neck, and the surgeon seated on a bench of convenient height, an incision was commenced upon the tumor just above the clavicle, and carried close to this bone and the upper end of the sternum, so as to termi-

* Dict. de Méd. tome 28me, p. 474.

nate immediately over the trachea, being about three inches long. Another incision, about the same length, was then made from the termination of this along the inner edge of the sterno-mastoid muscle, and the integuments dissected back from the platysma-myoides, beginning at the lower angle of the incision when they were turned over upon the tumor and side of the neck.

After cutting through the platysma, the sternal origin of the sterno-mastoid muscle was cautiously divided in the direction of the first incision, and also reflected over the tumor (Plate XXXVII. Figs. 2 and 3).

The sterno-hyoid muscle was next divided, and then the sterno-thyroid, and turned up on the opposite side of the wound over the trachea, exposing the sheath of the carotid artery. A little above the sternum, this sheath was opened, the nerve and vein drawn to the outside, the artery drawn to the trachea, and the subclavian laid bare about a half inch from its origin, the handle of the scalpel being mostly employed in order to avoid injuring these parts.

Whilst separating the cellular substance from the artery with the smooth handle of the scalpel, a branch of an artery was lacerated which yielded for a few minutes a smart hemorrhage. It was about half an inch distant from the innominata, and about the size of a crowquill; but the bleeding ceased upon a little pressure.

The bifurcation of the innominata being now in view, the dissection was mainly done with Dr. Parrish's knife (Plate XXXV. Fig. 1), care being taken to keep it directly over and along the upper surface of the artery. After fairly denuding the vessel on its upper surface, the cellular substance was very cautiously separated from the sides of it by the handle of the scalpel, so as to avoid injuring the pleura, and a round silk ligature being passed by means of the Philadelphia needle (Plate XXXV. Fig. 2), the artery was tied about half an inch below its bifurcation, the recurrent and phrenic nerves being undisturbed.

In introducing one of the smallest blunt needles (Plate XXXV. Fig. 5) around the artery, the instrument was passed from without inwards, so that the cellular substance and the pleura could be pressed down with a part of the instrument, whilst the point was very carefully insinuated under the artery from below upwards, so as to appear on the opposite side of the artery. The hook (Plate XXXV. Fig. 9), being then introduced into the eye of the needle, the shank

was unscrewed and the needle drawn through with the utmost facility, leaving the ligature *in sitû*, after which the knot was gradually tightened.

The integuments being then closed tightly, the patient was put to bed with a pulse beating sixty-nine, ten minutes after the operation.

This patient subsequently did so well that, on the fourteenth day, the ligature separated. On the twentieth day he walked several times across the yard, but on the twenty-third day was attacked with hemorrhage from the wound, which recurred at intervals, till on the twenty-sixth day after the operation, he died.*

REMARKS.—The want of success attending the performance of this operation in so many able hands (it having resulted fatally in every instance) has, at present, generally proscribed the operation from the list of those that are justifiable in cases of aneurism.

The dissection of Dr. Mott's patient showed a firm clot in the artery below the ligature, and that an ulceration on the opposite side of the artery was the source of the hemorrhage. Græfe's operation in 1822 apparently did well for sixty-eight days, but then hemorrhage ensued upon the patient's exerting himself. Blandin, in 1837, lost his patient by hemorrhage on the eighteenth day. Hall lost his on the sixth day also by hemorrhage; and the patient of Mr. Lizars died in ten days of hemorrhage, the chest containing twenty ounces of blood, the subclavian artery alone being diseased. Judging from these results, Velpeau has therefore expressed the decided opinion "that the operation ought not to be attempted, at least for the cure of aneurism."†

SECTION III.

LIGATURE OF THE SUBCLAVIAN ARTERY.

Ligature of the Subclavian Artery is an operation which dates back only to the commencement of the present century, having been first successfully performed by Mr. Keate, of England, in March 1800; by Ramsden unsuccessfully in 1809; after which it was successfully ligated January 17th, 1815, by Chamberlaine, and then by

* Mott, Velpeau; also Eclect. Repertory, vol. ix., and other journals.

† Dict. de Méd., tome xxviii. p. 474.

Dr. Wright Post, of New York, September 8th, 1817,* being the first time it was performed in the United States. Since this period, it has been frequently accomplished both in Europe and the United States.†

The ligature of the subclavian artery is an operation generally admitted to be accompanied by many difficulties, and to require perfect anatomical as well as surgical skill.

Three different points have been selected for the application of the ligature, the choice being usually directed by the necessities of the case. These points are usually designated as the operation upon the first rib; that between the scaleni, and that within the muscles, the difficulties being greater in most of them, when it is necessary to operate upon the artery of the left side. As the clearest account of the operative proceedings, I have selected those furnished by Malgaigne and by Velpeau, adding to them a few of the steps taken by the surgeons whose cases are reported in the American journals.

§ 1.—LIGATURE OF THE SUBCLAVIAN ARTERY ON THE FIRST RIB.

OPERATION OF LISFRANC.—The patient lying down with the head secured and the shoulder drawn downwards and slightly forwards so as to depress the clavicle, an incision should be made immediately above the bone parallel to its posterior border, commencing one inch outside the sternal end, and extending to the insertion of the trapezius muscle. The skin being cautiously divided, the external jugular vein, if it shows itself, should be drawn inwards by an assistant by means of a blunt hook. Then, cutting across the superficial fascia and platysma-myoides muscle, cautiously open the fascia profunda colli, and laying aside the knife tear the cellular tissue with the finger nail or point of the director. On carrying the forefinger into the internal angle of the wound, feel for the scalenus tubercle of the first rib, and, finding this point, the artery will be felt pulsating on its external side. Then, whilst keeping the finger upon the tubercle as a guide, pass the aneurismal needle carefully under the artery on its inside, bring it out externally, and, holding

* Norris, Am. Journ. Med. Sciences, vol. x., N. S., p. 14.

† See Bibliography.

the artery with the finger to prevent its slipping, place the finger between it and the first fasciculus of the brachial plexus, facilitating the introduction of the needle by depressing the shoulder and turning the patient's head to the opposite side.*

Remarks.—Roux has directed that an incision should be made perpendicularly to the clavicle, and I have found this mode of operating quite easy upon the subject.

A somewhat similar, but more accurate method, is as follows: Make an incision perpendicular to the clavicle by dropping a line from the point where the anterior edge of the trapezius and posterior margin of the sterno-mastoid muscle meet (supra-clavicular fossa), so as to divide this triangular depression into two triangles, and then dissect or lacerate the tissues until the artery is distinctly felt. This mode of reaching the subclavian was suggested many years since by Dr. Horner, of Philadelphia, and exposes the surgeon to less risk of wounding the external jugular vein, or any of the transverse vessels, so often found near the subclavian artery, than is the case if the incision, as advised by Roux, should fall too near the sternal end of the bone.

§ 2.—LIGATURE OF THE ARTERY BETWEEN THE SCALENI MUSCLES.

Operation of Dupuytren.—Make at the base of the neck a transverse incision extending from the anterior edge of the trapezius to the inner border, or to a short distance upon the outer side of the sterno-mastoid muscle, cutting through the different layers as before mentioned. Having found the insertion of the scalenus anticus, insinuate between its posterior surface and the front of the artery a grooved director, and divide the muscle upon it, when the retraction of the muscle will lay bare the artery, and enable the needle to pass under it from without inwards.†

Remarks.—In this operation, caution has always been given respecting the position of the phrenic nerve, which, it will be recollected, lies against the internal side of the scalenus anticus, and a little anterior to it. But Mr. Malgaigne‡ also advises that attention should be given to the internal mammary artery which runs outside

* Malgaigne. † Velpeau.

‡ Malgaigne, Philad. edit., p. 150.

of this nerve, and is much exposed if the cut is made too near the rib.

§ 3.—LIGATURE OF THE ARTERY WITHIN THE SCALENI MUSCLES.

This operation, which was first performed by Mr. Colles, of Dublin, who lost his patient on the eighth day, has since been repeated several times in Europe and this country, Dr. Mott, of New York, performing the second operation; and Dr. Kearney Rogers, of New York, having been, as I believe, the first surgeon who tied the left subclavian within these muscles.

Operation of Dr. Mott.*—The patient being placed upon the table with the shoulders elevated, the head thrown backwards, and the face and body inclined to the left side, an incision was begun at the lower part of the outer edge of the sternal origin of the sterno-mastoid muscle, and carried upwards about two inches. Another, commencing at the same point, was then made along the upper surface of the clavicle for the same extent. When the triangular flap of skin, with the corresponding portion of the platysma, and its investments, was separately dissected and turned aside, the clavicular portion of the mastoid muscle was severed immediately upon its insertion, and reflected upon the neck. This laying bare the deep-seated fascia, the latter was raised with the forceps, and divided a little below the course of the omo-hyoid muscle, on the outside of the deep jugular vein. On enlarging this opening an inch downwards, the adipose and cellular tissues were readily pushed aside, and the scalenus anticus muscle exposed to view. The cellular substance being now separated with the fingers and handle of the knife, the subclavian artery was exposed just within the thyroid axis, the branches of which could be plainly seen. The filamentous tissue being raised from the artery with the forceps and cautiously divided, the ligature was passed under the vessel from below upwards by Dr. Parrish's needle, curved spatulæ being employed to draw the deep jugular vein towards the trachea as well as to separate the edges of the wound. Three small arteries were tied, no vein required the ligature, but on the eighteenth day the patient died of secondary hemorrhage.

* Am. Journ. Med. Sciences, vol. xii. p. 354. 1833.

§ 4.—LIGATURE OF THE LEFT SUBCLAVIAN ARTERY WITHIN THE SCALENI MUSCLES.

A German, 42 years of age, was admitted September 13, 1845, into the New York Hospital, with an aneurismal tumor above the clavicle, about the size of a small hen's egg, extending externally to the outer third of the bone, and covered internally by the outer edge of the sterno-mastoid muscle. A consultation having left the decision of an operation to Dr. J. Kearney Rogers, this gentleman concluded, after mature reflection, that the operation was possible, and therefore determined to try it.

Operation of Dr. J. Kearney Rogers.*—The patient being placed on a low bed with his head and shoulders raised, and his face turned to the right side, so that the light from the dome could shine directly on the part to be operated on, an incision three inches and a half long was made on the inner edge of the sterno-mastoid so as to terminate at the sternum, and divide the integuments and platysma-myoides. This was then met by another incision, which extended along the sternal extremity of the clavicle, about two and a half inches, and divided a plexus of varicose veins which were in the integuments covering the clavicle, and communicated with the subclavian vein. To check the free bleeding which occurred from their cut extremities, it therefore became necessary to tie them.

The flap of integuments and platysma-myoides being now dissected up, and the lower end of the sterno-cleido-mastoid laid bare, a director was passed under this muscle, and the sternal as well as half of the clavicular origin divided by a bistoury. This muscle being now turned up, the sterno-hyoid and omo-hyoid muscles, as well as the deep-seated jugular vein, were seen covered by the deep cervical fascia.

On turning up the sterno-mastoid, a portion of the aneurismal sac was seen strongly pulsating and overlapping about half the width of the scalenus, so as to form the outer half of the track through which it was necessary that the operator should pass, showing fearfully one of the dangers of the operation, but one which Dr. Rogers had anticipated. The deep fascia being then divided by

* Am. Journ. of Med. Sciences, vol. xi. N. S. p. 541.

the handle of the scalpel and the fingers, the dissection was continued in contact with the outer side of the deep jugular vein to the inner edge of the scalenus anticus muscle, for the purpose of reaching this muscle fully half an inch above the rib, instead of at its insertion, in order to guard against any injury of the thoracic duct. The phrenic nerve could now be distinctly felt running down on the anterior surface of the scalenus, and was of course avoided, until, by pressing the finger downwards, the rib was discovered, when after some little search the position of the artery was recognized. By pressing the vessel against the rib, all pulsation in the tumor ceased, whilst on removing the finger the pulsation returned. In order to avoid any injury to the pleura and thoracic duct in detaching the artery, Dr. Parrish's needle was employed after that of Sir Philip Crampton had been tried, the point of the former being introduced under the artery, and directed upwards so as to avoid the pleura. The needle being detached from the shaft of the instrument, the ligature was drawn upwards so as to surround the artery, and then tightened with the forefingers at the bottom of the wound, all pulsation ceasing immediately in the tumor, and also in the arteries of the extremity. Warmth was subsequently applied to the limb, and the usual treatment pursued. On the thirteenth day, the patient, on changing his position from the right side to his back, was attacked with hemorrhage, of which he died two days subsequently, or fifteen days after the application of the ligature. A post-mortem examination, after detailing other points, established the inaccuracy of one fact, which had been previously urged as an argument against the operation, to wit, the chances of hemorrhage from the want of sufficient adhesions in the artery. In this case there was a perfect coagulum found in the vessels, the hemorrhage had come from the distal end of the artery in consequence of the free communication of the internal carotid at the base of the brain with the vertebral, the latter vessel having been given off from the subclavian just beyond the point where Dr. Rogers had applied his ligature. Decidedly the greatest danger in the operation was thought by the operator to be the risk of wounding the pleura and thoracic duct.

PLATE XXXVII.

OPERATIONS PRACTICED AT THE LOWER PORTION OF THE NECK.

Fig. 1. A view of the operation for the Strangulation of a large Goitre which was inducing strangulation, as performed by Liston. By a crucial incision the skin has been dissected from the tumor, which is then caused to slough off by strangulating it by means of ligatures carried through and around its base by needles. This tumor sloughed off in eight days. 1. Sterno-hyoid and thyroid muscles divided and turned down. 2. Upper portion of the same. 3. Os hyoides. 4, 4. Enlarged veins on surface of tumor. After Liston.

Fig. 2. A view of Mott's operation for Ligature of the Innominata. 1. Aneurismal tumor of the subclavian. 2. Skin and platysma-myoides turned back. 3. Section of sternal origin of sterno-cleido-mastoid muscle. 4. Arteria innominata. After Mott.

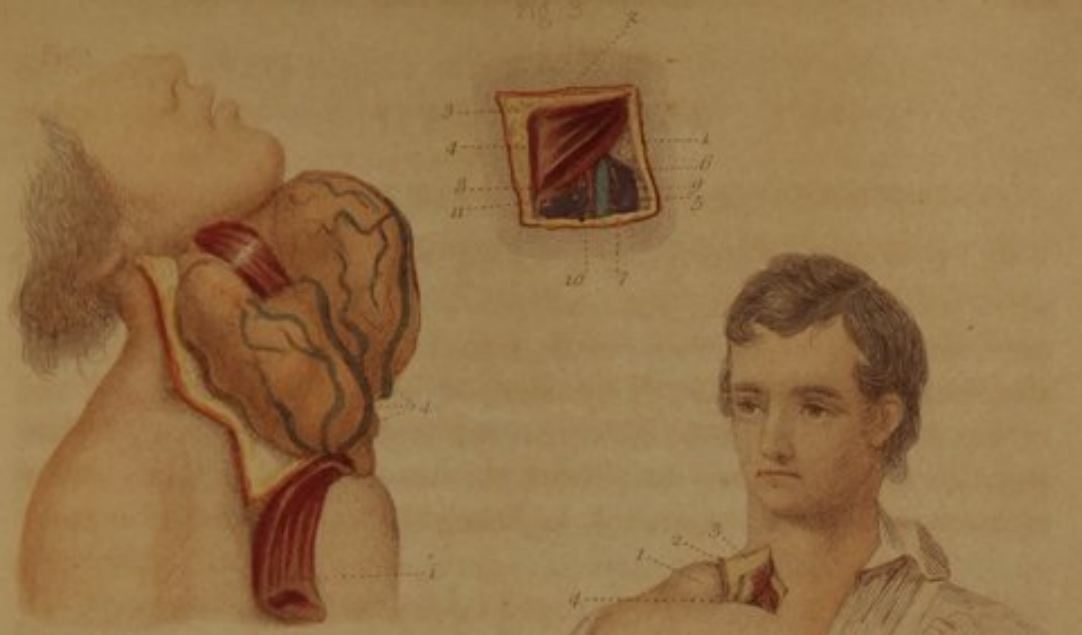
Fig. 3. View of the relative position of the parts concerned in this operation. 1. Vertical incision. 2. Corresponding edge of skin. 3. Flap everted. 4. Sterno-mastoid muscle. 5. Arteria innominata. 6. Internal jugular vein. 7. Origin of subclavian artery. 8. Vertebral artery drawn forwards. 9. Inferior thyroid artery. 10. Internal mammary. 11. Transversalis cervicis artery. After Bourgery and Jacobson.

Fig. 4. A view of the position and arrangement of the Bloodvessels and Nerves of the Neck, as shown by turning off the Clavicle. 1. Trapezius muscle. 2. Sterno-cleido-mastoid. 3. Sterno-thyroid muscle and thyroid gland. 4. Upper portion of sternum. 5. Omo-hyoid muscle. 6. One of the cervical ganglia of the sympathetic nerve. 7. First cervical plexus. 8. Right primitive carotid. 9. Subclavian vein. 10. Ligature on subclavian artery. 11. Hook holding down internal jugular vein. 12. Hook holding par vagum nerve. 13. Branches of spinal accessory nerve. 14. Section of second rib. 15. Phrenic nerve. 16. Aneurismal tumor of the subclavian artery. After Auvert.

Fig. 5. Surgical anatomy of vessels just above the clavicle as connected with the ligature of the Subclavian Artery. 1. Incision in skin. 2. Scalenus anticus muscle. 3. Omo-hyoid. 4. Subclavian vein. 5. External jugular vein. 6. Transverse cervical. 7. Superficial artery. 8. Subclavian artery outside the scalenus muscle. 9. Supra-clavicular nerves. 10. Roots of brachial plexus. 11. Phrenic nerve.

Fig. 6. Excision of the Clavicle as performed by Dr. Warren. The skin has been turned back by a crucial incision, and the bone, being sawed across near its humeral end, is represented as raised by a ligature so as to favor its disarticulation. After Nature.

Plate 37.



§ 5.—STATISTICS OF THE OPERATION OF LIGATING THE SUBCLAVIAN ARTERY.

Of sixty-nine cases reported by Dr. Norris, of Philadelphia,* thirty-six recovered and thirty-three died, or a few more than one-half recovered. Of fifty-four cases, in which the affected side is mentioned, thirty-one were on the right and twenty-three on the left side.

Of the fifty cases reported by Velpeau† (several of which have been also counted by Dr. Norris), twenty-three died and twenty-seven were cured. Of the twenty-three cases in which the left artery was tied, as reported by Dr. Norris, fifteen were cured and eight died; but there is no mention made of any of these having been performed on the left side within the scaleni muscles.

Of twenty-six cases of aneurism reported by Mr. Crisp,‡ ten were ligatured successfully, one was cured by pressure, and five died after the application of the ligature from hemorrhage.

Of thirteen cases of the ligature of the subclavian collected by myself,§ ten were cured and three died. Of seventeen performed in the United States and reported by Norris, eleven were cured and six died. Of the thirty cases, therefore, in the United States, twenty-one were cured and nine died.

On summing up these one hundred and fifty-eight cases, eighty-three are mentioned as cured, out of the whole number reported in the tables. It appears, therefore, that the successful cases have been more than one-half of those operated on, but that the ligature within the scaleni muscles has been by far the most fatal of all, the deaths ensuing chiefly from hemorrhage or from inflammation of the pleura or pulmonary organs.

The anatomical relations of the pleura to these arteries sufficiently explain this result.

* Am. Journ. Med. Sciences, vol. x. N. S. p. 18.
† Operat. Surg., by Mott, vol. ii. p. 219.
‡ Lond. Med. Ex., No. 8, vol. ii. p. 209.
§ Bibliographical Index, Lig. of Subclavian.

CHAPTER X.

OPERATIONS UPON THE CHEST.

SECTION I.

SURGICAL ANATOMY.

THE extent of the chest as a surgical region has been usually regarded by anatomists as being limited above by a circular boundary, formed by the upper extremity of the sternum, the first rib and first dorsal vertebra, or, in other words, by the bony constituents of the thorax, and below by the curved line formed in the arrangement of the cartilages of the ribs, the chest being at this point completely separated from the abdomen by the diaphragm.

There is, however, a portion of the body of great importance to the surgeon, which is not included in these limits, and which is yet not included in those assigned to the upper extremities, to wit, the structures about the clavicle; and it will, therefore, answer better for the purposes of description, at present, to define the chest as that portion of the body intermediate to the neck and abdomen, the upper portion being intimately connected with the upper extremities; but the lower separated entirely from the abdomen by the diaphragm. As most of the constituents of this section of the body are unimportant, consisting merely of skin and muscle, they do not present any points requiring either a precise regional description, or a minute account of their connections with subjacent parts. The reader may, therefore, be referred for their description to the anatomical account of this part which every one gains in the course of a medical education; as its surgical details are also limited, such a brief account as may readily be presented in connection with the operations performed upon it, is all that is at present demanded.

§ 1.—SURGICAL ANATOMY OF THE PORTION OF THE CHEST ABOUT THE CLAVICLE.

The clavicle, being fixed by its articulations at the sternal and acromial extremities, has for its function the preservation of the pectoral space, or the steadying of the shoulder, and the prevention of its approach to the sternum. At each of its extremities is found a perfect joint amply supported by ligaments, in addition to which may be noted two other ligaments, which are upon its under surface, and tend to hold the bone in its proper relations to the chest; to wit, the costo-clavicular or rhomboid ligament, which, arising from the cartilage of the first rib, is inserted into the roughness on the under surface of the clavicle near its sternal extremity, and the coraco-clavicular or conoid ligament, which, arising from the coracoid process of the scapula, is inserted into the tubercle near the inferior and external surface of the bone. The ligamentum bicorne, or bifid ligament, is so closely connected with the subclavius muscle, that it may be regarded chiefly as its fascia, and a further account of it omitted.

The muscles connected with the clavicle above are a portion of the sterno-cleido-mastoid at its sternal extremity, and a part of the trapezius at its humeral end, whilst the pectoralis major and part of the deltoid are in front, and the subclavius muscle below. The latter muscle, arising from the cartilage of the first rib, is inserted into the inferior face of the clavicle, from near the sternum to the conoid ligament, and therefore draws the clavicle towards the rib.

The subclavian artery and vein are both placed between this muscle and the first rib, the vein being close to the artery, but in front of it.

The brachial plexus of nerves extends from the scaleni muscles to the axilla, passing along with the artery between the subclavius muscle and the rib. It has the axillary vein in front of it, but the different nerves surround the artery, as if plaited.

The fascia superficialis of the chest and neck, together with the skin, complete the coverings of this part.

SECTION II.

OPERATIONS UPON THE CLAVICLE.

I. EXTIRPATION OF THE CLAVICLE.

The removal of this bone, either entire or in part, is an operation that has been occasionally found necessary or expedient, in consequence of the development of osteo-sarcomatous growths upon it, and their encroachment upon adjacent parts, or for the relief of necrosis. In the operation performed by the celebrated French surgeon, Moreau, the entire clavicle in a state of necrosis was removed, and at the autopsy of the patient, made several months subsequently, the bone was found to have been entirely regenerated, so as to preserve its relations with both the sternum and scapula. There is, however, no doubt, from the account furnished of this operation, that it was only the removal of a sequestrum resembling the former clavicle, and that this, like the sequestra in other bones in a certain stage of necrosis, had been encased by the new osseous deposit consequent on the efforts of nature to remedy the disease. The only real cases of entire extirpation of the bone that I have been able to find recorded are those performed in the United States by Drs. Mott and Warren, and hereafter quoted.

Extirpation of the entire Clavicle, by Dr. Mott, of New York.—A young man, nineteen years of age, had a conical tumor to form on the left clavicle, without his being able to assign for it any cause. At the time of the operation, it was about four inches in diameter at its base, of an incompressible hardness, firmly attached to the anterior portion of the bone, and with its apex covered with luxuriant fungous granulations, the consequence of former means of treatment, from which profuse hemorrhage took place from time to time.

Operation of Dr. Mott.—An incision, being commenced over the sterno-clavicular articulation, was carried in a semilunar direction in the sound integuments to near the junction of the clavicle with the acromion process of the scapula, exposing the fibres of the pectoralis major muscle. These fibres were then carefully divided, so as to avoid injuring the cephalic vein, a small portion of the del-

toid muscle being detached from the clavicle, and the vein drawn outward towards the shoulder. It being now found impossible, from the size of the tumor and its proximity to the coracoid process, to get under the clavicle in this direction, another incision was made from the outer edge of the external jugular vein over the tumor, to the top of the shoulder, so as to divide the skin, platysma-myoides, and a portion of the trapezius, by which means a sound part of the bone was laid bare near the acromion process. A director very much curved was then cautiously passed under the bone from above, great care being taken to keep the end of the instrument in contact with the under surface, and an eyed probe being conveyed along the director, a chain-saw was passed, and, after being carefully moved a little to see that nothing intervened, made to cut the bone entirely through at this point.

The dissection being now continued along the under surface of the tumor below the pectoralis major, a number of very large arteries and veins were cut and ligated; the first rib exposed under the sternal end of the clavicle; the costo-clavicular ligament divided and the sterno-clavicular articulation opened from below, thus giving considerable mobility to the mass. The sawed end of the clavicle being then elevated by means of strong curved spatulæ, the subclavius muscle was divided at its origin, the remainder of it being obliterated in the tumor. The tumor was now separated from the cellular and fatty structure between the omo-hyoid and the subclavian vessels, at the upper and outer part of which, a number of large arteries required the ligature, especially a large branch from the inferior thyroid artery. The anterior part of the upper incision being then made from the sternal end of the clavicle over the tumor until it met the other at the external jugular vein, this vein was tied with two ligatures, and divided between them. The clavicular origin of the sterno-cleido-mastoid was also divided about three inches above the clavicle, and the deep fascia being exposed, the mass was very cautiously dissected until the scalenus anticus was exposed; the subclavian vein, which was firmly adherent to the tumor, being most carefully detached, without injury, by the handle and blade of the scalpel. The external jugular vein being so connected with this part of the tumor as again to require two ligatures near the subclavian, and be again divided in the interspace, the whole mass was removed, the hemorrhage throughout being so free as to require more than forty ligatures. The patient recovered in

about eight weeks, and was subsequently enabled to use his arm by means of a mechanical contrivance which kept the shoulder off from the chest.*

Operation of Dr. J. C. Warren, of Boston.†—A man, aged twenty-four, after violent muscular effort, felt a severe pain at the junction of the right clavicle with the sternum. A year afterwards, his clavicle presented a tumor measuring seven inches from the sternal end in a line with the bone to its scapular extremity; from the clavicle to the nipple, it measured five inches; the tumor being hard, with no evident fluctuation, though a slight pulsation could be perceived by the stethoscope. There was no sensible difference in the pulsation at the wrists; the patient complained of its occasionally pressing on his windpipe, and the constitution presented signs of the scrofulous diathesis.

Operation of Dr. Warren.—The patient being placed on the table, with the shoulders elevated, an incision was made from the acromial extremity of the clavicle to the sternal end of the opposite bone. This being crossed by another at right angles with it, beginning just below the middle of the sterno-mastoid muscle and extending to the face of the pectoral muscle below the middle of the clavicle, the four flaps were dissected from the surface of the tumor, and the outer extremity of the bone laid bare by dissecting the deltoid from its anterior, and the trapezius from its posterior edge. The coraco-clavicular ligament being then divided, an eyed-probe, armed with a ligature, was passed under the clavicle, and a chain-saw attached to the ligature drawn after it under the bone so as to saw it entirely through.

A strong band being now passed around the outer extremity of the divided bone, the tumor was partly moved by it so as to give tension to the surrounding soft parts. (Plate XXXVII. Fig. 6.)

The pectoralis major muscle, being then divided and dissected from the lower edge of the tumor, was drawn so as to expose the pectoralis minor and the cephalic vein. On continuing the dissection under the tumor, the subclavius muscle could be freed from the outer part, but was lost in the tumor at its sternal end, where the dissection necessarily proceeded over the surface of the subclavian vein. An adhesion of the tumor to the second rib, in which it was imbedded,

* Am. Journ. Med. Sciences, vol. iii. p. 100. 1828.

† Ibid., vol. xiii. p. 17. 1833.

prevented also its perfect separation at this part until the close of the operation.

The next step being to divide the attachments of the upper or cervical edge of the tumor, the posterior external jugular vein was divided and tied. Being filled with dense lymph, it discharged no blood.

The sterno-mastoid muscle was next cut across, and the sheath of the cerebral bloodvessels exposed; the internal jugular vein which passed into the tumor being, after much care, separated from it, and the carotid and par vagum drawn to one side. The anterior external jugular vein was found imbedded in the internal extremity of the tumor, and, though also filled with lymph, was tied as a measure of safety, when the sternal end of the tumor was with great caution separated from the corresponding parts of the jugular and subclavian veins, the whole extent of the latter vessel, as well as the lower part of the internal jugular and par vagum nerve, being exposed and put in motion by the pulsation of the subclavian, carotid, and innominata arteries, when the extirpation was completed. But little blood was lost; only one or two arteries, and the veins just stated, requiring the ligature. The flaps were then brought over and retained by three sutures and adhesive plaster, so as to cover the wound perfectly. On the thirteenth day after the operation the patient was attacked with chills, and in the fourth week he died (as far as could be judged from the post-mortem examination), of constitutional irritation, being of a bad habit of body.

Remarks.—In the details of these operations, there may be noted some difference in the methods of operating, caused apparently by the peculiar circumstances of each tumor, though in most of the important points they correspond. As such will doubtless be the case hereafter, should the operation be repeated, any estimate of the advantages of one plan over the other could only be theoretical, and not serve as a guide for future operators. That both operations involved a great risk of life, cannot be doubted; but this a competent surgeon will always be prepared to meet, and if the patient's condition can be benefited by a repetition of these rare operations, no experienced operator should, for a moment, hesitate about its performance. A point worthy of being mentioned in connection with these operations, as well as others involving the great veins of the neck, is the liability to the entrance of air into the vein from even a very slight wound of the vessel, and when the constant action of the

vessel, as affected by the expiration and inspiration of the patient, is recalled, the rapid passage of a bubble of air to the heart may be readily understood. But, though this circumstance has caused most speedy death, yet it has not invariably done so, and the use of anæsthetic agents in this operation, when judiciously conducted, will, it is thought, diminish very much its danger. When a patient is fully etherized, great tranquillity is obtained in the respiratory movement of the chest, and there is therefore less risk of a wound being accidentally inflicted; whilst, in consequence of the diminished inflation of the lungs, the absence of all efforts at crying, as well as of the shock to the system caused by this valuable agent, the risks of the operation, when thus performed, must be less than they were formerly. With the heart beating about sixty in the minute, and the respiration slow and comparatively feeble, as is usually the case in etherization, it may be doubted whether these important veins would not be as free from danger as is possible in any dissection in the neighborhood of their parietes.

II. RESECTION OF THE CLAVICLE.

Resection of a portion of the clavicle is a comparatively simple operation that may be occasionally demanded in cases of necrosis of this bone. It may be performed either at its sternal or humeral third.

§ 1.—RESECTION OF THE STERNAL END OF THE CLAVICLE.

In a case of necrosis of the clavicle, Velpeau operated in the following manner:—

OPERATION OF VELPEAU.—A crucial incision being made with each branch four inches long, the flaps were dissected back, the acromio-clavicular ligament and some portions of the deltoid and trapezius muscles divided, and the necrosed bone raised by means of a bit of wood which was employed as a lever, until the sequestrum could be detached from the sound parts.*

RESECTION OF THE STERNAL END OF THE CLAVICLE has also been performed by Dr. Davy, of Bungay, England, in order to relieve the

* Malgaigne, Philad. edit., p. 195.

pressure upon the œsophagus of a young lady, consequent on a dislocation of the sternal end of this bone from a disease of the vertebral column.

Operation of Dr. Davy, of England.—An incision, two inches long and following the axis of the clavicle, being made on the extremity of the displaced bone, the articular ligaments were divided, and a piece of shoe-leather slipped under the end of the bone, so that it could be divided by sawing upon the leather without involving the deeper-seated parts. The wound healed readily, deglutition was restored, and the patient perfectly relieved by the operation.*

§ 2.—Resection of the Acromion Process of the Scapula.

The resection of this process would be an operation so very similar to that of the acromial end of the clavicle, allowance being made for the position of the muscles and other parts, that it can be readily understood without further reference.

SECTION III.

OPERATIONS ON THE PARTS ABOUT THE CLAVICLE.

In the portion of the chest immediately about the clavicle, only one operation of importance is ever requisite, to wit, the ligature of the axillary artery, or as it is sometimes though incorrectly termed, the ligature of the subclavian artery beneath the clavicle.

I. LIGATURE OF THE AXILLARY ARTERY BENEATH THE CLAVICLE.

The axillary in this portion of its course may be found in the triangular space which is bounded above by the clavicle, below and on the outside by the pectoralis minor muscle, and below and on the inside by the sternal origin of the pectoralis major.

Ordinary Operation.†—The patient being laid upon the table

* Malgaigne, p. 196.

† Malgaigne, Philad. edit., p. 147.

with the shoulders slightly raised, and the elbow carried a little off from the body so as to stretch the skin, an incision should be made three inches long, and about three quarters of an inch below the clavicle, parallel with the bone so as to terminate outside of the line of junction of the pectoralis major and deltoid muscles, dividing only the skin. The superficial fascia of the chest, and the fibres of the pectoralis muscle being then carefully cut, and attention given to the position of the cephalic vein, a director should be introduced beneath the posterior portion of the sheath of the muscle; then, after bringing the arm to the side so as to relax the parts, tear the cellular tissue about the vessels with the point of the director, and carry the index finger behind the upper border of the pectoralis minor muscle, and, pushing it downwards and outwards, the vessels will be seen in the following order: 1st. On the inside, the axillary vein swollen at each expiration and partly covering the artery. 2d. Outside and a little behind the vein, the axillary artery. 3d. More externally and behind, the nerves of the brachial plexus. The vein being drawn inwards by a blunt hook, the aneurismal needle should be passed between the vein and the artery from within outwards, above the origin of the acromial and mammary arteries, which would otherwise interfere with the formation of the coagulum. (Plate XXXVI. Fig. 4.)

Operation of Lisfranc.—Abducting the arm forcibly from the body, so as to render distinct the clavicular and thoracic origins of the pectoralis major muscle, Lisfranc incised the skin in an oblique direction from the clavicle downwards and outwards. The fascia superficialis being then carefully divided, and the line of separation of these two parts of the muscle apparent, their adhesions were separated by the finger or knife handle, the arm brought close to the side, and the artery sought for and tied, as in the plan just described. Malgaigne* gives as a rule a direction which I have always found to be a good one, and that is, after the laceration of the posterior part of the sheath of the pectoralis major muscle, to search on the inside of the wound for the vein, which is the first vessel met with, and is an infallible landmark. Carrying it inwards, the artery will be found a little outside and a little behind.

Remarks.—The ligature of the axillary artery by either of the

* Philad. edit., p. 148.

above plans, will be found to be a troublesome operation, and in the case of an aneurism or wound lower down, which are the principal disorders likely to require it, a most difficult one to perform in consequence of the infiltration of the parts, or the enlargement of the thoracic vessels. The after-treatment will also be troublesome, and require special attention at each dressing, in order to prevent collections of pus within the wound, or the travelling of matter into the axilla, or beneath the pectoral muscles, in consequence of the depth of the wound. The position of the brachial nerves, or any anomalous distribution of the vessels, is also liable to lead the operator into error, although the rule laid down by Mr. Malgaigne would obviate this in the hands of a careful surgeon and good anatomist. As the artery may be more readily tied in the axilla (as will be shown in connection with the operations upon the upper extremity), and as it is not so difficult to ligate it above the clavicle as it is below, this place is now seldom selected for the application of the ligature. The results attending the ligature of the axillary artery by surgeons in the United States may be seen to a limited extent in the Bibliographical Index, and will be again referred to in connection with the operations on the extremities.

In studying all operations, but especially the ligature of arteries, the student will find it much to his interest to practice them upon the subject in the manner that has just been described. The French surgeons are particularly fond of this kind of practical exercise, and it is one reason why their directions in relation to the ligature of arteries are especially valuable. In every operation upon the blood-vessels, those who are accustomed merely to the practice of the dissecting-rooms should, however, recollect the additional difficulties that they may have to encounter from the changes in the relative position of the parts in consequence of disease, as well as the increased dangers always to be encountered from the thin coats of veins being distended with blood in the respiratory efforts of the patient.

CHAPTER XI.

OPERATIONS UPON THE MAMMARY GLAND OF THE FEMALE.

The mammary gland of the female is peculiarly liable to the development of tumors of various kinds which may require either to be separated from the gland and removed by themselves, or may be of such a character as will render the extirpation of the entire breast the most advantageous operation. To decide on the extent of an operation of this kind, the surgeon should be perfectly familiar with the peculiar tendencies of the different kinds found in this organ.

All tumors of the breast have been divided, by Sir Astley Cooper, into those which are benignant and those which are malignant, the first being often curable by remedial measures, or by the extirpation of the tumor itself; the latter being liable to invade the whole gland and render its entire extirpation proper, except when developed in the breasts of those who from age or other circumstances may find it desirable to retain the bosom, even at the risk of being compelled to submit to a repetition of the operation. The removal of any of the benignant tumors may be accomplished by such incisions through the skin as will expose the new growth, when, after passing a ligature through it, or obtaining a good hold upon it in some other manner, the surgeon should carefully dissect it from the surrounding structure, so as to leave no particle of it. The extirpation of the entire gland will be more fully detailed subsequently, in connection with the anatomical relations of this part.

At present, attention may be advantageously directed to the general pathology of tumors of the breast, in order to enable the operator to decide which operation may be advisable.

SECTION I.

PATHOLOGY AND DIAGNOSIS OF MAMMARY TUMORS.

In the extended work of Sir Astley Cooper,* in that of Dr. Warren, of Boston,† and in an able article by Velpeau,‡ may be found much valuable instruction in relation to this class of complaints, to which those desiring more extended details than can be reasonably anticipated in a work of the general operative character of the present, are referred.

In the subdivision of the benignant class of Sir Astley Cooper, are placed six different species of tumors. 1. The Hydatid. 2. The Chronic Mammary. 3. Cartilaginous and Osseous. 4. Adipose. 5. Large Pendulous Breast. 6. Scrofulous. 7. The Irritable Tumor. Of the signs of each Dr. Warren gives the following :—

1st. The Scrofulous Tumor is seen in early life in patients who present all the constitutional signs of scrofula. This tumor is large, irregular, indistinct, not painful, varies in size at different times, and corresponds with the tuberculous tumor of Velpeau.

2d. The Chronic Mammary Tumor occurs before the age of thirty-five, in healthy, but feeble constitutions; is circumscribed, of a rounded form, quite movable; not tender or painful; increases slowly, and is not malignant.

3d. The Irritable Mammary Tumor is seen before middle age in delicate and nervous habits; is not large nor well defined; is tender, painful, and sometimes accompanied with general swelling of the breast and fever. It is not malignant.

4th. Hydatids, or Hydatid Tumors, appear before middle age; are irregular; occupy the whole breast; are not tender, painful, or discolored; increase rapidly and attain a great size, when they may be readily distinguished by the globular bodies which form on the surface, as well as by their magnitude and freedom from pain.

5th. The Adipose Tumor is seen in healthy females, and easily recognized by its great size, elasticity, freedom from sharp pain, and regular surface.

6th. Cartilaginous and Osseous Tumors, which are rare, may be known by their extreme hardness.

* Cooper on the Diseases of the Breast.

† Warren on Tumors.

‡ Dict. de Médecine, tome 19.

7th. Cancerous Tumors are usually seen between the ages of thirty and fifty; often in those whose relatives have suffered from cancerous complaints.

8th. Encephaloid growths occur in young subjects; are large and soft; consist of two or more globular bodies; increase rapidly; ulcerate; create a fungus, and bleed.

Velpeau, with the accuracy of detail which is so characteristic of an extended experience, divides all mammary tumors into three classes: 1st. Those arising from simple hypertrophy, either of the gland or its envelopes. 2d. Those due to degeneration of the natural tissues; and 3d. Those which are the result of abnormal deposits, as shown in the following table:—

- 1. Simple hypertrophy.
  - 1. Of the mammary gland.
  - 2. Of the cellular tissue.
  - 3. Of the fat.
- 2. Degenerations.
  - Fibrous.
    - In laminæ.
    - In mass.
    - In radii.
  - Fibro-scirrhous.
    - Of the glandules.
    - Of the gland.
    - Of the milk-ducts.
- 3. Abnormal productions.
  - Liquid cysts.
    - Serous or hydatid.
    - Gelatinous.
    - Sanguinolent.
  - Solid.
    - Fibrinous.
    - Tuberculous.
    - Buttery, milky, or cheesy.
    - Osseous.
    - Scirrhous.
    - Encephaloid.
    - Colloid.
    - Melanotic.

In the above well-arranged table may be found a designation of nearly all the tumors of this portion of the body, and the following description, which is mainly condensed from the information furnished by his valuable paper, will sufficiently fill up this brief enumeration.

§ 1.—TUMORS DEPENDENT ON HYPERTROPHY.

HYPERTROPHY OF THE MAMMARY GLAND is only seen in the unmarried female, is most apt to appear soon after puberty, and sometimes creates such a development of the organ as is almost incredible, some having been reported in which the gland hung down to the knees and weighed thirty pounds, and others having been forty-two inches in circumference. In the only case that I have seen in Philadelphia, the breast reached nearly to the umbilicus, and was larger than a man's head, as tested by an attempt to surround the gland with a hat.

This complaint is universally admitted to be rare, and yields no further inconvenience, in many instances, than such as can be remedied by stays, and, in many instances, disappear on child-bearing. The natural appearance and feel of the gland will usually prevent diagnostic errors.

THE FATTY TUMOR, or hypertrophy of the adipose and cellular tissues around the breast, is not intended to include the ordinary lipomatous growth which is occasionally seen in the breast, as well as elsewhere, and which is a circumscribed, lobulated, and pediculated tumor, but designates a rare form of disease in which the adipose structure of the entire breast is much augmented, creating a mass of considerable size, of a broad base and not pediculated. This tumor is apparently dependent on an extreme development of the adipose cells in the interlobular septa of the breast as well as in the subcutaneous layer of fat. The mass is nearly always lobulated, or as if subdivided into numerous secondary masses, by the fibro-cellular septa which create the lobules of the breast. When incised, there is seen an almost homogeneous mass furrowed by a few whitish fibrous bridles, intermixed with many glandular lobules which are greasy and unctuous to the touch, of a yellow color, of the consistence of lard, and which may be broken down by the finger.

Dr. Warren* reports an instance of this kind of tumor which he removed, and which weighed eight pounds. No appreciable cause could be assigned for its production.

FIBRO-CELLULAR HYPERTROPHY is an abnormal development of the natural partitions, and fibrous or cellular laminæ which separate

* On Tumors, p. 229.

or envelop the lobes of the breast, and is generally due to some inflammation of the breast which has previously existed, such as an acute or chronic mammary abscess. On examining the breast after this complaint, the gland is often found to be decidedly harder, less elastic, less lobulated, and more homogeneous than is the case in its natural condition. The subcutaneous cellular and fatty tissue, together with the divisions of the lobules, are now found to be confounded in one regular mass, in the midst of which the natural structure of the gland seems to be lost. This disorder has been described by Sir Astley Cooper and Dr. Warren as the chronic mammary tumor, and is difficult to distinguish from the early stages of carcinoma. It may, however, be diagnosticated from scirrhus by the previous history showing that it was consequent on one or more attacks of inflammation; by the absence of pain, heat, and redness; by its density, by its mobility, notwithstanding the appearance of adhesions between the tumor and the skin; by the good constitution of the patient and their self-satisfied condition, as well as by its remaining stationary, rarely or ever increasing. This fibro-cellular hypertrophy often disappears of itself by a complete and gradual resolution, even after it has existed a long time; seldom or ever degenerates, and does not usually demand operative interference. In a patient, at present under my treatment, the left breast has been thus indurated during a period of four years, as the consequence of an inflammation of the gland, which, in accordance with the advice of Mr. Cusack and other surgeons of Dublin, has been untouched by the knife. During two different lactations, acute inflammation has shown itself about the structure, the first of which was relieved by an antiphlogistic and resolutive treatment, and in the second by a free suppuration, which, though causing some diminution of the surrounding enlargement, did not materially change the character of the original deposit.

§ 2.—TUMORS DUE TO DEGENERATION OF TISSUE.

The class of tumors of the breast, designated as those due to a degeneration of tissue, is intended to include such as present the elements of the gland either in a condition of induration which has been compared to the hardness of wood, or to that of fibro-scirrhous deposit. The first may be found arranged either in laminæ, in mass

or in radii, constituting a variety of scirrhus, and deserving of special consideration in order to render the diagnosis of the tumors of this part more accurate, as well as to present a more definite account of the changes of structure than could be furnished under the general term "scirrhous degeneration."

I. LIGNEOUS, OR WOOD-LIKE SCIRRHUS.

The ligneous variety of scirrhus may be seen either in laminæ, mass, or radii.

In the laminated class, the disease usually occupies a disk, which is more or less regularly circumscribed by a tegumentary envelop, and, as a general rule, seated in the skin, though sometimes it consists in isolated points which are deep-seated. In the first case, the skin is hard to the touch, a little wrinkled, thickened, and of a grayish or red color, which is altogether unnatural, looking as if the part had been tanned. In other instances, the disks are much smaller and disseminated, the two varieties occasionally existing in the same patient, a large disk being surrounded by an infinite number of small ones. Sometimes they rise above the surface of the skin, whilst at others they are disseminated in the subcutaneous layer. This sort of degeneration continues, usually, notwithstanding the most judicious treatment; is reproduced with extreme obstinacy, and cannot be operated on with any chance of success. At other times, this ligneous degeneration shows itself as small shot or pea-like tumors, in or under the skin, which have their seat in the subcutaneous cellular tissue, and apparently result from the transformation of this tissue. These tumors are also reproduced with extreme obstinacy, and are not benefited by an operation.

In a paper by Dr. Joseph Parrish,* the condition of parts, in this form of scirrhus, has been distinctly noted, his attention having been called to it by Dr. Physick. It is there described as giving the sensation of a granulated surface as if the skin were filled with small shot. Dr. Physick considered this as the most dangerous form of true scirrhus, and thought that he had never known an operation to prove ultimately successful, an opinion in which Dr. Parrish coincided.

* North Amer. Med. and Surg. Journ., vol. vi. p. 295, 1828.

II. FIBRO-SCIRRHOUS DEGENERATION.

This class includes most of the tumors which are designated in common language as cancerous. They may be seen either as affecting the septa which surround or separate the different lobes of the breast; as extending to the proper structure of the gland, or as connected with the milk-ducts. On incising a breast affected with the first (septa), it is seen to be partitioned by hard, pearl-like laminæ, which creak when cut, and this variety is the most difficult to eradicate of all the forms of scirrhus, as these apparent roots, by prolonging themselves in every direction, can seldom be entirely removed.

III. THE ORDINARY CANCEROUS TUMOR OF THE BREAST.

This tumor, as described by Dr. Parrish,* commences with a small distinct lump, which runs its course either with great rapidity, or remains indolent for months or years. When it becomes active, the first symptom is generally a lancinating, or an exceedingly distressing burning pain.

When the tumor increases in size, it embraces the adjacent parts, and identifies them with its own peculiar structure. As at first perceived,† it is a hard irregular lump without definite limits, is movable, that is, moves with the portion of the gland in which it is situated, but does not move in that portion like the chronic mammary tumor before spoken of. As it contracts adhesions with the skin, the latter becomes wrinkled and puckered, or is slightly swollen, and the nipple is retracted or depressed below its ordinary level; whilst, as adhesions form with the pectoral muscle, the whole mass becomes, as it were, a part of the thorax. The skin, changing color, becomes of a dark red, cracks, and gives exit to a thin serum, which is followed by ulceration. Hectic fever comes on, the disease involves the adjacent lymphatic glands, and an operation for its removal becomes unjustifiable.

The pain which attends the development of cancerous tumors is evidently due to the compression of the nerves of the part by the scirrhous substance, and usually follows the course of the thoracic

* Opus citat.

† Warren on Tumors, p. 236.

nerves into the axilla. This pain, combined with the peculiar cachexia, is an important aid in diagnosticating these complaints.

§ 3.—ABNORMAL PRODUCTIONS.

Of the abnormal deposits in the mammary gland, there are found two kinds, to wit, such as are liquid and such as are solid.

The liquid deposits embrace the whole class of encysted tumors, and are comparatively simple in their character, requiring either the removal of the cyst and its contents, or the development of such an action as will modify the process of secretion.

The solid tumors may be either benignant or malignant. Of the first, we have the fibrinous, tuberculous, cheesy, and osseous, all of which may be extirpated with but little chance of return; whilst the scirrhous, encephaloid, colloid, and melanotic will most frequently be reproduced at some period, or in some other spot, after extirpation. The variety seen in these productions must, however, prevent a more detailed allusion to them, and the account of the progress and result witnessed in the numerous tumors found in and about the mammary gland may, therefore, be briefly summed up in the following facts:—

1st. All tumors of the breast are, or are not, susceptible of malignant transformation.

2d. Those not susceptible of cancerous transformation are the encysted class, as the hydatids, the serous or sanguinolent effusions, and the fibrinous, tuberculous, cheesy, and osseous tumors.

3d. All those included in the preceding table under the head of degenerations, as the ligneous, fibro-scirrhous, &c., are liable to conversion into cancer, whilst the other solid abnormal productions are well known to be malignant.

SECTION II.

EXTIRPATION OR AMPUTATION OF THE MAMMARY GLAND.

The mammary gland is covered by the integuments in front and adherent behind, by a loose cellular tissue, to the fascia covering the pectoralis muscle, being chiefly supplied with blood from the

PLATE XXXVIII.

OPERATIONS PRACTICED ON THE CHEST.

Fig. 1. Extirpation of the mammary gland of the female. The patient is seen lying down with the arm carried off from the body, and the lowest of the two elliptical incisions has been made from the axilla towards the sternum. The parts being intended to heal by granulation, much more of the integument is about to be removed than is usual in the United States.

1, 2, 3. First or lowest incision. 1, 4, 5. Line of second incision.

After Bernard and Huette.

Fig. 2. Represents the completion of the operation of extirpation of the breast, as usually practiced. The left hand of the surgeon grasps the gland and draws it towards the sternum, whilst the thickened cellular tissue or lymphatics are being dissected from the margin of the axilla.

After Nature.

Fig. 3. A view of the arrangement of the adhesive straps after the operation. The straps should be long, and pass obliquely around the chest, so as to leave intervals between the different strips. A piece of linen has been introduced between the edges of the skin at the lowest angle of the wound, in order to secure a vent for the matter.

1. Line of union of the wound left by the incisions. 2. Mesh to favor escape of the pus. 3, 3. Posterior course of the adhesive strips.

After Bernard and Huette.

Fig. 4. Operation of empyema upon the right side of a man. The patient is represented lying down, and slightly inclined to the left side, while the surgeon makes an opening between the eighth and ninth ribs.

After Bernard and Huette.

Fig. 5. Resection of two of the ribs on the left side. The patient lying down and inclined towards the right, a crucial incision has been made over the seat of the disease, the flaps 1, 1 turned back, the ribs 2, 2 sawed across or broken, and the posterior extremities elevated by a bandage, previous to their removal. The thickened surface of the pleura 3 is seen behind the seat of the disease.

After Nature.

Plate 38.

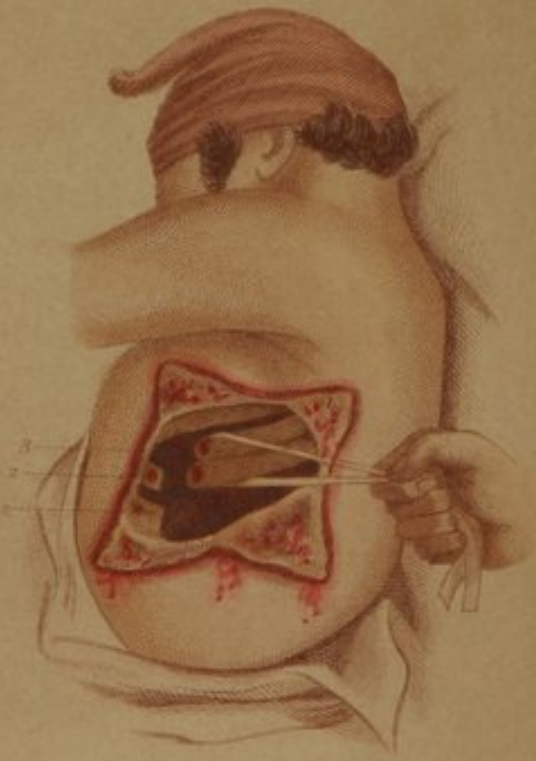
Fig 1.

Fig 2.

Fig 3.

Fig 4.

Fig 5.



branches of the external mammary artery, whilst its veins run up into the axillary vein. Its removal may be readily effected by incising the skin in such a form as circumstances may demand, but the subsequent dissection of the gland should be conducted in the line of the fibres of the pectoralis muscle, that is, from the sternum towards the axilla.

Operation.—The patient being etherized and placed upon a table, rather than upon a chair, with her head and shoulders slightly raised, the arm of the affected side should be carried off from the body, and held by an assistant, so as to keep the skin and pectoral muscle upon the stretch. The surgeon, standing on the side of the disease, or by the shoulders of the patient, should then place the four fingers of his left hand upon the skin, so as to make it tense, whilst another assistant does the same with the integuments of the opposite side of the tumor. After thus steadying the skin, make a semi-elliptical incision with its concavity upwards and the nipple near its centre, either by cutting from the axillary margin of the gland, or lower portion of the anterior border of the axilla towards the sternum, if standing on the diseased side, or by beginning on the sternal side and extending the cut towards the axilla if standing at the shoulder of the affected side, holding the scalpel in the first position (Plate III. Fig. 1), and bearing on it with tolerable firmness, so as to divide the integuments thoroughly by the first stroke of the knife. Then, while the breast and skin are drawn in different directions by himself and assistant, let him dissect the integuments free from the gland on its lower portion, and after this make another elliptical incision with its concavity downwards, on the upper side of the gland, so as to meet the first one at its sternal termination, but not quite reach it at the axilla, including between these two incisions as much integument as will remove any excess of skin (Plate XXXVIII. Fig. 1). Then dissecting the upper flap off from the gland in the same manner as before, seize the mass firmly, either with the tumor forceps, or by means of a ligature passed through it, or by the fingers, which are usually the best instruments; and dissect it from the sternum towards the axilla, either by working from above downwards or the reverse, according as it is found most convenient, though the dissection from below exposes the operator to the risk of getting beneath the fold of the pectoral muscle in approaching the axilla. As the various branches of the mammary arteries (external thoracic)

are divided, the hemorrhage, if profuse, or if the patient is feeble, should be checked, by ligating each vessel as it is cut. But, if this is not the case, they may be overlooked for the moment, or temporarily compressed by the fingers of an assistant, when they will often contract and give no further trouble.

In prosecuting this dissection, the left forefinger and thumb should constantly examine the surrounding textures, in order to detect any hardened portions, the dissection being always carried so far into the healthy tissue as to leave a margin of the latter to be extirpated along with the breast. On approaching the axillary end of the ellipse, the breast should be grasped in the left hand (Plate XXXVIII. Fig. 2), and drawn upon so as to insure the removal of any of the condensed laminæ, or fibres of indurated cellular tissue. If the axillary glands also show any signs of hardening, they may now be readily removed, by slightly prolonging the incisions into the axilla, and working from above downwards. This part of the operation requires considerable care in some instances, in order to avoid injuring the axillary vein. To prevent this, it will be found advantageous to elevate the arm towards the head of the patient, as this position removes the axillary vessels as far as possible from the point of the knife. When, however, any of the thoracic veins appear to be connected with the lymphatic glands or indurated tissues, or when the disease is thought to approach near to the main vein, it will be safer, instead of dissecting it out, to surround the axillary portion with a strong ligature, and cut off the part connected with the tumor on the mammary side of the thread, leaving the remainder to slough or ulcerate out.

After being fully satisfied that every diseased particle is removed, the wound should be cleansed, any arteries that continue to bleed ligated, and the ligatures brought out at the sternal extremity of the incisions.

The arm being now brought to the side, the edges of the skin may be approximated and held together at the central point by a single suture, supported by long adhesive strips, or the whole may be closed by the interrupted suture without resorting to the use of plaster. In either case, it is a good practice to introduce a little mesh of linen into the lower orifice of the incision (Plate XXXVIII. Fig. 3), in order to secure a vent for the pus by preventing the entire union of the skin before the ligatures come away, or before adhesions have formed in the deeper seated parts. When adhesive strips

are employed, they should be applied from below upwards, obliquely across the line of the wound, so as to leave spaces between each strip for the escape of matter (Plate XXXVIII. Fig. 3). After this, a compress should be firmly retained against the part by a spiral reversed bandage of the chest, so as to prevent the pus collecting within the lower flap, whilst the arm of the side operated on should be supported in a sling, or kept close to the side, so as to preserve perfect rest of the pectoral muscle until union has occurred.

If the disease has involved a part of the pectoral muscle, this portion should also be removed, though, as a general rule, it is best to avoid incising even the anterior fascia of the muscle, lest it subsequently interfere with the free motions of the arm. Should the gland be known to be adherent to the muscle before operating, the chances of the cure will be so much diminished that the surgeon may well hesitate before he advises his patient to submit to the knife.

Remarks.—The simplicity of the operation of extirpating the breast is often such that the detailed account of it just given may by many be deemed unnecessary, and to the man of experience such will doubtless be the case in this as in most other operations, but to others it will, it is thought, prove useful. The frequency of the operation demands also that those whose experience is limited should, if possible, be made aware of the difficulties which are occasionally met with; whilst, in an operation for the removal of a growth which is so very liable to return, too much care cannot be taken to excise every portion that is diseased, and this can only be accomplished by following the details of a proceeding similar to that just stated.

In what seemed to be a simple case of extirpation of the mammary gland, as performed by Dr. Warren, of Boston, everything did well until it became necessary to remove some of the indurated lymphatic glands of the axilla. When the separation of these was nearly effected, "a vein was divided, which gave exit to a small quantity of venous blood, when almost instantly the patient struggled, her complexion changed to a livid color, and a bubbling gurgling noise was indistinctly heard, showing the entrance of air into the vein. The axilla was, therefore, instantly compressed, but the patient became insensible, and breathed as if in apoplexy. The tumor was at once separated, the patient laid down, brandy poured down her throat, and ammonia introduced into her nostrils, but the pulse became less distinct every instant," and although every other possible

means of exciting animation were tried, even to opening the larynx and inflating the lungs by a pair of bellows, and continued without intermission for twenty minutes, the patient never breathed again. In the history of this case, Dr. Warren* suggests that the entrance of air into the axillary vein in this operation may be prevented by keeping the arm towards the side, so as to relax the coats of the vessel, instead of extending it as directed in the preceding description of the operation. But when the surgeon is aware of the risk of this accident, and is cautious, he will, at least, be enabled to see better the parts that he is about to cut when the axillary dissection is made as before directed. In all such cases, however, it is certainly the safest plan to secure the chain of glands and cellular tissue with a ligature, and leave the pedicle to slough out, instead of dissecting into the axilla, in order to remove them.

The selection of the different incisions or their direction is, it is thought, a matter that must be settled at the moment by the peculiar circumstances of the case. The elliptical incision in the line of the fibres of the pectoral muscle is that most frequently resorted to, and answers perfectly well in most instances. The propriety of arresting the hemorrhage as the arteries are divided, or simply twisting or compressing them during the operation, is also a point on which surgeons differ, and must be left to the decision of the operator, who should be guided in his course by the strength of the patient, and by the number and size of the vessels that are divided. I have seen many instances where only from one to four ligatures were demanded, whilst, on the other hand, I have been compelled to apply fifteen or twenty before the bleeding was checked.

Statistics.—A very important question connected with this operation is the advantages likely to result to the patient from its performance. To decide this point correctly, it is essential that the subsequent history of the cases operated on should be known, and this from various causes it seems to be almost impossible to obtain. An effort is, however, now making, under the auspices of the American Medical Association, which may do something towards elucidating this question.

At present, the general opinion, as formed from limited accounts, and the *recollection* of operators, is that, in the majority of cases of

* Warren on Tumors, p. 260: also Am. Cyclopedia Pract. Med. and Surg., by Hays, vol. i. p. 263, article Air, 1834.

well-marked cancer, the operation does not cure the patient, though it has been supposed to prolong her days. The latter assertion has been urged by those who advocate the operation in all cases; but the so-called fact is, in my opinion, a doubtful matter, as I have known advanced cases of ulcerated cancer to live many months (in one instance three years), under a local antiphlogistic and palliative treatment, combined with the free use of chalybeates, as directed in the plan of treatment pursued by Justamond and others.

The following seem to be the opinions of the surgeons hereafter quoted, so far as I have been able to collect them:—

Rhazes,* A. D. 924, opposed all operations for cancer when the tumor was not entirely free from the surrounding parts.

Albucasis,† A. D. 1100, strongly doubted the propriety of operating in cancerous tumors, declaring that he never cured or saw cured a single case.

Monro in England, and Delpech in France, are believed to have been opposed to the operation. Velpeau,‡ on the contrary, regards most of the cancerous, encephaloid, or colloid tumors as a primary local complaint, the rest of the system being only involved secondarily. He thinks, therefore, that every case of cancer should be operated on, and operated on as early as possible, without delaying in order to try remedial measures.

Dr. Joseph Parrish, of Philadelphia, admits that, after considerable observation and experience, he was much discouraged by the final success of the operation, and never resorted to the knife (unless at the particular request of the patient), where the disease had penetrated into the axilla, or fixed upon the parts beneath the breast. When the breast alone was affected, he advised the operation, though believing it to offer but a doubtful prospect of escape.

Dr. Warren,§ of Boston, is satisfied that many cases may be cured by the operation, and, according to the best of his information, thinks that one in three has been cured without a relapse, and that when the tumor is not ulcerated, and there are no signs of a constitutional disorder, it is best to try the experiment.

Dr. Dudley,‖ of Lexington, reports to the Committee on Surgery,

* History of Surgery, p. xx, Part I. of this volume.

† Ibid., p. xxi.

‡ Dict. de Méd., tome 19me, p. 97.

§ On Tumors, p. 278. 1839.

‖ North Am. Med. and Surg. Journ., vol. vi. p. 300. 1828.

of the American Medical Association for 1850, "that he never removed a scirrhous breast without a return of the disease at a subsequent period."

Dr. Paul F. Eve* "never operated when the diagnosis was unequivocal, that the affection did not return."

Dr. J. Kearney Rodgers,† of New York, gives, as the result of his experience, that "no two cases survived the operation, in good health, two years; the majority being in their graves in less than twelve, and many in six months."

Dr. Mussey,‡ of Cincinnati, "has operated for cancer of the breast, in many instances, without learning the sequel; but of those ascertained there were only two in which the disease did not return in some part of the system within four years, and most of them within one year."

Drs. Twitchell§ of New Hampshire, and Gross of Kentucky, entertain the same views; so also does Dr. Knight, of Connecticut; but the latter thinks that in some instances life has been prolonged by the operation.

Dr. Flint‖ has seen one case of undoubted encephaloid disease of the breast in which the patient was well seven years after the operation.

The result of the report of the committee is, therefore, "that soft as well as hard cancer of the mammary gland is, in some instances, a local disease, and that the operation *may* prolong life."¶

Leroy D'Etiolles** gives, as the result of his statistics, that in four hundred and twelve cases the mean result of cancer in women (not limiting the disease to the breast), was three years and six months' life without the operation, and two years and six months after it. "Extirpation (of cancer) does not, therefore, prolong life." Of cancerous tumors in the breast alone, Leroy gives the following result: "Of two hundred and four, twenty-two died in the year after the operation, and eighty-seven had a return of the complaint, making the whole number one hundred and nine, or more than one-half." He, therefore, discountenances the operation.

* Transact. Am. Med. Association, vol. iii. p. 332.

† Ibid.

‡ Chairman of committee, op. citat.

§ Transact. Am. Med. Association, vol. iii. p. 332.

‖ Opus citat., p. 334. ¶ Ibid., p. 337.

** Chelius's Surgery, vol. iii. p. 510, note by J. F. South.

"Brodie* states that the late Mr. Cline, senior, and Sir Everard Home would scarcely ever consent to the operation under any circumstances."

"Bransby Cooper gives, as his recollection of the sentiments of Sir Astley, that he acknowledged there were only nine or ten out of a hundred extirpations that he had performed in which the disease did not return."

The same surgeon, however, reports one of his own cases where it was eleven and a-half years before the disease showed itself; and Mr. Callaway, a case where the patient did not die till twenty years subsequent to the operation.†

My own observation, though limited in comparison with the experience of the distinguished men just named, is decidedly adverse to the cure of cancer of the breast by the operation, not one out of ten, to the best of my knowledge, having escaped a return of the disease.

On summing up the opinions thus quoted, it seems that nearly four are opposed to the operation for every one who favors it, though, even among those quoted as favoring it, the recommendation is only either as an experiment, or in the hope of prolonging life.

Until further and accurate statistics can be obtained, the surgeon had therefore better state to his patient, fully, the little danger that is to be apprehended from the performance of the operation, but also state the chances of a return of the complaint, and leave the decision to her own willingness to endure the pain of the wound. As far as can be judged from a somewhat extended research, there is, I think, no reason to believe that the course of the disease has been hastened by the operation in this country, though Leroy thinks differently in regard to his cases which were chiefly collected from the Parisian hospitals.

SECTION III.

REMOVAL OF TUMORS OF THE CHEST.

In addition to the tumors just referred to in connection with the mammary gland of the female, the surgeon may be called upon to

* Chelius's Surgery, vol. iii. p. 539, note by J. F. South.
† Ibid., p. 540. ‡ Ibid.

extirpate degenerations of the same gland or its resemblance as found in the male. This, as well as the ordinary lipomatous, fibrous, or other tumors found upon the side of the chest, may be readily excised by the means described in connection with the treatment of tumors in the neck, that is, by making an elliptical, crucial, or other suitable incision through the skin over the tumor, introducing the loop of a ligature into it, in order to obtain a firm hold upon the growth, and then dissecting it with as little injury as possible from the surrounding parts. The after-treatment should be the same as that described in connection with the operation on the female mamma.

When the tumor is a cyst with liquid contents, it may be cured by means of the seton, according to the usual plan.

The following case may serve as an illustration of the character and means of treatment occasionally useful in these tumors.

CONGENITAL ENCYSTED TUMOR ON THE RIGHT SIDE OF THE CHEST SUCCESSFULLY TREATED BY A SETON.

An infant, three weeks old, of good development and health, had a tumor at birth of a globular shape, six inches in its vertical diameter by seven and a-quarter in the transverse. Its circumference at the base was thirteen inches, and it reached from within an inch and a-half of the sternum in front to the spine behind, and from the axilla as low as the tenth rib. It was soft, elastic, fluctuating, and transparent, like a hydrocele. Its surface was somewhat lobulated, of a bluish color, and traversed by large veins, the skin being sound, and the part free from pain.

Operation of Dr. Gross, of Kentucky.*—After ascertaining, by an exploratory puncture with a cataract needle, that the contents of the tumor were liquid, a small trocar was introduced, and seven ounces of serum, colored like Madeira wine, were drawn off, leaving about one-third of the contents in the tumor. The puncture was then closed by adhesive plaster. Three days subsequently, six ounces of liquid were evacuated in the same manner, emptying the sac entirely; after which the collapsed walls were approximated by a compress and bandage. Four days subsequently there was a partial re-accumulation which was drawn off, and a few silk threads introduced to act as a seton, as in the treatment of hydrocele. At

* Am. Journ. Med. Sciences, vol. xvii., N. S., p. 22. 1846.

the end of forty-eight hours, sufficient inflammatory action being excited, the seton was withdrawn, and the patient, after a convulsion and serious constitutional disturbance, recovered. (See note.)*

CHAPTER XII.

OPERATIONS PRACTICED ON THE WALLS OF THE THORAX.

Owing to the existence of caries, necrosis, spina ventosa, or other diseases of the bones of the thorax, or from the formation of matter within the cavity of the chest, it has occasionally been found necessary to resort to such operative measures as will facilitate the removal either of the affected ribs, or of the liquid that may have accumulated within the pleura, so as to interfere seriously with the action of the lung.

SECTION I.

SURGICAL ANATOMY OF THE THORAX.

The parietes of the thorax have been subdivided into the anterior, posterior, and lateral portions, to the latter of which the surgeon is chiefly limited in the operations about to be described. The greatest portion of the thorax being formed of the ribs, and parts immediately connected with them, that part of the chest which is bounded by these bones has been named the *Costal region.*

This region presents two faces; the one which is concave, smooth, and lined by the pleura, being designated as the pulmonary surface; whilst the other, which is external and convex, is only covered by the integuments and muscles.

The muscles of the chest are found both between the ribs as well as exterior to them, and are mainly concerned either in respiration, or in the motion of the body.

* By an error in the Bibliographical Index, the paper by Dr. Foltz is quoted as vol. xii. instead of vol. xi. of the Journal. The tumor also was on the side of the pelvis, and not, as there stated, on the chest.

Of these muscles the intercostal fill up each intercostal space, and present their fibres in different directions, those of the outside passing from above downwards and from behind forwards, and those which are within, taking the opposite line.

On the outside of the lateral portion of the chest, we find the serratus magnus muscle, which, arising from the nine upper ribs, is inserted into the base of the scapula. At the same part, there may also be noted some of the digitations of the external oblique muscle of the abdomen; which, arising from the eight inferior ribs, are interlocked in its five upper heads with the serratus magnus. The diaphragm, after being attached to the lower edge of the thorax, rises up within the chest by a convex surface, which is on a level with the fourth rib.

The intercostal arteries pass from behind forwards, and are found on the lower margin of each rib between the two intercostal muscles from the third rib down.

The veins and nerves follow pretty much the course of the arteries, and all of these parts, as well as the inner surface of the bones, are lined by the serous membrane known as the Pleura Costalis. The adhesions of this membrane to the ribs is often exceedingly firm, especially when diseased, though at other periods it has been found to be much thickened, and yet quite distant from the ribs, in consequence of the formation of exterior abscesses depressing it upon the pulmonary cavity.

SECTION II.

OPERATIONS ON THE CHEST.

Resection of one or more of the ribs, or perforation of the sternum, or the extraction of liquid from within the cavity of the pleura or pericardium, are the principal operations to which attention may now be given.

§ 1.—RESECTION OF THE RIBS.

Resection of the ribs has been demanded in cases of serious diseases of these bones.

In a patient of Dr. George McClellan,* a spina ventosa was developed upon the sixth and seventh ribs of the right side, which extended from their cartilages nearly to the dorsal vertebræ, so as to form a tumor not less than ten inches in its longest diameter. This tumor projected four inches on both the internal and external surface of the ribs, so as to push back the pleura, and nearly destroy the function of the lung.

Operation of Dr. G. McClellan, of Philadelphia.—By two elliptical incisions, which included a portion of the skin, the integuments over the tumor were removed from over this point, and the sixth and seventh ribs found to be so involved in the disease as to have caused the destruction of most of their central portions, their extremities projecting at either side into the substance of the tumor. On removing the mass, by means of the chain-saw and bone-nippers, the hand could be readily passed within and behind the ribs, so that the soft pulpy contents of the tumor, mingled with the expanded and bony fragments, could be rapidly scooped out, the remainder being carefully detached from the pleura by the fingers and handle of the scalpel until the whole mass was removed. The hemorrhage, which was free, was then checked by lint, slightly moistened with creasote.

The cavity left by the disease was now seen to be quite large, being capable, without exaggeration, of admitting with ease a child's head of the ordinary size at birth.

The patient, immediately after the operation, did well; the wound filled rapidly with granulations, and the lung gradually recovered its function, the patient being sufficiently recovered to dress and walk about his room, when an attack of bilious remittent fever caused death ten weeks after the operation.

A remarkable case of resection of the fifth and sixth ribs, performed by Dr. Antony, of Georgia, may also be found by reference to the Bibliographical Index, but my present limits forbid its insertion.

In the systematic description of resection of these bones, usually presented in the various works on operative surgery, the following directions are given:—

Operation.†—Lay bare the diseased portions of the bone either

* McClellan's Princ. and Pract. of Surg., note by Dr. J. H. B. McClellan.

† Malgaigne, Philad. edit., p. 207.

by a straight-curved or crucial incision. (Plate XXXVIII. Fig. 5.) Divide the intercostal muscles above and below the rib, either from without inwards, or the reverse, on a director passed under them. Then detach the pleura from the rib with the handle of a scalpel, and saw through the bone with a chain or Hey's saw. The pleura being usually thickened, there is but little danger of wounding it, though occasionally this membrane is almost healthy.

Remarks.—The comparative rarity of a disease which could create such effects as would lead the surgeon to think of the resection of the ribs, as well as the risk of injuring the pleura, has rendered this operation not only uncommon, but also one from which many surgeons would at first recoil, as not being likely to benefit the patient. But this is not by any means a modern operation, nor are such cases as that reported by Dr. Antony, unique, as may be readily seen by a brief reference to the history of the operation. In an article on the Resection of the Ribs, by J. Cloquet and A. Bérard,* and in one by Velpeau,† there may be found a reference to numerous instances in which this operation has been performed, the periods varying from the time of Galen up to the present day. Velpeau mentions a case reported in the ancient *Journal Encyclopédique*, in which Suif excised two ribs, and removed a portion of the lung in such a manner as to be able to introduce his fist into the chest, and yet the patient recovered. In a case reported by Richerand, in 1818, the middle portions of four ribs were removed to the extent of four inches, and the thickened pleura also excised, so that the pulsations of the heart in the pericardium could be seen. The patient lived several months, but ultimately died of a return of the cancer, for the relief of which the operation was performed. According to Velpeau, Severin, J. L. Petit, Duverney, David, Lapeyronie, and Dessault have all done the same thing in cases of caries and necrosis. He has also performed the operation himself in three instances with success.

Dr. Warren, of Boston, has successfully excised the seventh, and in another case the sixth and seventh ribs successfully for caries, and Drs. McDowell of Virginia, Mott of New York, and McClellan, in three other instances, have also performed this operation with varying success. As an operation, its execution is said to be compara-

* Dict. de Médecine, tome 9me, p. 147.

† Operat. Surg., by Mott, vol. ii. p. 738.

tively easy, the thickened condition of the pleura obviating most of the risk likely to arise from opening the pulmonary cavity. But it should be remembered that caries and necrosis can both be cured by the mere efforts of nature, or by slight surgical assistance, and nothing can, therefore, justify a repetition of any of these operations, unless the sufferings of the patient, and the effects upon his respiration, should be most urgent. Indeed in this, as in many other cases, surgical skill and judgment are often best shown when the surgeon can cure the complaint without resorting to the knife.

Caries or necrosis of the sternum may usually be relieved when an operation is demanded, by trephining the bone, this operation being the same in principle as that described in connection with the injuries of the head.

§ 2.—PARACENTESIS THORACIS.

The evacuation of liquid from the cavity of the chest is among the most ancient of surgical operations, being referred to by Hippocrates, B. C. 460, as well as by many others at different periods subsequently.

PATHOLOGY OF LIQUID EFFUSIONS INTO THE CHEST.—The word empyema (ἐν in, πύον pus) though originally employed to designate a collection of pus in any cavity, and especially in the chest, is now often used to express the presence of any liquid, or even the operation that is required to evacuate it. The operation of paracentesis thoracis being, however, intended especially for the relief of collections of pus within the pleural cavity, or for the removal of the fluid of hydrothorax, a brief reference to the pathological condition of the parts concerned may advantageously be made to precede the description of the operation.

A collection of pus, either within or without the pleura, is usually the result of such circumstances as induce an inflammatory action of the part, such as external injuries, or pleuritic attacks, or it may be produced by the bursting of large vomica, or from the discharge of abscesses in the liver. When the complaint results from external violence, the purulent collection will often be found to be nothing more than an abscess exterior to the pleura, though the effusion may also ensue upon the development of caries or necrosis of the adjoining ribs, the tumor which indicates the collection being made by pus

which comes from within the pleural cavity. In most instances, however, whether of external or internal empyema, the pleura exhibits the ordinary signs of inflammation of the serous tissues, such as opacity, thickening, false membrane or pus, and sometimes adheres to surrounding parts so closely as to create cysts. Occasionally, it has also happened that the pleura has been thickened to the extent of three or five superimposed layers of lymph, exhibiting a honeycomb-like arrangement, or a genuine fibrous, cartilaginous, or osseous degeneration. When the effused liquid is in great quantity, and within the pleural cavity, the lung will be found compressed to the top of the chest, though occasionally strong adhesions to the pleura costalis may retain it much lower, and expose it to be wounded in the operation of paracentesis.

An account of the diagnostic signs of such a condition as would justify the operation would carry these remarks too far, and it must, therefore, suffice merely to state that auscultation and percussion of the chest should be skilfully employed in every instance, before the surgeon attempts the operation.

The operation of paracentesis thoracis has been variously performed, but the object of all the plans is to evacuate the liquid contents of the part, without admitting air into the pulmonary cavity. To accomplish this, it has been suggested to puncture the parietes of the chest with a trocar and canula, or with a trocar and syringe, or to make a direct dissection, layer by layer, from the skin to the pleura. In all the plans that have been recommended for the accomplishment of this object, surgeons have differed mainly in regard to the best point for the puncture; but, as the patient is usually compelled to sit up, and as the general anatomical relations of the region especially favor a certain point, it is sufficient to state that, when circumstances admit of it, the space between the fourth and fifth, or fifth and sixth ribs, and a little posterior to their middle, should be selected.

In order to avoid wounding the diaphragm, which is presumed to be pushed up by the liver, it is generally advised to puncture the right pleura one rib higher than that advised for the left. Such a position is, however, far from being established as correct, the idea being based rather on the descriptions of the normal condition of the part than on the diseased state, and it is most probable that the weight of the fluid collected within the right pleura will more than counteract any elevation of the liver when the patient is in the erect position. In counting the ribs in a person of moderate flesh, but

little difficulty will be found in tracing them from below upwards; but in those who are fat, or in those who have the side œdematous and swollen, it may be impossible to distinguish these spaces, and under such circumstances the rule has been given to select a spot which is about six finger-breadths below the inferior angle of the scapula.*

Ordinary Operations of Paracentesis Thoracis.—The patient being propped up in bed, and a little inclined to the sound side, so as to separate the ribs as much as possible on the diseased side, the skin is to be divided to the extent of one and a half inches in a direction parallel with the superior edge of the lowest rib on the intercostal space, that is selected for the puncture. After dividing the superficial fascia, and any portion of a muscle of the chest that may intervene, as well as the external and internal intercostal muscles, the pleura will be found generally to bulge into the wound. After being distinctly felt by the forefinger, so as to establish the fact that only a fluid is behind it, the puncture should be made with the point of a bistoury, and the opening gradually enlarged as the liquid escapes† (Plate XXXVIII. Fig. 4). If the pleura is very much thickened, care will be requisite to avoid the error of pushing it before the instrument. A similar case may be found in the Bibliographical Index. Velpeau entertains the opinion that in cases which require the operation, the effused liquid, or even an abscess, will remove the lung from the point of puncture. He, therefore, objects to the details just given, and advises that the side of the chest be at once opened by a deep puncture with the bistoury in the same manner as an ordinary abscess.

After-Treatment.—If circumstances render it desirable to keep the wound open, a tent may be introduced, and removed from day to day; but if the whole of the liquid be evacuated, the opening may be at once closed with adhesive strips, a compress, and bandage. If the subsequent discharge continues copious, or becomes very fetid, advantage may be derived from washing out the cavity with warm water, or warm barley water; weak astringent washes, or those of an antiseptic character, being subsequently employed.

In order to evacuate the liquid, and yet prevent the entrance of air, various contrivances have been employed. Pelletan employed a syringe for this purpose, and Reybard placed a piece of gold-beaters'

* Malgaigne.

† Velpeau, Op. Surg., by Mott, p. 515, vol. iii.

skin, or the intestine of the cat, over a canula introduced into the pulmonary cavity, by means of a perforation in the rib, so that the matter might flow out and yet the air not enter.

Dr. Wyman, of Cambridge, United States, has also invented a brass suction-pump with an exploring canula, in order to permit the evacuation of the fluid without allowing the air to enter the pleura,* and has reported numerous instances of the success of this mode of operating, which he thinks is preferable to the ordinary mode of incising the soft parts.

Remarks.—The value of the operation of paracentesis thoracis has been differently estimated at various periods, most of the surgeons, up to the time of the discovery of Laennec, having regarded it as a doubtful or dangerous operation, especially from the difficulties attendant on the diagnosis. Since the more general resort to auscultation, many of these difficulties have been removed. Diseases of the lungs are now no longer confounded with those of the pleura, and a skilful auscultator can in most instances render the knowledge of the presence of a liquid in the chest absolutely certain.

But, though the cases can now be better selected than they were formerly, a successful result is not always obtained. The true result of the operation may, it is thought, be correctly stated thus: Paracentesis always affords temporary relief, and about one-half of the cases recover; but whether these patients would have died without it, it is difficult to tell.

The idea is certainly erroneous that paracentesis thoracis is an eminently easy and successful operation, and though its results have been such as to justify its performance, the prognosis should be guarded.

In the statistics which I have collected from various sources, it will be seen that the mortality is considerable, and the objections that have been raised against the operation in former days should, therefore, not be slightly disregarded. They are thus stated by Velpeau:—

If the lung has been forcibly compressed by the liquid, and yet is permeable, the evacuation of the liquid without the entrance of air into the pulmonary cavity may distend it so rapidly as to excite violent inflammation. If, on the contrary, the lung has shrunk so

* Transact. Am. Med. Assoc., vol. iv. p. 245.

much as to yield but slowly to the entrance of air, the void which is immediately left about the parts is very liable to derange the respiration and pectoral circulation. The introduction of air into the cavity of the pleura, though obviating this, yet exposes the patient to danger by exciting inflammation, and creating unhealthy pus, thus giving rise to adynamic symptoms, under which many have died.

ESTIMATE OF THE OPERATION.—In estimating the value of any of these modes of operating, the difficulties or objections applicable to each should not be overlooked. When the intercostal spaces are prominent, and the presence of liquid certain, the direct puncture of Velpeau is the best; when there is any doubt of the position of the liquid, then the ordinary operation by dissection of layers would be preferable. Where, however, the diagnosis is positive, and the chances of failure from the accident of pushing forward the thickened membrane, instead of perforating it, is guarded against, the instrument of Dr. Wyman, of Massachusetts, may prove advantageous. In Boston, the experience of the profession is said to be favorable to it. Under all circumstances, the surgeon may anticipate an anxious and long-continued convalescence of the patient, and one which will exact all his skill as a practitioner, to conduct the case to a favorable result.

The employment of a trocar is the most objectionable of the various instruments employed, as it is not so shaped as to obtain a keen edge, whilst the point of the canula, even when closely fitted to the shoulder of the instrument, is very liable to tear or push the pleura before it, as is occasionally seen in cases of hydrocele accompanied with thickening of the tunica vaginalis. When the surgeon recals the constitutional effects liable to result from opening closed cavities, and especially those containing pus, and covered by a pyogenic membrane, he can readily foresee the consequences of opening the pleura in cases of empyema. The natural tendency of such collections is either to be absorbed or discharged by the efforts of nature. If discharged by nature, the inflammation of the surrounding parts, and the character of the opening made by ulceration, are well known to be more favorable to a cure than is the case when the surgeon punctures it. I would, therefore, express the opinion that this operation should not be resorted to until the latest possible moment; that, when done, air should be prevented from entering the cavity of the chest; that the pus should be slowly and only partially discharged, the wound closed, and the operation re-

peated, if necessary. If, however, the entrance of air cannot be prevented, it will be better to evacuate the whole of the liquid, and treat the case subsequently like one of cold abscess. The results obtained in the following instances show pretty correctly what may be anticipated from the operation, when resorted to after the diagnosis has been made with the aid of auscultation :—

STATISTICS OF THE OPERATION OF PARACENTESIS THORACIS.

	CURED.	DIED.
Of 11 cases treated in the United States,* there were, counting two reported as relieved,	9	2
Of 72 cases reported by Velpeau,†	41	31
Of 44 " " " Roe,‡	32	12
Of 26 " " " Roe,ȝ for hydrothorax,	17	9
Of 16 " " " T. Davis,‖	12	4
Total, 169	111	58

From this table it appears that nearly two-thirds of the cases operated on have been cured.

§ 3.—EFFUSIONS IN THE PERICARDIUM.

A collection of fluid within the cavity of the pericardium, when the result of chronic disease, has occasionally been deemed a proper subject for an operation, and several surgeons have, from time to time, reported instances in which they have successfully opened the investing membrane of the heart and given exit to the fluid which had been the source of such great distress to the patient. As, however, this relief can only be temporary, and as the patient is exposed to considerable danger from various steps in the operation, surgeons have not been disposed to advocate it. In fact, the rare occurrence of such condition as would justify a resort to the operation has not offered a sufficient number of cases to test its value. Velpeau, in analyzing the few cases that have been reported, expresses the opin-

* Bibliographical Index.

† Velpeau, Méd. Opératoire.

‡ Am. Journ. Med. Sciences, vol. xxiii. N. S. p. 38. Paper by Wm. Pepper, M. D.

ȝ Ibid.

‖ Ibid.

ion that doubt may be attached to all except the one performed by Dr. John C. Warren, of Boston; but this one has lately been reported to me* as successful, and is, it is thought, the only positively successful case on record.

CHAPTER XIII.

OPERATIONS UPON THE ABDOMEN.

THE parietes of the abdomen are liable, like similar tissues elsewhere, to the development of tumors of various kinds, the fatty, fibrous, and lipomatous being those most frequently met with. As the removal of these tumors is to be accomplished by precisely the same means as those already designated in the account of the neck, this slight allusion to them may be sufficient to preserve the continuous arrangement of the subject adopted as the order of this volume.

Within the walls of the abdomen there are, however, such a variety of organs that its contents require a more detailed consideration; and whilst reserving the account of Hernia for another chapter, and the operations upon the genito-urinary organs through the abdominal parietes for Part IV., there remains to be described the surgical treatment adapted to the relief of certain conditions of the peritoneum, liver, stomach, and intestines.

As the surgical anatomy of these organs does not offer any points worthy of special consideration when we exclude such details as are generally presented in an account of the special anatomy of the region, the operations for the relief of affections of the peritoneum may first claim attention; after which those demanded by some of the disorders of the abdominal organs will be referred to.

In doing this, I shall, however, limit my descriptions to such as are generally recognized as justifiable; extirpation of the spleen, or scirrhus of the pancreas, not being included in this class.

* Dr. Warren in MS.

SECTION I.

PARACENTESIS ABDOMINIS.

The accumulation of such an amount of serum within the peritoneal cavity as seriously interferes with respiration has usually been deemed sufficient cause to justify its evacuation by an operation, although little more than temporary relief can be anticipated.

Ordinary Operation.—Having prepared a good flat trocar and canula, surround the patient's belly with a broad bandage, the ends of which should be cut into tails, crossed upon the back and drawn upon by assistants, in order to keep up a constant pressure upon the abdominal cavity as the liquid escapes; or the same may be effected merely by the pressure of their hands. The surgeon, being then perfectly satisfied of the correctness of his diagnosis, has only to push the trocar through the abdominal parietes near the median line of the abdomen, about two inches below the umbilicus, and, withdrawing the trocar, to allow the fluid to escape through the canula until he is satisfied that sufficient has been evacuated, when, removing the instrument, the wound may be closed by a piece of adhesive plaster, and dressed with a compress and bandage.

Remarks.—Simple as this operation evidently is, surgeons have differed somewhat in regard to the details of its performance. Thus, some have advised that the patient should be seated, others that he should be lying down; some have recommended the entire evacuation of the fluid, whilst others direct the removal only a part of it; some have selected the trocar and canula, as mentioned in the preceding account of the operation, and others preferred the use of a lancet and catheter. As these differences are chiefly the result of individual opinion, the surgeon, in deciding upon the advantages of one method over another, must, of course, be guided by the peculiarities of the case. Dr. Physick* always advised making the puncture with a lancet, and then introducing a flat canula or female catheter, and this will be found to constitute a safe and easy mode of operating. The use of the catheter has, however, been recently claimed for M. Fleming, of the Val de Grâce,† though it had, as is

* Dorsey, Surgery, vol. ii. p. 365.

† Malgaigne, Philad. edit., p. 387.

shown above, been employed many years before his suggestion was announced.

Dr. Physick's Operation.—The patient being placed near the edge of the bed with a piece of oil-cloth under him, a lancet is to be inserted through the abdominal parietes in the line of the linea alba, about two inches below the navel, and as soon as it is removed the fluid will escape through the puncture. After the liquid has partially escaped, and the stream begins to diminish, a female catheter may be introduced to favor its further evacuation. The subsequent dressing is the same as in the ordinary operation.

Estimate.—The advantage of the operation recommended by Dr. Physick will be found in the slight pain caused by the puncture; in the greater tendency of the parts to heal; in the impossibility of pushing the peritoneum, especially in encysted dropsy, in advance of the instrument; in the patient being less likely to faint when lying down than when sitting up; and in the more gradual evacuation of the fluid permitting the abdominal parietes to accommodate themselves to the vacuum otherwise liable to be left in the abdomen unless the belly is kept well bandaged. As it is also well known that incised wounds are less liable to inflammation than punctured, the chances of peritonitis are hereby diminished. Whether the proposal to excite inflammatory action in the sac of the peritoneum by injecting iodine, or similar articles, will ever be generally adopted, is a matter of doubt. Velpeau has long been sanguine of success from this means; but his opinion is based mainly on theoretical views, and no other surgeon, so far as I know, has attempted it, though several have favored a resort to his suggestion.

SECTION II.

HEPATIC ABSCESSES.

The production of inflammatory action in the liver, as the result of disease, has not unfrequently resulted in the formation of pus, which, if allowed to accumulate, has a tendency to cause a disintegration of the secretory portion of the gland. This purulent collection, like abscesses elsewhere, will often be evacuated solely by the efforts of nature, the matter sometimes escaping through the diaphragm, lung, and bronchia, whence it is expectorated, or into

PLATE XXXIX.

OPERATIONS PRACTICED ON THE ABDOMEN.

Fig. 1. Evacuation of an hepatic abscess. An eschar has been formed near the abscess, in order to favor the adhesion of the adjacent serous surfaces, after which the puncture has been made by the bistoury. 1. The eschar produced by caustic. 2. The bistoury puncturing the abscess. 3. Pus escaping through the puncture.

After Bourgery and Jacob.

Fig. 2. Manner of enlarging an abdominal wound in order to favor the restoration of the prolapsed intestines. After the fingers of one hand have gently separated the intestinal convolutions, and the forefinger is insinuated at the upper angle of the wound, the bistoury is to be passed along the finger with its back towards the finger nail, and, being introduced, enlarge the wound by slightly incising the abdominal parietes upwards.

After Bourgery and Jacob.

Fig. 3. A longitudinal wound of the intestines, closed by Pellier's suture. Whilst the left hand of the surgeon holds the two ends of the thread, the right hand is occupied in replacing the protruded bowel, commencing at that part which last escaped from the abdomen, and retaining the ends of the suture to attach the wounded intestine to the abdominal parietes.

After Bourgery and Jacob.

Fig. 4. Transverse wound of the intestines about to be treated by the method of Reybard. 1. The wound. After introducing the plate through the intestinal opening, and applying the suture, the parts are to be restored.

After Bourgery and Jacob.

Fig. 5. Enteroraphy as performed in the method of Ledran. 1. The puckered surface of the intestine. 2. Line of the wound. 3. The various sutures collected together, and twisted into a cord.

After Bourgery and Jacob.

Fig. 6. Taxis, as practiced upon an external inguinal hernia of the left side, the surgeon standing on the right side of the patient, and manipulating the tumor as directed in the text.

After Bourgery and Jacob.

Fig. 7. Taxis as performed upon reducible crural hernia, on the right groin of a man, the operator being placed on the patient's left side. The palm of the hand inclosing the tumor pulls it towards the saphenous opening, whilst the fingers of the same and opposite hand press the viscera vertically upwards towards the femoral ring.

After Bourgery and Jacob.

Plate 39.

Fig. 1.

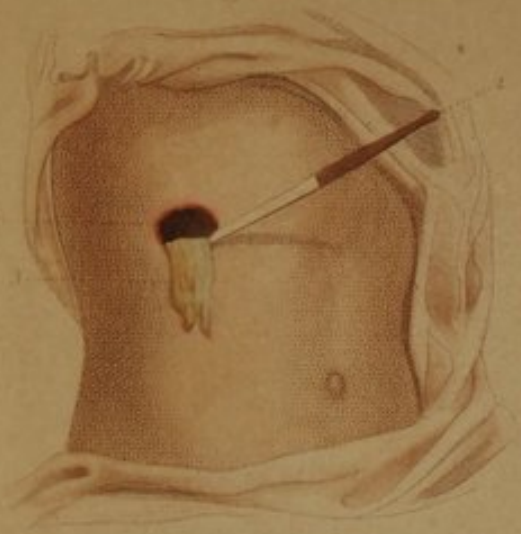


Fig. 2.

Fig. 5.

Fig. 3.

Fig. 4.

Fig. 6.

Fig. 7.

the cavity of the pleura, so as to constitute one source of empyema; or the abscess may open into the stomach, bowels, or cavity of the abdomen, or it may tend towards the abdominal parietes, and be evacuated externally like a superficial abscess. As it is a matter of some consequence to prevent any great increase in the amount of the collection, which is apt to be the case if the complaint is left too long to the powers of nature, the surgeon may be required to aid the progress of the pus to the surface by means of an operation.

Diagnosis.—When an abscess of the liver tends to point outwardly, it creates a swelling or tumor, which is quite apparent through the abdominal parietes. This may show itself at various points; sometimes it has been found on the back near the vertebral column; at others the matter has travelled nearly as low as the spinous process of the ilium, though most frequently it has been found under or near the false ribs.

Other tumors may, however, occupy the same point, and it has been found so difficult to distinguish hydatids, encysted, or fatty tumors of this region, from the swelling caused by a hepatic abscess, that Récamier has proposed to test the contents of such tumors by the exploring needle. As such a test exposes the patient to the risks of peritonitis, from the escape of even a small quantity of pus into the surrounding parts, this means of diagnosis is generally discountenanced. The best means of arriving at a correct conclusion will be found in studying the history of the case, and watching for the signs of fluctuation and inflammation about the part.

When a diagnosis is firmly established, it is of much importance to evacuate the collection promptly; and to do this, resort may be had either to caustics or puncture, or to both (Récamier), or to a dissection and puncture, after adhesions have formed between the peritoneum, covering the liver and that lining the abdominal parietes. (Begin.) To the latter mode of operating I would give the preference.

Operation of Begin, of France.—Make an incision two or three inches long upon the most prominent part of the swelling, and divide with great caution the layers of the abdomen (as is done in hernia), until the peritoneum lining the abdominal parietes is reached. Raise this carefully with the forceps and nick it, dividing it subsequently upon the director. If the intestine presents itself, it may be gently pushed to one side; but when the patient is well etherized, there is but little tendency in the bowels to move towards

the wound. On reaching the surface of the tumor, the operation should be temporarily arrested, the wound filled with lint, and the parts closed by a compress and bandage. After three or four days, or when adhesions have taken place between the swelling and the peritoneum, the abscess may be opened, the diet being always strictly regulated (Plate XXXIX. Fig. 1).*

Operation of Dr. Savery, of New Hampshire.†—An intemperate man, aged sixty, after laboring for some years under chronic hepatitis, presented a circumscribed swelling in the right hypochondrium, which became pointed and painful, and gave an obscure sense of fluctuation. An incision was therefore made into the abscess, and nearly a gallon of sero-purulent fluid discharged, the last portion evacuated having all the properties of bile. A broad band, having been carried around the body previous to the incision, was then gradually tightened as the swelling diminished, so as to keep the parts in apposition. The discharge continued for a few days, and then ceased; but considerable constitutional irritation existed during the first week, and required the free use of wine and quinine, with other appropriate remedies.

Remarks.—The opening of a hepatic abscess would be a very simple measure, were it not from the doubts that are often excited as to the actual existence of pus, and the difficulty of judging whether adhesions have formed between the parietes of the liver and those of the abdomen. Until the latter exist, the evacuation of the pus must expose the patient to the risk of the peritonitis, consequent on its escape into the peritoneal cavity. The application of the bandage, as employed by Dr. Savery, may, therefore, be regarded as a valuable addition to the operative proceeding recommended by Begin, as it not only tends to approximate the abdominal parietes and the liver, but also diminishes the cavity of the abscess by compressing its walls, and thus favoring its adhesion.

The necessity of an active constitutional treatment in connection with this operation need only be mentioned, as every surgeon would doubtless resort to it under such circumstances.

* Dict. de Méd., tome 13me, p. 249.

† See Bibliographical Index. Operat. on Abdomen.

SECTION III.

I. GASTROTOMY OR ENTEROTOMY.

Gastrotomy (γαστηρ the belly, and τομη incision) is a term which has been somewhat indefinitely applied to any incision upon the parietes of the abdomen, by which its contents could be exposed. The word is, therefore, sometimes employed to designate the opening of the uterus in the Cæsarian section, or the incision practiced for the removal of ovarian tumors, though it should be limited to such operations as directly expose the stomach; enterotomy designating the similar operations practiced on the intestines, ovariotomy the removal of ovarian tumors, and herniotomy that employed for the relief of constrictions of the bowels.

Either gastrotomy or enterotomy must, however, continue to be very rare operations, the risks of general peritonitis, as well as the possession of less difficult plans of treatment, rendering surgeons indisposed to resort to them, either in order to remove such foreign bodies as are not likely to pass through the alimentary canal, or to overcome the intestinal obstruction in cases of volvulus. Opening the stomach, or exposure of the intestinal canal cannot be an operation of great difficulty to a person who is familiar with the general anatomical relations of the viscera. As a general rule, therefore, it is only requisite to proceed in the manner just detailed for the treatment of hepatic abscess, that is, to cut through the abdominal parietes with caution, until the peritoneum is exposed; carefully open it; hook or seize the front surface of the stomach, stitch it fast to the abdominal parietes, and then wait, if possible, for adhesion to occur, before puncturing it, lest its liquid contents escape into the peritoneal cavity. Should the patient be able to sustain the constitutional shock and disorder likely to ensue on such an operation, it may subsequently be necessary to treat the wound as any other fistula.

In cases of volvulus, the difficulty of the diagnosis must render the resort to an abdominal incision a most hazardous and uncertain operation; yet such operations have been performed, and, when the patient is under the influence of an anæsthetic, might be again employed with less risk and difficulty than has heretofore been the case. Although I doubt very much the propriety of such an operation, and

would urge the utmost caution in respect to diagnosis on the part of any surgeon who might be placed in such circumstances as apparently demanded it, yet it presents some chances of success, and perhaps quite as much as the operation of œsophagotomy; and as such a concatenation of circumstances may occur as will demand the consideration of this operation, there is good reason for exhibiting the few facts that have been presented in connection with the subject. By referring to the Bibliographical Index, several cases may be found in which the intestinal canal has been most rudely treated without causing death. But, though success has followed these cases, it is presumed that no judicious surgeon would take any of them as a precedent for an operation which is universally regarded as a forlorn hope, except under the most urgent circumstances, as where he is fully satisfied that the patient's chances of life are less without than they would be after the performance of the operation.

Gastrotomy successfully performed by Dr. J. E. Manlove, of Tennessee.*—In July, 1844, Dr. Manlove was called to see a negro, aged seventeen years, who had had no evacuation of the bowels for twelve or fifteen days, and was laboring under fever, &c. After making every possible effort by constitutional means to relieve him, but without success, he was on the fourth day found to be in the following condition: Abdomen enormously distended; breathing difficult; extremities cold; pulse very feeble and quick, and countenance anxious. A consultation decided that, although the operation of gastrotomy promised but little benefit, yet the certainty of death without it justified its performance.

Operation.—An incision was, therefore, made in the median line of the abdomen, commencing about two inches below the umbilicus, and extending down towards the pubis four or five inches. The peritoneum and bowels along the lower half of the incision being found adherent, an opening of about a fourth of an inch in length was made into the bowel, from which there escaped large quantities of flatus and liquid feces, as well as some of the medicine which had been taken a short time previously. A further examination, showing that the intestines were united to the peritoneum by extensive adhesions at various points, within reach of the finger and probe, the wound was closed by sutures and adhesive strips, except at the intestinal opening. The amendment in all the symptoms was prompt,

* Boston Med. and Surg. Journ., vol. xxxii. p. 492.

the extremities becoming warm, and the pulse fuller and slower within an hour afterwards. On the next day the appetite was good, and the patient continued to improve, discharging the contents of the bowel through the artificial anus until the seventeenth day, when he had an evacuation per vias naturales, the opening having nearly closed. Nine months after this, he was presented to the Tennessee State Medical Society for inspection, being perfectly well. The adhesions were supposed to have been the result of a contusion of the abdomen, received six months previously.

II. ENTEROTOMY.

In the paper just quoted, Dr. Manlove also states an instance in which Dr. Wilson, of the same county, performed gastrotomy in a case of volvulus; drew out the intestines until he reached the obstruction, dissected the adhesions found at the invaginated portion, overcame the obstruction, replaced the bowels, and the patient rapidly recovered.*

Successful Enterotomy, and Removal of a Silver Teaspoon, by Dr. Samuel White, of Hudson, New York.†—A man, aged twenty-six years, suffered in May, 1806, from rheumatism, when, after a severe relapse, he became delirious and bent upon self-destruction. On the 7th of July, he procured a full-sized teaspoon with some fruit jelly, and forced the spoon down his throat in the absence of his nurse, and, by pressing his fingers against the handle, was enabled to swallow it. He was then greatly agitated, talked much, and declared that no attempt could save his life. On the 9th, a spasmodic affection of the stomach, alternating every fifteen minutes with stupor, showed itself, during which he would throw himself violently about. This lasted during two hours, while the spoon probably passed the pylorus, when he suddenly fell asleep, became rational, and expressed great anxiety for relief. On the 25th of July, a cutting sensation, confirmed by the pressure of the hand when the abdomen was relaxed, led to the discovery of the spoon in one of the convolutions of the ilium near the line dividing the right iliac and hypogastric regions. It remained fixed in this

* Boston Med. and Surg. Journ., vol. xxxii. p. 495.

† New York Repository, vol. x. p. 367. 1807.

position with increased heat and irritation in the adjacent parts till August 7th, when, fearing the consequences of further delay, it was decided to attempt its removal.

Operation of Dr. White.—An incision three inches long being made through the abdominal parietes, and parallel with the epigastric artery, extending upwards to the level of the crest of the ileum, the peritoneum was opened with a lancet; the turn of the intestine, which contained the spoon-handle, protruded; the intestine pierced with the lancet over the end of the handle, and the spoon extracted by forceps. The divided edges of the intestine were then secured by the Glover's suture, and the external wound closed with adhesive strips and lint.

Under simple dressings, the wound healed by the first intention, and the patient recovered.

SECTION IV.

GASTRIC AND INTESTINAL FISTULÆ.

From various causes, the creation of a fistula in the abdominal parietes, and a communication of it with the viscera of the part, may be produced. Like those resulting from strangulated hernia (artificial anus), these fistulæ nearly always present certain common symptoms, and may be relieved by very much the same general treatment. Most frequently they will be found to give rise to more or less excoriation and inflammation of the skin of the abdomen, in consequence of the escape of the discharges externally, whilst they also affect the nutrition of the patient, and expose him to a protrusion or even strangulation of the inner coat of the bowels, in a manner analogous to that seen in prolapsus of the rectum. As illustrative of a simple plan of relieving this condition, the following case is cited:—

Fistulous opening of the Stomach successfully treated by Pressure, &c., by Dr. Cook.*—A widow lady, æt. thirty-nine years, had been attacked with constipation and violent pain at the pit of the stomach, which resisted every remedy until the nineteenth

* Amer. Journ. Med. Sciences, vol. xiv. p. 271, quoted from Western Journ. Med. and Phys. Sciences, Jan. 1834.

day, when a fistulous orifice showed itself. Six months subsequently she presented a fistula immediately by the side of the umbilicus, the external orifice of which was about the size of a buckshot, and on removing the dressing a gill of bile was suddenly discharged, after which a small quantity of (gastric?) fluid came slowly away. The acrid character of these discharges had excoriated and inflamed the abdomen and rendered it intolerably painful. On drinking a glass of water, the whole of it was discharged through the fistula in twenty seconds, and an examination by a catheter introduced into the opening, therefore, led to the conclusion that the opening was in the stomach near the pylorus.

TREATMENT.—A beef's bladder being cut open longitudinally, was spread with adhesive plaster and applied over linen spread with cerate, so as to cover the excoriated part, an opening being made in the dressing corresponding to the fistulous orifice, after which a firm bandage and compress were applied and the diet limited, nourishing enemata being resorted to in order to sustain the patient. The external irritation soon healed; the bandage was gradually tightened and a cylindrical compress employed, under which treatment the fistula was completely healed in thirty days, and the patient subsequently regained her health.

REMARKS.—Should the orifice of such a fistula fail to heal under similar measures, the surgeon might derive advantage from the use of escharotics. As the experiments connected with digestion, performed by Dr. Beaumont upon St. Martin, who also labored under one of these fistula, have long been before the profession, it is only necessary to refer to his paper* for the evidence there presented of the powers of nature under such circumstances, as well as the means employed by Dr. Lovell, U. S. army, to obviate the inconvenience resulting from the creation of the opening. It is important that the tendency of the mucous membrane to become everted and strangulated at the orifice of the fistula, should always be guarded against by appropriate pressure during the treatment of the case, and especially in its early stages.

* Med. Record., vols. viii. and ix. 1825.

CHAPTER XIV.

WOUNDS IN THE ABDOMEN.

INCISED wounds of this region, if limited to the abdominal parietes, demand only the ordinary treatment of wounds, to wit, the prompt and neat approximation of the edges, and their retention in apposition until union occurs. To favor this the patient should be confined to bed, and the abdominal muscles relaxed by elevating the shoulders and flexing the thighs on the pelvis. The most important of these wounds are those complicated with a protrusion of some of the abdominal contents, as the latter, when once protruded, are with difficulty replaced, not only in consequence of the contraction of the muscular fibres around the wound, creating strangulation, but also from the peristaltic action of the bowels, causing the protruded intestines to be filled with solid or gaseous deposits.

SECTION I.

WOUNDS WHICH CAUSE PROTRUSION OR STRANGULATION OF THE INTESTINE OR OMENTUM.

In treating these wounds it should be adopted as a universal rule of practice that, before resorting to any incision to facilitate the restoration of the protruded bowels, the surgeon should endeavor to replace them by manual means, aided by such a position of the patient, use of anæsthetics and other constitutional measures, as will induce perfect relaxation of the tissues involved. Since the discovery of ether, the replacing of intestines or omentum which have protruded through an abdominal wound, is much more easily accomplished than was the case formerly. The following plan of treatment will, therefore, often succeed.

TREATMENT.—Place the patient upon the back, with the shoulders elevated and the knees drawn up in order to favor the relaxation of the abdominal muscles, and then by means of Ether produce perfect anæsthesia. As soon as this is accomplished, cleanse the parts

by squeezing water upon them from a sponge, and gently seizing that portion which had last protruded between the thumb and fingers, compress it lightly so as to force back its contents, endeavoring to carry the bowel into the cavity of the abdomen by pressing upon it with the forefingers. The peristaltic action of the bowel being entirely arrested during anæsthesia, the muscles of the abdomen perfectly relaxed, and the diaphragm partly quiescent, success will often crown the surgeon's efforts.

When the protruded portion is returned, it only remains to unite the sides of the wound by a few points of the twisted suture, and support them by adhesive strips and a bandage. But if it should be found impossible to accomplish the restoration in this manner, it may become necessary to introduce a director and enlarge the upper angle of the wound a little by means of the probe-pointed bistoury. (Plate XXXIX. Fig. 2.)

When the protruded portion is omentum, the treatment will be very much the same unless strangulation has occurred, in which case it may become necessary to treat it as is done in a similar condition in hernia.

SECTION II.

WOUNDS OF THE INTESTINE.

When an intestine is wounded in a such a manner that the injured part can be seen through the opening in the abdominal parietes, it becomes necessary to treat it by such means as may induce union, and prevent the escape of the intestinal contents into the cavity of the abdomen. These means vary somewhat according to the extent of the wound, and its longitudinal or transverse direction, sundry suggestions having been made by surgeons at different periods, in order to accomplish this object, and yet diminish the risk consequent upon peritoneal inflammation.

Two kinds of wounds of the intestine require the application of sutures, the first being that in which the wound is longitudinal, the second that in which it is transverse, and the consideration of these various sutures will, therefore, be referred to separately, it being premised that in every instance it will facilitate the operation, and add to the patient's chances of life, to resort to the use of anæsthetic agents before commencing the operation.

PLATE XL.

SUTURES OF THE INTESTINES AND ARTIFICIAL ANUS.

Fig. 1. Continued Suture for Longitudinal Wounds. 1, 1. Ends of the thread. 2, 2. Points perforated by the first stitch, showing the distance from end wound. 3, 4, 5, 6. Subsequent points, showing the distances to be observed between the several stitches, and their relations to the edges of the wound. After Bernard and Huette.

Fig. 2. Looped Suture of Palfyn, to unite the sides of a wound, and bring the peritoneal coat of the intestine in contact with the abdominal parietes. 1. Abdominal parietes. 2. Intestine. 3. Longitudinal wound of intestine. 4. Loop of the suture as seen in the intestine. 5. Ends of the thread brought out and knotted on the abdomen. After Bernard and Huette.

Fig. 3. Suture of Jobert for Transverse Wounds. 1. First thread passed through the intestine. 2. Second suture. 3. Edges of transverse wound of intestine. 4. Mesentery. 5. Point at which it has been incised in order to favor the union of the two ends of intestine. After Bernard and Huette.

Fig. 4. Suture of Lembert for uniting Transverse Wounds of the Intestine by approximating the adjacent serous surfaces. 1. The first insertion of the thread. 2, 2. Its point of exit and re-entrance, or the 2d suture. 3. The third point. After Bourgery and Jacob.

Fig. 5. Profile of this Suture. A. The suture as first formed. 1. End of the thread. 2. First loop. 3. Portion of thread over the wound. 4. Second loop. 5. Termination of thread. B. Profile of this suture as finished. 1. Exterior knot.

Fig. 6. Artificial Anus, in which the ends of the intestine open upon the groin by separate orifices. 1, 2. Ends of the intestine. 3. Mesentery between them. 4, 5. The two anal orifices. After Bourgery and Jacob.

Fig. 7. Artificial Anus where the two ends of the bowel open by a single orifice. 1, 2. Upper ends of intestine. 3. Septum formed by union of adjacent sides. 4. Lower orifice or point of artificial anus. After Bourgery and Jacob.

Fig. 8. Artificial Anus, showing the funnel-shape of the cavity near the orifice. 1. Cavity of peritoneum. 2, 3. Ends of intestine. 4. Intervening mesentery. 5. The septum. 6. Funnel-shaped orifice formed around artificial anus by the peritoneum. 7. Probe passed into orifice to show course of fecal contents. After Scarpa, from Bernard and Huette.

Fig. 9. Another view of the same. 1, 2. Intestines. 3. Septum. 4. Course of contents of bowel. After Bernard and Huette.

Fig. 10. The septum partially removed. 1, 2. Intestines. 3. Short septum. 4. Mesentery. After Bernard and Huette.

Fig. 11. A view of the Enterotome of Dupuytren as applied. 1. Abdominal parietes. 2. Instrument. After Bourgery and Jacob.

Fig. 12. Enterotome of Liotard applied. 1. Septum. 2. Instrument. After Bourgery and Jacob.

Plate 40.

Fig 1.

Fig 2.

Fig 3.

Fig 4.

Fig 5.

Fig 6.

Fig 7.

Fig 8.

Fig 11.

Fig 12.

Fig 9.

Fig 10.

When a wounded intestine presents itself, so that the injured point can be readily reached, the extent of the wound is the first point to which attention should be directed, the means of treatment being necessarily varied according to the nature of the injury. In small punctures, or those less than a third of an inch in extent, or those openings through the intestinal coats, which are consequent on the strangulation and ulceration that ensues upon certain conditions of hernia, Sir Astley Cooper recommended that the sides of the opening should be gently gathered together, or pinched up, and then the adjacent portion constricted by tying a fine ligature around it, in the same manner that a divided artery is secured.

But if the opening is more extensive, then resort must be had to some of the various sutures that have been recommended by surgeons at different periods. Albucasis, A. D. 1100, Guy de Chauliac, A. D. 1360, Le Dran, Ramdohr, Shipton, Travers, Thos. Smith, Gross, and others, having advised peculiar methods of treatment.

The different sutures that have been employed by these surgeons are usually designated as the glover's suture, which was suggested by Guy, and supported by the opinion of Heister; the suture of the four masters in which a foreign body (trachea of an animal) was introduced into the intestine, in order to support the sides of the wound; the looped suture of Palfyn; that of Le Dran; and the continued or interrupted suture, as recommended, with various modifications, by Reybard, Jobert, Bertrand, and others.

§ 1.—SUTURES EMPLOYED IN LONGITUDINAL WOUNDS OF THE INTESTINE.

THE GLOVER'S SUTURE may be formed by means of a straight, round needle, and a waxed thread, by passing the needle obliquely through the sides of the wound when held together by an assistant, the first point of the suture being made at one line from the upper angle of the wound, and at an equal distance from its edges. The thread being then drawn through to within a few inches of its end, the needle should be repassed through the edges of the wound, from the same side as it commenced on, and the wound traversed obliquely from side to side, so as to carry the thread over and over, from stitch to stitch, as in "whipping a seam." On reaching the lower end of the wound, the needle should be removed, and three or four inches of the thread be left. This and the first end being then held by the

assistant (Plate XXXIX. Fig. 3,) the surgeon should proceed to reduce the intestine, and then drawing the ends of the thread towards the abdominal parietes, cause the outer coat of the intestine to approximate the peritoneum lining the abdominal parietes, so that it may be made to adhere to the surface of the abdominal wound. Five or six days subsequently one end of the thread should be cut off close to the abdomen, when by gently drawing on the other, whilst the edges of the wound are supported, the suture may be withdrawn without deranging the adhesions.*

The Loop Suture of Ledran.—Having prepared as many ordinary sewing needles and threads as he wished to make stitches, the edges of the wound were approximated, and each needle passed transversely to the line of the wound, at a distance of about a quarter of an inch from each other. The threads on each side being then tied together, the two bundles were collected together and twisted into one, so as to pucker up the edges of the wound. (Plate XXXIX. Fig. 5.)

Loop Suture of Palfyn.—A ligature being passed through the middle of the wound in the intestine, so as to leave a loop on its inside, the ends were left out of the external wound, so as to draw the serous coat of the intestine up to the peritoneum lining the abdomen, after which the abdominal wound was closed, and the threads fastened upon the skin by adhesive strips. (Plate XL. Fig. 2.)

Suture of Reybard.†—A small, thin, and oiled piece of light wood, twelve to fifteen lines long, and four to six broad, being first introduced into the intestine at the wound with a piece of thread attached to it, each end of the thread was armed with a needle. After passing each needle from one side to the other, from the inside outwards through the thickness of the intestine, and also of the abdominal parietes, the wooden plate was drawn upon so as to compress the peritoneal coat of the intestine against the serous lining of the abdomen, thus closing the wound hermetically. When the adhesions thus excited seemed to be sufficiently strong, that is in about two or three days, the thread was withdrawn, and the little plate of wood left to be discharged by stool.

Suture of Jobert.—After cleansing the edges of the wound, this surgeon turned in the serous surface on each side with the

* Malgaigne.

† Mott's Velpeau, vol. iii. p. 623.

needle, and passed the threads transversely through them, at sufficient distances to keep the serous membrane of each side in contact. Then the ends being knotted and tied as in the interrupted suture, were left to come away by stool, or they were twisted and brought out of the wound, as in the suture of Ledran.*

SUTURE OF BERTRAND.—The lips of the wound being approximated, pierce them both rather obliquely about two lines from their edges and one from their extremity. Then repassing the needle in the same way on the opposite side, two lines farther on, continue them in the same direction to the other end by a series of equal stitches. The intestine being reduced, fasten the end upon the abdomen, and three days subsequently cut off one end of the thread near the wound, and draw out the other.† (Plate XL. Fig. 1.)

§ 2.—SUTURE OF TRANSVERSE WOUNDS.

SUTURE OF RAMDOHR.—Invagination of the two ends of the intestine being accomplished, this surgeon stitched them together by two or three points of the interrupted suture, reduced the intestine, and left the suture to the efforts of nature. If the mesentery interfered with the invagination, he excised it to a sufficient extent.

SUTURE OF JOBERT.—With a piece of silk passed at each end into a needle, Jobert operated as follows. After traversing the anterior part of the upper end from without inwards with one needle, he then passed both needles from within outwards through the lower end of the intestine, and after placing as many threads in this manner as were sufficient to unite the wound, invaginated the intestine by gentle traction upon the threads, and either knotted them on the outside of the inferior end, or brought them out of the wound in the abdomen. (Plate XL. Fig. 3.)

SUTURE OF LEMBERT.—After preparing as many threads, each armed with needles, as seemed requisite, one needle was pushed through the coats of the intestine as far as the mucous membrane, from without inwards, and then repassed from within outwards, so as to come out about one line from the edge of the wound. Then passing it across the fissure, he carried it from without inwards, at a similar distance from the opposite side of the wound, and brought

* Malgaigne, p. 399, Phil. edit.
† Ibid.

it out again at a distance of about three lines from its point of entrance (Plate XL. Fig. 4). All the threads being passed in a similar way, the serous surfaces were brought in contact, so as to force the lips of the wound to double inwards, and form a sort of valve (Plate XL. Fig. 5), after which the knots were tied, the ends cut off, and the intestine reduced.*

Remarks.—In the account of the different sutures just described, as adapted to the union of both longitudinal and transverse wounds of the intestine, a brief enumeration of such of the various plans as are deemed most available, has been given, most of the details having been collected from various surgical works. The importance of the subject, and the numerous experiments that have been performed upon animals in order to test the result of similar injuries in man, might perhaps have authorized my adding much to the above account, but as this would have transcended my present limits, it must suffice merely to mention a few of the points generally admitted as settled in the treatment of these injuries.

From the experiments of former surgeons, and especially of Mr. Travers,† it appears that sutures of every description, when applied to an intestine and left unconfined at the external wound, ulcerate through into the bowel and are discharged by stool, the opening made by their escape through the intestine being closed by the effusion of lymph, and strengthened by adhesion of the edges of the ulcer to surrounding parts.

If a small portion of the intestine is encircled by a ligature, as was done by Sir A. Cooper, lymph is rapidly effused around the constricted point, and whilst the thread ulcerates into the bowel, the external coverings are replaced by new tissue. But if the ligature surrounding a portion of the intestine is attached externally, it does not ulcerate through, but comes away in the same manner that the loop of the thread does from an artery.

As these facts have been established by the observation of Dr. Smith of Philadelphia,‡ Gross of Louisville, Kentucky,§ as well as

* Malgaigne, p. 404.

† Inquiry into the Process of Nature in repairing Injuries of the Intestines, by Benjamin Travers. London, 1812.

‡ An Inaugural Essay on Wounds of the Intestines, for the degree of M. D. in the University of Pennsylvania, by Thomas Smith, Member of the Philadelphia Medical Society, 1805.

§ An experimental and critical Inquiry into the Nature and Treatment of Wounds of the Intestines, by Samuel D. Gross, M. D. Louisville, 1843.

by many surgeons in Europe, no one can doubt the advantages of that mode of closing a wounded intestine which cuts off the ends of the thread and leaves the suture to be discharged per anum.

In the application of every suture, it is important that the stitch should not, if possible, pass through the mucous coat, but rather between it and the muscular; that the wound should be so accurately closed that fecal matter cannot escape; that two peritoneal surfaces be brought in contact in order to promote adhesions; that the bowels be kept as still as possible, and that every means be employed to keep down general peritoneal inflammation. Under proper treatment, and with the exhibition of sound judgment, moderate wounds of the intestine are by no means a hopeless class of injuries, various cases having been reported, in which patients recovered after most extensive injuries, and even the loss of seventeen inches of the intestinal canal.* Although such a case could not be taken as exemplifying the ordinary result, yet it may be mentioned as a fact justifying the surgeon in forming a prognosis of a more favorable kind than might be the case if he trusted solely to general ideas on the subject, and induce him to exert his skill towards the preservation of life in even the most desperate cases.

ESTIMATE OF THESE DIFFERENT SUTURES.—For a small punctured wound, there can be no question that the application of the ligature as advised by Sir A. Cooper, is the most advantageous; that the loop suture of Palfyn and Ledran come next, according to the extent of the wound, and then the process of Jobert. In the union of transverse wounds, the interrupted suture is probably equal to any other. The plan of Ramdohr is generally deemed objectionable from the difficulty of invaginating the part; from the necessity of incising the mesentery in order to permit it, and from the great tendency of the intestinal contents to escape into the abdominal cavity, owing to the want of accurate adjustment. The modifications usually spoken of as the plans of Denans, Duverger, or Amussat, in which a foreign substance is introduced to preserve the relative position of the two ends of the intestine, though more useful, are yet not without serious objections. The union of a transverse wound by the suture of Lembert is, therefore, thought to present the best prospect of an accurate agglutination of surface.

* Bibliographical Index, p. lxii.

CHAPTER XV.

HERNIA IN GENERAL.

THE cases of hernia that may require a surgical operation, are those in which the contents of the tumor are strangulated at some one of the openings, usually designated as the inguinal, femoral, or umbilical rings. As the existence of hernial protrusions is very common, about one in every eight being believed to labor under them, and as the complaint is one which either rapidly destroys life or exposes the patient to constant annoyance, it is not surprising that it has claimed and received so large a share of professional attention. From a very laudable desire to investigate the anatomical relations of a tumor which involves parts of such vital consequence, the examination of the structures connected with hernia has been conducted with a degree of minuteness that has hardly left any shred or portion of the tissue concerned, without a name. These details have consequently thrown a mist around the descriptions, that has confused and puzzled the brains of many, who, under a less artificial account of the parts, would promptly have seized on all the facts possessing a practical value. The anxiety that has been shown to individualize tissues that in other parts of the body were scarcely noted, together with the habit of attaching to cellular tissue the inappropriate name of "fascia," has also tended not a little to add to the cloud which surrounds this subject as first presented to the mind of a young student; and though by subsequent study, he may find that the various names, given by different writers, often designate the same part, it is long before the impression of extraordinary difficulty, which has been associated with the very term of hernia, wears away. That the profession have materially benefited by the details furnished by the distinguished men whose names are identified with this subject, cannot be denied; but that the student or inexperienced surgeon has been misled, when, knife in hand, he undertook to investigate the structure for himself, will, it is thought, be admitted by those who can recall the earlier moments of professional experience.

A very material defect in the usual account of hernia, as adapted

to the wants of the surgeon, may also be seen in the tendency of surgical teachers to adopt the descriptions furnished by normal anatomy, instead of those presented in the pathological changes of the complaint; and, instead of describing the alterations of structure produced by disease, presenting a perfect and minute detail of the disposition of the parts as found upon subjects where no hernia has existed.

In an account like the following, which is furnished for the practical information of an inexperienced operator in the hour of need, it is thought to be inexpedient to dwell long upon the special anatomy of these parts. No one qualified for the study of operative surgery can be presumed to be ignorant of the principal facts in special anatomy; and in the effort which will now be made to present a concise account of the surgical or rather pathological anatomy of hernia, it will be assumed that the reader is familiar with the great points of reference as usually described by the anatomist. In this account there will first be presented those general facts which are applicable to the complaint wherever found; after which, such special descriptions will be given as may be demanded for the explanation of the peculiar condition of tissues found in the three most common varieties of the complaint, to wit, Inguinal, Femoral, and Umbilical Hernia.

SECTION I.

GENERAL PATHOLOGY OF HERNIA.

Any portion of the contents of the abdomen, as the bladder, uterus, or other organ, which protrudes through a natural or preternatural opening constitutes a hernia, though, in the majority of instances, the protruding part is composed of the intestines or omentum. These viscera being so situated within the cavity of the abdomen as to have the great sac of the peritoneum in front and around them, it follows that their protrusion at any point will generally involve a prolapse also of this membrane, as well as of such other tissues as may be so situated as to be acted on by the mass. The envelops of every protrusion become, therefore, the first portion of structure to be examined.

PLATE XLI.

SURGICAL ANATOMY OF THE PARTS CONCERNED IN HERNIA.

Fig. 1. A Sketch of the Exterior of the Abdomen, showing the general outline of the muscles, as well as the general points of reference required in operations upon this region. 1. The umbilicus. 2. Hypogastric region. 3. A line drawn from the anterior-superior spinous process of the ilium to the umbilicus, and crossing the course of the epigastric artery. At one period the puncture in ascites was advised to be made in this line, but was given up, owing to the risk of wounding the artery.

After Bernard and Huette.

Fig. 2. The same parts as shown, after the removal of the skin, fat, and superficial fascia, by a careful dissection. 1, 1. The linea alba. 2, 2. Rectus abdominis muscle, and lineæ transversæ. 3. External oblique. 4. Its tendon, also the position of the internal abdominal ring. 5. Round ligament of the uterus at its exit from the external abdominal ring. 6. Epigastric artery. 7. Peritoneum covering the intestines. 8. Section of fascia transversalis everted. 9. Transversalis abdominis muscle. 10. Internal oblique muscle. 11. External oblique. 12. Section of the rectus.

After Bernard and Huette.

Fig. 3. A View of the Superficial Fascia of the Abdomen and Thigh, as shown by a careful dissection of the skin. 1, 1. The fascia superficialis, arising on the thigh and extending over the abdomen, as one continuous layer. 2, 2. Branches of the arteria ad cutem abdominis. 3, 3. Branches of the corresponding superficial veins.

After Bernard and Huette.

Fig. 4. Another view of the same as seen after a closer dissection, but especially in its relations to femoral hernia. 1. Fascia superficialis. 2. Perforations in the superficial fascia of the thigh for the passage of the superficial vessels. 3, 3. Extension of the superficial fascia over the cord and testicles. 4, 4. Superficial arteries.

After Bernard and Huette.

Fig. 3

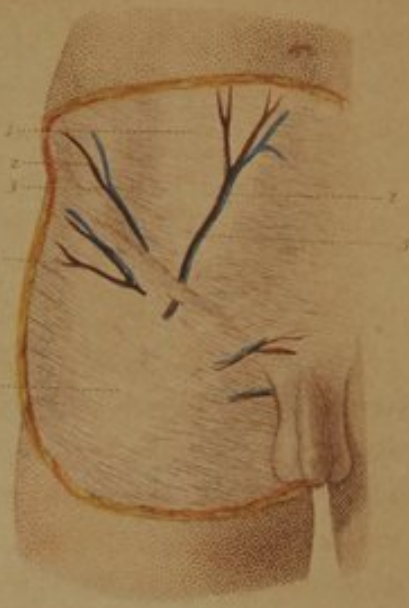


Fig. 1

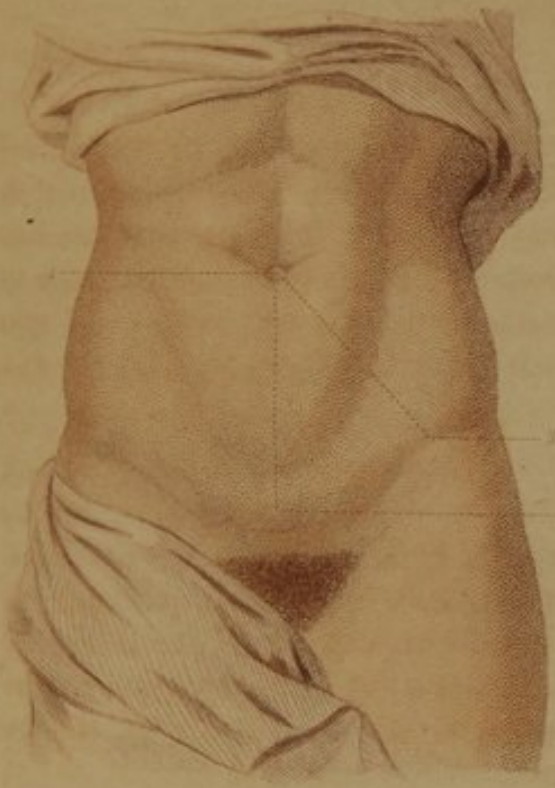


Fig. 2

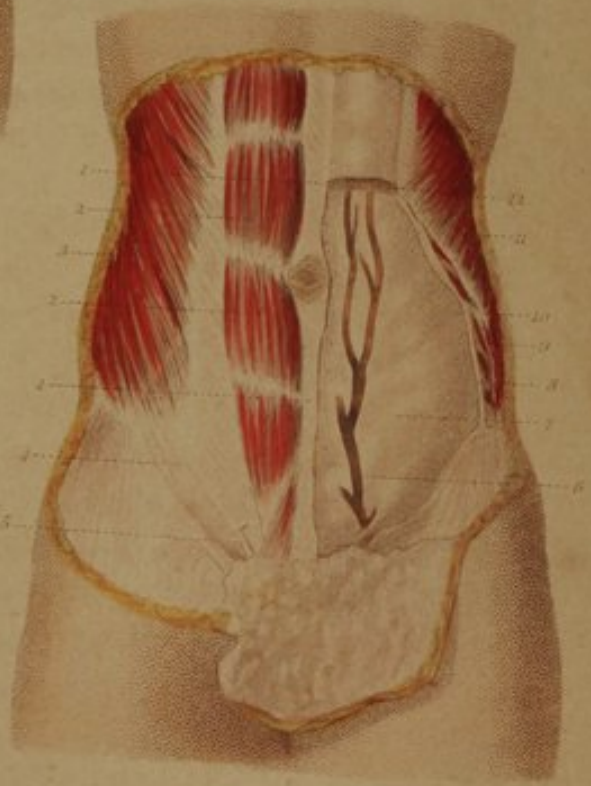


Fig. 4

§ 1.—ENVELOPS OF HERNIA.

The coverings of any hernia, which protrudes externally through the abdominal walls, must necessarily consist of a portion of every tissue which is to be found between the skin and the peritoneum, unless violence has destroyed the continuity of the layers, or nature left in them a deficiency or opening through which the tumor could escape; or unless the distension of the structure has been so great as to lead to its absorption, or to its being so thinned as to escape our observation. Following the natural course of a hernia, and tracing it from the abdomen outwards, we have first to notice the sac.

The prolapsed portion of peritoneum, or the *Sac*, presents on its inside the smooth shining surface of a serous membrane, but when irritated displays the usual characteristics of the serous tissues, by giving rise to effusions of serum which often fill it, or to effusions of lymph which glue together its sides and its contents, or its density may be very much increased or diminished from that seen in the normal condition of parts. Outside of the peritoneum is generally found a cellular layer of greater or less density (according to its position), which varies somewhat in its attachments to the peculiar region in which it is placed; thus, at the sides of the pelvis and groins it is loose and movable, whilst in front its adhesions are firmer and less easily overcome. In this extra-peritoneal cellular substance, or outer layer of the sac, are found the more important of the bloodvessels directly connected with the operations of strangulated hernia, and in it are also found the particles of fat which have occasionally been mistaken for omental hernia.

The changes made by disease in this cellular structure are varied. When pressure is made upon it, it becomes more developed, thickened, and laminated, acquiring a density and fibrous appearance which qualify it for the name of "fascia," which it has generally received.

In the protrusions seen on the front of the abdomen, or in those found escaping at the groin, this layer constitutes either the fascia transversalis abdominis, or the fascia propria, according to the views of different writers. Outside of this tissue are occasionally noted layers of muscular fibre, which are held together by the cellular tissue always more or less spread around them, or by the condensed cel-

lular structure which fills up the spaces left around the vessels. Outside of this again is found the fascia superficialis, or second grand tegumentary covering of the body, and outside of this is the skin.

When, however, long-continued pressure or inflammatory action has existed for some time, these layers, which in the normal condition are easily distinguished, will be found so blended and thickened as to have lost most of their ordinary characters and position, being fused, as it were, into one, or they may have their laminæ so increased, that nearly twice as many will be found over a hernia, as might be looked for as the natural envelops of the part. When muscular fibre forms one of the layers covering a hernia, there is less change observed in it than is the case with some of the other tissues. Its presence may, therefore, be generally told by its normal characteristics, and by these a distinction may readily be made of the different envelops of the tumor which otherwise it would be very difficult to recognize, the extra peritoneal and the subcutaneous fascia, or the cellular tissue outside of the peritoneum, and that underneath the skin, being sometimes so blended as to appear to the operator like a thickening of one and the same structure. The special coverings of each hernia will be again referred to in connection with the particular class to which it belongs.

§ 2.—SEAT OF HERNIA.

The abdomen being a closed cavity, which is accurately filled by its contents, the different tissues which enter into the composition of its parietes naturally sustain an amount of pressure, which varies according to circumstances. Above, or at the upper boundary of this region, the pressure is resisted by the diaphragm, but this septum is seldom the seat of rupture, in consequence of its mobility, though some of the intestines have occasionally been forced through it into the cavity of the chest.* Below, the abdominal contents are sustained by the bones of the pelvis and their attachments, the resisting nature of which is so marked, that hernia are also rare in this direction, though they have been seen at some of its weaker parts, and especially at the point of exit of its arteries, as at the obturator foramen, or opening for the thyroid artery; at the sacro-sciatic notch, where the gluteal artery passes out, and also alongside of the vagina of the female, or through a laceration of the perineum of the male.

* See Bibliography, page lx.

Posteriorly, the abdominal walls are composed of the muscles of the loins and of the vertebræ, the former of which can alone give exit to hernia, a few rare cases having been reported by Petit and Cloquet, and named lumbar hernia, where the intestines protruded through the muscles immediately above the pelvis, after the parts had been wounded, or submitted to extreme pressure.

As the natural tendency of gravity is to cause the abdominal contents to press against the anterior parietes of the abdomen when the patient is in the erect position, and as many weak points exist in them for the transmission of the various organs of the male and female, this region is by far the most common seat of hernia in both sexes. In that part of the anterior parietes which is immediately at the line of the groin, there is also found openings for the escape of the femoral vessels, and at this point, anterior hernia are also frequently seen.

Another class of anterior hernia which is usually designated as umbilical, presents a variety, which, though often supposed to be due to the passage of the viscera through the opening left by the umbilical vessels of the fœtus, seldom or ever does so. This hernia, from having been rather loosely described, is liable to mislead such as do not carefully attend to the normal relations of the part, the fact being that hernia seldom escapes by the umbilicus. In the fœtus a perfect opening exists in this portion of the abdominal parietes, which is correctly designated as the umbilicus, and through this the vessels of the cord are transmitted; and whilst the latter exist, or shortly afterwards, a hernia may pass directly along the course of the vessels, but in the adult it is otherwise. At this age the former aperture is so closely contracted, and the vessels which occupied it so perfectly solidified, that this point offers greater resistance than the linea alba itself, and a hernia through the course of the umbilical vessels is, therefore, almost impossible. An examination of the linea alba shows, however, even in the normal condition, at many points, but especially in the neighborhood of the umbilicus, a weakness of the structure around the course of the vessels, as well as a number of minute orifices in the tendinous parietes, which give exit to bloodvessels and nerves. When, therefore, one or more of these openings have yielded to the relaxation consequent on pregnancies or such other causes as produce distension of the part, the tumor may be designated as an umbilical hernia, because occurring in the neighborhood of the umbilicus, though, unless the aperture is

found close to that through which the fœtal vessels have passed, it would be more correct to designate it as a ventral hernia.

§ 3.—EFFECTS OF THE FORMATION OF HERNIA.

When the escape of a hernia from the abdominal cavity has caused a protrusion of the peritoneum, and formed what has been termed the sac, the effects of the complaint will vary according to circumstances. Thus, if the protrusion has been gradual, there will generally be seen an elongation of all the tissues in front of it; whilst if the rupture has been the result of a sudden effort, or of direct violence, it may lacerate one or more of them, and pass directly through. The majority of hernia being produced by the application of forces, which are continued for a longer or shorter period, most of the tissues connected with the seat of the tumor are elongated, rather than torn, and acquire a peculiar pouch-like form, especially the peritoneum, and hence the protruding portion of the latter has been called the "sac." In order to distinguish points of the sac, it has been divided into different regions, so as to enable writers to define more accurately the part to which reference is made, thus its mouth is the portion which is continuous with the abdomen; the neck that which adjoins the opening in the abdominal parietes, through which it protrudes; whilst its body is the main cavity, and the fundus its inferior portion, or that which is most distant, from the abdomen. But, though these names generally indicate the regions of the sac, and, therefore, to a certain extent its outline, they are not universally applicable. Sometimes there are two distinct sacs, or the body of one sac is contracted in the middle, so as to present a kind of hour-glass contraction, and create two necks, or two bodies, as may be seen by reference to the plates connected with this subject. Under ordinary circumstances, when a sac has been formed, it is possible, if seen immediately after its protrusion, to replace both it and its contents in the abdominal cavity: a little later the contents may be returned; but the external surface of the sac, having contracted adhesions to the extra-peritoneal fascia (fascia propria), the sac remains (reducible hernia). Sometimes both the sac and its contents contract adhesions and are permanently fixed (irreducible hernia,) or the contents may be so constricted as to arrest the circulation, and lead to the development of a certain train of

symptoms designated as those of strangulated hernia. It is for the relief of the latter that the operation of herniotomy, as it is sometimes termed, or the incision of the parts around the protrusion, is demanded; but before proceeding to the details of this operation, the general symptoms of each kind of hernia may be advantageously described.

§ 1.—REDUCIBLE HERNIA.

SYMPTOMS.—All hernia, whether reducible, irreducible, or strangulated, give rise to tumors which vary in shape, size, and position.

The constitutional disturbances caused by reducible hernia are such as may be chiefly referred to derangement of digestion, as constipation, belching, rumbling, dragging pains in the belly, and occasionally a disposition to nausea or vomiting, all of which are relieved when the contents of the tumor are replaced in their natural position, as sometimes happens when the patient lies down, or when pressure is properly made upon the protruded portion. The other symptoms being often the result of the peculiar position of the hernia, will be detailed under their special heads.

§ 2.—IRREDUCIBLE HERNIA.

SYMPTOMS.—The tumor caused by this class of hernia is more or less permanent, varying in size and symptoms according to circumstances; thus constipation, flatulency, the erect posture, corpulency, or pregnancy, may increase it, by filling the cavity of the bowels, or by obstructing the circulation and giving rise to infiltration of the omentum, these conditions being shown at the time by the pain, and other symptoms detailed in connection with the reducible class. But colic is more common in the irreducible hernia than it is in the reducible class, on account of the greater tendency of feculent matter to lodge in the protruded intestine. The patient is also more apt to suffer from attacks of nausea and vomiting, in consequence of the fixed position of the omentum or intestine interfering with the distension and upward movements of the stomach, especially after a full meal. Irreducible hernia may also give rise to symptoms which are the result of injury to the contents of the tumor by external causes, as well as to those which will be hereafter detailed as the result of strangulation.

PLATE XLII.

A VIEW OF SOME OF THE PARTS CONCERNED IN INGUINAL AND FEMORAL HERNIA.

Fig. 1. Surgical relations of the Bloodvessels in Inguinal and Femoral Hernia. 1. Skin, fascia, external oblique, internal oblique, and transversalis muscles incised. 2. Fascia transversalis and peritoneum covering the intestines. 3. Position of internal inguinal ring. 4. Epigastric vessels. 5. Section of rectus abdominis. 6. Tendon of external oblique or Poupart's ligament. 7. Fascia lata femoris. 8. Femoral artery. 9. Femoral vein. 10. Sheath of vessels. 11. Saphena vein.

After Bernard and Huette.

Fig. 2. Envelopes of an oblique inguinal hernia. 1. Skin and superficial fascia. 2. Tendon of external oblique distended by the hernia. 3. Cremaster and tunica vaginalis communis, or the fascia propria of the hernia. 4. Sac. 5. Omentum. 6. Intestine.

After Bernard and Huette.

Fig. 3. View of a direct inguinal or a ventro-inguinal hernia. 1. Integuments of abdomen. 2. Tendon of external oblique. 3. Fascia transversalis and peritoneum. 4. Spermatic cord. 5. Sac laid open. 6. Position of epigastric artery in this variety of hernia. 7. Intestine. 8. Position of the crural ring. 9. Saphena vein. 10. Saphenous opening of fascia lata.

After Bernard and Huette.

Fig. 4. Plan to show the relation of the parts of the sac. 1. Abdominal parietes and ring. 2. Neck of sac. 3. Its fundus. 4. Its mouth. 5. Peritoneal cavity.

After Bernard and Huette.

Fig. 5. Peculiar form of a sac, as occasionally seen. 1. Abdominal parietes and ring. 2. Fundus of sac. 3. Body of the sac above an hour-glass contraction. 4. Cavity of the peritoneum.

After Bernard and Huette.

Fig. 6. Commencement of the changes seen in the formation of a hernial sac. 1. Abdominal parietes. 2, 2. Knuckle of intestine protruding at the ring, and forcing the peritoneum before it so as to form the sac. 3. Fundus of sac.

After Bernard and Huette.

Fig. 7. Next step of the formation, as seen in a recent hernia. 1. Abdominal ring. 2. Intestine as protruding and constricted by the ring.

After Bernard and Huette.

Fig. 8. A view of the parts as seen in a more advanced hernia. 1. Abdominal parietes. 2, 2, 2. Intestine. 3, 3, 3. Continuous line of peritoneum.

After Bernard and Huette.

Plate 42

Fig. 1.

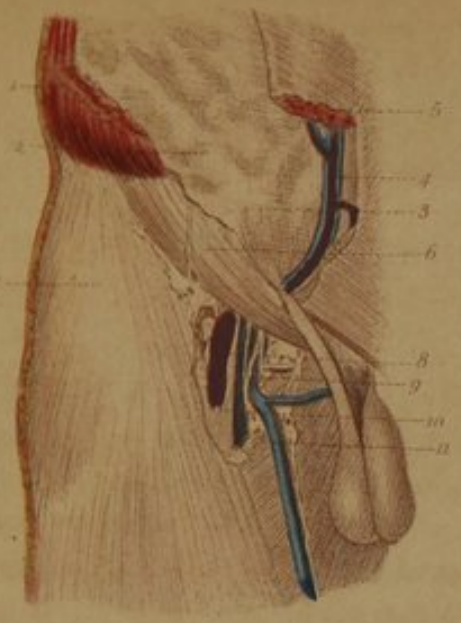


Fig. 2.

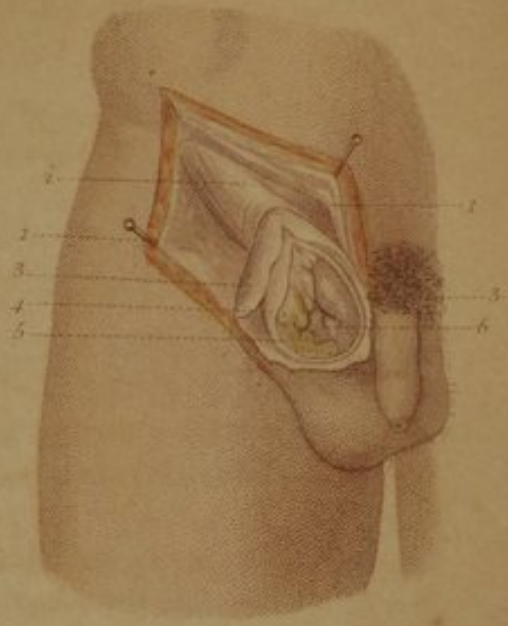


Fig. 3.

Fig. 4.

Fig. 5.

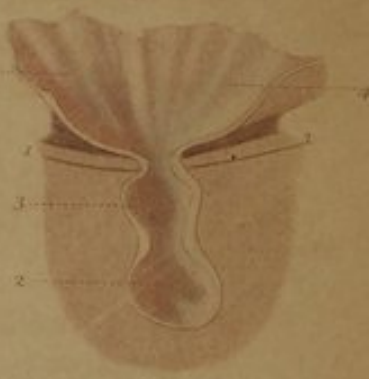


Fig. 6.

Fig. 7.

Fig. 8.

§ 3.—STRANGULATED HERNIA.

When either a reducible or irreducible hernia becomes constricted to such a degree as to interfere with the passage of the contents of the bowels through it, or when the circulation becomes interrupted either in the bowel or in the omentum, a certain class of symptoms are induced which are regarded as positive evidence of the existence of strangulation or constriction. These symptoms may arise either in consequence of a sudden protrusion of intestine through a small aperture; from the distension of the part by accumulations of flatus, feces, or blood; from swelling of the narrow portion (neck) of the sac; from spasm of the parts around it, or from the formation of bands at its mouth as the result of inflammation.

Symptoms.—The symptoms of strangulated hernia will be found to vary with the tightness of the constriction, and the length of time that it has continued; they will also vary when the strangulation results simply from obstruction to the passage of matter through the protruded part, and when it is the result of inflammation.

When the consequence of simple obstruction, the patient experiences a sense of uneasiness, fullness, or constriction, in the part or in the abdomen, as if a cord was drawn around the latter, accompanied with flatulence; more or less violent colicky pains, a desire to go to stool or to strain, but without any, or at least slight evacuations. This is followed by nausea and vomiting of the contents of the stomach, then of mucus and bile, and subsequently by distressing retching, restlessness, moisture of the skin, irritation and excitement of the pulse, and the other usual symptoms of a bad attack of colic. If promptly relieved by a reduction of the tumor, these symptoms will all disappear, the patient obtain immediate relief, and have a free evacuation of the bowels; though there may remain a certain amount of soreness of the region or even of the whole abdomen. But if the obstruction remains, and inflammation is induced, then the symptoms just detailed will be followed by others of a more serious character. In some cases of strangulation, these violent symptoms may be the first indications given of the existence of constriction, patients often suffering from some of those just detailed, without deeming them more than the ordinary inconvenience likely to result, or which has previously resulted, from their complaint.

The symptoms of strangulation in very marked cases consist in a

greater tension and tenderness of the tumor, in increased tenderness and swelling of the abdomen, in increased vomiting, which often brings up stercoraceous matter, accompanied or followed by hiccough, and in a change in the color of the tumor, which becomes dark red or livid, and gives a doughy or crackling sensation to the touch. The pulse becomes more frequent, small, and wiry; the skin more wet, cold, and sodden; the countenance expressive of distress and suffering; the mind desponding and anxious, though presenting occasionally intervals of apparent relief, till at last the suffering ceases; the patient is apparently easy, though very feeble; the pulse fails; respiration becomes short and labored, and death closes the scene. On examining the parts *post mortem*, there is no difficulty in recognizing the previous existence of such an acute inflammation as has resulted in a more or less advanced stage of mortification.

Occasionally, however, patients rally even after mortification has been developed, the external coverings of the tumor ulcerate and open, the slough separates from the most diseased portion of the intestine; but the adjacent parts being glued to the side of the seat of protrusion, by the lymph resulting from the inflammation, the peristaltic action of the bowel forces its contents out at the opening thus made, and gives the patient the complaint designated as Artificial Anus.

SECTION II.

TREATMENT OF HERNIA.

The symptoms above detailed having shown that the dangers of hernia, though imminent, depend to some extent upon the existence of strangulation, or on the period during which the protruded part has remained constricted, it is evident that the whole treatment may be resolved into either a prevention or removal of this constriction.

In every case, therefore, it becomes the surgeon's duty to attempt the restoration of the contents of the tumor at as early a period as possible, but bearing in mind, in all his efforts, the great liability of the protruded parts to be bruised or injured by pressure, as well as the possibility of lacerating, in certain cases of strangulation, such portions as are in a state of softening or mortification.

§ 1.—REDUCTION OF HERNIA.

The manual treatment requisite for the reduction of hernia is designated by the term *taxis* (ταττω, to arrange), signifying the replacing of the contents of the tumor in the abdominal cavity. To perform the taxis with success, it is desirable that the parts constricting the tumor, as well as the muscular system generally, should be placed in as perfect a condition of relaxation as possible, both by means of position and also by constitutional measures, and that the pressure of the fingers should be made in the axis of the tumor, unless its peculiar position requires some slight modification of the rule, as will be shown in connection with the special cases. At present, the general arrangements likely to facilitate the reduction of all hernia, where any difficulty is experienced, alone claim attention.

The earliest causes of difficulty in the reduction of most hernia being found in the accumulation of matter within the protruded portion, the first point to be attended to is the emptying of the bowels below by enemata, and of the stomach by emetics, especially if a full meal has preceded the difficulty, and nature has not already accomplished this object; whilst the bladder should be voided of its contents in order to give as much room as possible within the cavity of the abdomen.

The next point of danger being the tendency of the constricted part to inflame, blood should be freely drawn, and will prove useful, not only by diminishing the general force of the circulation, but also by relaxing the system and promoting a freer circulation through the adjacent parts. If, in any hernia, the constriction is supposed to be the result of muscular contraction, perfect relaxation of the whole system should be produced, and the patient placed in such a condition as will diminish the frequent action of the diaphragm and respiratory muscles. To accomplish this, nothing, in my experience, is comparable to perfect etherization; as the patient, in this state, always lies perfectly quiescent, and has a respiratory movement of so slight a kind as, compared with the efforts which are usually made by them to resist the taxis, either in consequence of pain or fear, that the facility of the reduction is much increased. Indeed, a resort to Ether is often sufficient, of itself, to accomplish the reduction without the abstraction of blood, the warm bath, or any of the other means usually employed; but the entire evacuation of the con-

tents of the stomach should always precede the employment of the anæsthetic. Should circumstances prevent a resort to this powerful agent, then the practitioner must find some other means of inducing the same degree of muscular relaxation, such as the warm or hot bath, or the use of tobacco or tartar emetic. The employment of tobacco in the form of infusion in the proportion of a drachm to the pint of water, one-third or one-half of which is thrown into the rectum at a time, is a very powerful means of inducing this relaxation, but it is liable to the objection of exciting a longer and more thorough depression of the system than is desired, in consequence of the continued absorption of the infusion if the rectum does not expel it, as sometimes happens in consequence of the relaxation of its muscular coat, even though the sphincter ani offer no impediment to its escape. A much safer and more controllable method of applying it will be found in the following plan:—

Macerate a drachm of tobacco for a few minutes in a sufficient quantity of hot water to soften it; then tie the mass up in a bag made of a small piece of gauze (bobbinet) previously soaked in water, and leave the end of the string that is tied around the mouth of the bag attached to it. Push the bag into the rectum like a suppository, and when a sufficient constitutional effect is induced, draw the bag out by means of the string, which has been left pendulous at the anus.

Various local means have been recommended as adjuvants to the taxis, such as warm applications to relax the cause of the constriction, or cold articles to favor the contraction of the protruded portion; but as the three principal varieties of hernia are mostly protruded through aponeurotic openings, little or no relaxation of the seat of the stricture can be anticipated, and the heat, by causing an afflux of blood to the part, must tend to increase the local congestion in the vessels of the tumor, especially if omentum constitutes a part of it. Cold, on the contrary, will diminish this congestion, excite contraction or peristaltic action in the bowel, and thus favor the reduction of the tumor, whilst it cannot affect the condition of a tissue so purely fibrous in its character as that found in the usual position of the hernial rings. When a hernia has been reduced, a good truss should be well adjusted to the opening to prevent further protrusion.

The other points connected with the treatment of reducible hernia, will be detailed in connection with their special application to each of the three principal classes of this complaint.

§ 2.—MEANS OF RADICALLY CURING REDUCIBLE HERNIA.

After the reduction of a hernia and the application of a truss, the patient is secure for the time from the dangers of strangulation, and though it has been asserted that radical cures have been effected by the constant use of the instrument inducing such adhesions and induration of tissue as plugged up the ring, my opportunities (and they have not been slight), have never enabled me to see one well-grown adult who had obtained this result from the use of an instrument. In children and young persons such a condition has been created as prevented the reproduction of the complaint for years; yet, even in these patients, the success has been far from constant. The most, therefore, that can be asserted of any truss is, that after its application, the patient is not liable to a descent of the hernia, provided it fits well, and is constantly worn. The manufacture and application of these instruments having, in many sections of the country, passed into the hands of ignorant men, professional evidence of the advantages resulting from the use of any particular kind of truss is rare. Some, I think, do more harm than good, and the surgeon should, therefore, make it his duty to examine the mode in which the truss is worn, as the instrument is often so badly adapted to the part as to increase the complaint.

It being generally admitted that little or no reliance can be placed upon a truss for the accomplishment of the radical cure of hernia, several surgeons have endeavored to find some other means of effecting this important object. Most of these, though differing in the details, have had one grand object in view, and that is, the creation of such a condition of the parts as would effectually and permanently close the opening.

One or two of these plans will now be briefly stated.

Operation of Gerdy.*—A curved needle, pierced with an eye near its point and fastened to a handle, several quills for the quilled suture, some strong aqua ammonia, together with ligatures and a camel's-hair pencil, being prepared, the operation is thus performed:—

"Whilst the patient is lying down, the surgeon places his left forefinger under the anterior edge of the scrotum, pushes back the

* Malgaigne.

skin from below upwards into the ring, and as far as possible into the inguinal canal, leaving the spermatic cord behind. The needle, armed with a double thread, is then directed on the finger to the bottom of this blind pouch, and its end brought out in front, so as to traverse, at the same time, the reflected portion of the skin, the front of the canal and the skin of the abdomen. As soon as the eye, near the point of the needle, is seen outside, one end of the ligature is disengaged and kept outside, whilst the other end is withdrawn with the needle. (Plate XLIV. Fig. 1.) Being then pushed through the same tissues, it is brought out half an inch from its first point of issue (Plate XLIV. Fig. 2), and the second end disengaged in the same way. The pouch, formed of the skin of the scrotum, being now retained by a loop of thread in the canal where it was pushed by the finger, the threads of one side are tied on a quill half an inch long, and the other threads on another tube so as to form the first point of a quilled suture. (Plate XLIV. Fig. 3.) Two other points of suture being made in the same way, one on the inside the other on the outside, at half an inch distance from the first, a camel's-hair pencil should be dipped in the ammonia, and the scrotal skin in the pouch cauterized sufficiently to destroy its epidermis. Inflammation attacking this skin, the two surfaces which are in contact, suppurate; and adhere about the eighth day, when the threads are removed and the canal obliterated.

Radical Cure of Hernia, by Dr. J. C. Nott, of Mobile.—A man, aged fifty, labored under enlargement of the testicle and scrotal hernia. After Dr. Hicklin, the attending surgeon, had removed the testicle, Dr. Nott proceeded to the cure of the hernia.

Operation.—Extending the incision a little above the external ring, the latter was fully cleared of cellular tissue. The hernial sac having been already opened, a considerable portion was removed with the testicle to which it was adherent, and a leaden wire passed through the internal column of the ring, two or three lines from its margin, and about four above the pubis. This being continued down under the neck of the sac, between the latter and the pubis, was brought out through the external column of the ring, at a point opposite to the perforation in the other column, the object being to draw together the two columns of the ring, and at the same time compress the neck of the sac. A single knot being made in the wire, the latter was twisted by a pair of forceps as tightly as so weak a substance would permit, but the opening being large enough

to admit three fingers to pass into the abdomen, was only reduced by the operation to about half its breadth. The integuments were now united by suture, &c.

The wound suppurated very profusely, and was about six weeks in closing, owing to peculiar difficulties. Two months after the operation a hard, insensible lump occupied the seat of the external ring, where the wire had been placed, and four months subsequently the patient, though engaged at hard labor, had had no return of his hernia.

Remarks.—Attempts to cure hernia radically date back to a very early period of the profession—Celsus, Aetius, Guy de Chauliac, and other surgeons, having advised various means of accomplishing it. Few, however, seem to have presented unexceptionable facts, as each period seems to have been dissatisfied with the acts of its predecessors, and to have endeavored to remedy the operation, or suggest another. The application of a ligature around the sac was advised especially by Guy de Chauliac, A. D. 1360, who directed that the sac should first be laid bare, in order to strangulate it with greater certainty at its root. The use of a leaden ligature, and the approximation of the sides of the ring, as advised by Dr. Nott, present, however, a modification which may prove to have several advantages over the old-fashioned thread, and the strangulation of the neck of the sac. Of the operation of Mr. Gerdy, I have only to say that my personal observation of some of his cases, several years since, did not induce any confidence in its ultimate success. A modification of the plastic operations was also tried many years ago by Dr. Jameson, of Baltimore, but though the patient was benefited, I am not aware of its having been repeated.

Upon the whole, I incline to the opinion that the result of the operations for the radical cure of hernia will be doubtful in the majority of cases, though, as it has succeeded, at least for some few months, other surgeons may deem it proper to repeat the trial. If called on to select any one method of operating, I should prefer the use of a leaden ligature around the ring and neck of the sac, in a manner somewhat similar to that reported by Dr. Nott.

PLATE XLIII.

SURGICAL RELATIONS OF THE PARTS CONCERNED IN HERNIA.

Fig. 1. A view of the relation of the Internal Oblique and Transversalis Muscles to Inguinal Hernia, showing the mode of formation of the Cremaster Muscle. 1. Tendon of external oblique, a portion of the muscle and its tendon having been excised in order to show the parts beneath. 2. The fibres of the internal oblique. 3. A section of the tendon of the external oblique everted upon the thigh, and showing the origin of the internal oblique and transversalis muscles from Poupart's ligament. 4. Common tendon of the last two muscles. 5. Cremaster muscle as seen upon the cord, but not extended upon the testicle, as is usually the case.

After Bernard and Huette.

Fig. 2. A view of the relations of the Transversalis Muscle and Fascia. 1. Transversalis muscle, as shown by the removal of the parts above it. 2. Circumflex ilii artery in its course to anastomose with the ilio-lumbar. This artery lies between the transversalis and internal oblique muscles. 3. The femoral artery exposed by opening its sheath. 4. The femoral vein.

After Bernard and Huette.

Fig. 3. Formation of an Inguinal Hernia at the internal ring, and the relative position of its coverings. 1. Tendon of external oblique everted. 2. Section of fascia transversalis. 3. Intestines seen through the peritoneum. 4. The cord. 5. Mouth of hernial sac.

After Bernard and Huette.

Fig. 4. Relative position of the coverings of an old Scrotal Hernia, as shown by laying open the part. 1. Penis hooked back. 2, 2. Skin pinned back. 3, 3. Fascia superficialis. 4. Dartos muscle. 5. Internal layer of dartos. 6. Tendon of external oblique, and external abdominal ring. 7. The spermatic cord. 8. Tunica vaginalis communis, or fascia propria.

After Bernard and Huette.

Fig. 5. Relative position of constituents of the Cord. 1. Tendon of external oblique. 2. Same slit open. 3. Fibres of internal oblique and transversalis, or the cremaster muscle. 4. Tunica vaginalis communis. 5. Probe passed beneath vessels of cord. 6. Vas deferens.

After Bernard and Huette.

Fig. 6. Relations of the coverings of the Testicle. 1. Tunica albuginea. 2. Tunica vaginalis testis. 3. Cremaster muscle and tunica vaginalis communis of the cord.

After Bernard and Huette.

Fig. 7. Mode in which a Hernial Sac is formed. 1, 1. Point of protrusion. 2, 2. Intestine about to escape. 3, 3. The peritoneum as protruded in front of the intestines.

After Bernard and Huette.

Plate 43.

Fig. 3

Fig. 1

Fig. 2

Fig. 4

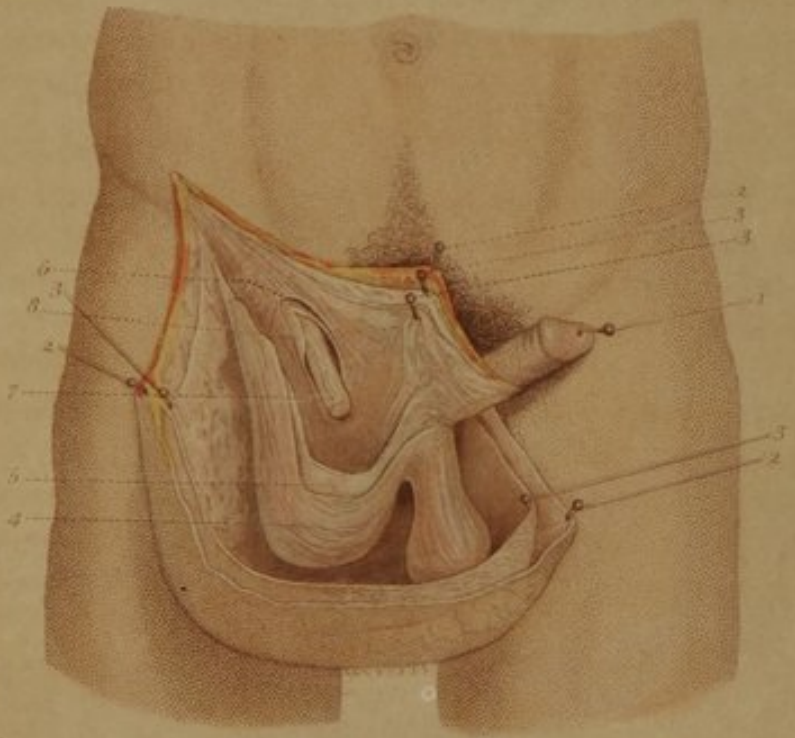


Fig. 5

Fig. 7

Fig. 6

CHAPTER XV.

STRANGULATED INGUINAL HERNIA.

Inguinal Hernia, in the male, consists in a protrusion of some of the abdominal contents through parts which have been left in a weakened condition, by the descent of the testicle from the loins to the scrotum. In the female, this form of hernia passes through the openings left for the passage of the round ligament of the uterus in its course to its insertion. By briefly referring to the changes induced upon the parts by the descent of the testicle, the comprehension of the anatomical relations of such portions as are directly connected with the operation, will, it is thought, be aided.

SECTION I.

SURGICAL RELATIONS OF INGUINAL HERNIA.

When the testicle of the fœtus leaves the loins in its descent to the scrotum, it pushes before it that portion of the peritoneal sac which lies in front of the intestine; then presses in front of it, and extends a portion of the extra peritoneal fascia (fascia transversalis); next a few fibres of the transversalis muscle; then a few of the internal oblique muscle, the two together constituting the cremaster muscle. Passing then through a slit in the aponeurosis of the external oblique muscle of the abdomen (external abdominal ring), it extends a portion of the cellular tissue which is between the sides of the ring, and the fascia superficialis, and lastly, drops into the pouch of the skin known as the scrotum. When in the scrotum this gland is, therefore, covered by the skin, fascia superficialis, cremaster muscle, condensed cellular tissue (tunica vaginalis communis), and by the peritoneum (tunica vaginalis testis), and the cord has the epigastric artery between the linea alba and the line of its descent (inguinal canal).

Shortly after taking its position in the scrotum, the tube-like process of the peritoneum, which then extends from the scrotum to the

abdomen, is obliterated, though sometimes it remains open (congenital hernia, congenital hydrocele), or is only closed at points (encysted hydrocele, hydrocele of the cord). The process of fascia transversalis (extra peritoneal cellular tissue), which had been protruded in a pouch like the peritoneum, but contracted into a tube-like prolongation on the cord, is then gradually changed, and loses its dense characters, except on the surface next to the peritoneum, where it presents a funnel-shaped depression at and around the cord, whilst the remaining layers contract upon the cord and are diminished in character and distinctness.

A portion of intestine or omentum (hernia) pressing against the peritoneum at the same point of the abdominal parietes, does the same thing as the testicle did, that is, pushes a portion of the peritoneum in advance of it, unless the sac formed by the descent of the testicle had not been cut off from its connections with the general peritoneal cavity, when it passes directly into the same sac as the testicle (congenital hernia).

On reaching the fascia transversalis it also slightly distends it into a sort of pouch, but, as the pressure is continued, the edges of this pouch at the point of pressure become thickened, especially in old hernia, and take on a defined shape (internal ring) whilst the centre is either absorbed or converted into a reticulated structure (fascia propria), and then the tumor passing on takes a position in front of the cord, but also a little towards the median line of the body. Being here beneath the fibres of the transversalis and internal oblique muscles (cremaster), it escapes through the opening in the tendon of the external oblique muscle (external ring), pushes before it the cellular tissue which usually fills up this ring (inter-columnar fascia), and pressing it against the superficial fascia, the two become blended in one, and there only remains the additional covering of the skin. In operating upon an inguinal hernia there are, therefore, usually found the skin, superficial fascia, cremaster muscle, fascia propria and sac, all of which must be divided before the contents of the tumor can be made apparent.

The only bloodvessels about this class of tumors, are a small artery and vein (arteria ad cutem abdominis), found directly beneath the superficial fascia, and the epigastric artery and vein, which is directly beneath the peritoneal fascia. The arteria ad cutem abdominis is therefore between the fascia superficialis and the external oblique tendon, whilst the epigastric artery is between the fascia transversalis and the

peritoneum. In indirect inguinal hernia, the latter artery is towards the inner side of the contents of the tumor, that is, towards the linea alba, and runs parallel with the external edge of the rectus abdominis muscle, whilst in ventro-inguinal hernia, or that in which the protruded part does not follow the entire course of the spermatic cord, it may be upon its outer side. (Plate XLII. Fig. 3.) But as the pressure of the hernia upon the peritoneum and fascia transversalis elongates the first, and causes a thickened margin to the second, this artery is removed a line or two from the edge or margin of the opening in this fascia, designated as the internal abdominal ring. In the normal condition of the parts, the distance between the internal and external abdominal rings is about an inch and a half, the internal ring being about this distance exterior to the external ring, or about as much nearer to the anterior inferior spinous process of the ilium. But in hernia, the traction caused by the protruded parts, especially in old hernia, approximates these two rings, so that one is often very nearly in contact, and also behind the other, and the epigastric artery brought, therefore, more towards the external ring and the linea alba; but unless an extraordinary arrangement exists, it will yet run parallel to the anterior edge of the rectus muscle, and be on the median side of the protrusion.

SECTION II.

OPERATIONS FOR THE RELIEF OF STRANGULATED INGUINAL HERNIA.

The operations required for the relief of this kind of hernia consist in that performed for the restoration of reducible hernia, and that requiring the division of the parts by the knife for the relief of the strangulation.

§ 1.—TAXIS.

Taxis, or the means resorted to for replacing a reducible hernia within the cavity of the abdomen, consists in manipulating the tumor so as to press the portion which was last protruded, first through the ring or opening at which it has passed, the remaining

part usually following readily the course of the first, when a judicious continuance of the pressure is persevered in.

In making the taxis in cases of inguinal hernia, it is essential to success that the parts concerned should be in a state of perfect relaxation, and that the patient should offer no resistance to the manipulation of the surgeon; but, as a strangulated hernia soon becomes painful, some little opposition may always be anticipated, unless means are taken to prevent it. The use of anæsthetics is, therefore, especially demanded in these cases, in order to obviate this resistance as well as to relax the muscles generally. As the position of the patient also materially facilitates the operation, he should, before being etherized, or when the latter agency is not employed, be placed upon the back with the knees drawn up and the shoulders well raised and supported by pillows, in order to relax the abdominal parietes. The surgeon being then placed upon the affected side, should seize the tumor with his right hand, and draw it gently downwards, so as slightly to elongate it; then placing his thumb and first two fingers at the upper part of the tumor, so as to compress or squeeze it gently, let him force back a portion of the intestinal contents, if possible, so as to reduce the bulk of the tumor, and pushing upwards and backwards the portion last protruded, compress the lower part of the swelling with the fingers and thumb of the other hand, in the same manner that he would squeeze a caoutchouc bottle to empty it of air. If, after a short time, the tumor diminishes in size, its base may be approximated to the summit, and the effort made with the fingers of the left hand near the ring to push into the abdomen some small portion of it, or this part may be slightly compressed by these fingers, whilst the others endeavor to replace another portion. Should the effort, however, not succeed, the fingers and thumbs of both hands should be made to force upwards and backwards all portions of the mass, kneading it so as to empty it of its contents; or a part of it may, if possible, be inverted by pressing the forefinger towards the ring, and then retaining it there a few seconds. (Plate XXXIX., Fig. 6.) If, after moderate manipulation in this manner, no diminution of the swelling is perceptible, the taxis should cease, the patient be allowed to rest, or his position be changed to such a direction as might induce the intestines within the abdomen to gravitate in a different direction from the hernia, and thus facilitate its return. If, however, a very small portion of the tumor can be

replaced, the rest will usually follow; and when the protruding portion is intestine a distinct gurgling sound will be perceived as the last part returns to the belly, in consequence of the liquid or gas which had been confined in the constricted portion again passing into the main channel.

If, after one or two trials of these means, no change is effected, then it may become a question whether it is better to resort to the knife, or to repeat the taxis.

In small hernia, where the constriction is tight, the part painful, and the patient vigorous, the repeated attempts at taxis, or a resort to anything like forcible pressure is always dangerous, and tends to the development of inflammation in the part. When, therefore, in such cases, no progress is made, notwithstanding a judicious employment of the adjuvants before alluded to, a repetition of the taxis can only tend to increase the patient's danger. But in large and old hernia, unaccompanied by much pain, or where the hernial contents have occasionally been down before, but reduced with some trouble, the repetition of the trial may succeed, especially if cold applications are continued to the tumor in the interval of the attempts. In recent and small hernia, great judgment in the use of pressure will be required, and as a general rule it will prove best not to employ the taxis too long, say more than twice, provided the manipulation is correctly practiced, that is, in the line of the axis of the tumor, or upwards towards the cavity of the abdomen and in the line of the inguinal canal. In other cases the demand for a prompt resort to the operation is not so urgent, as it has more than once happened that in these hernia, after everything has apparently been tried and a resort to the knife been decided on, a slight and apparently hopeless effort has suddenly caused the tumor to disappear. With young surgeons there is apt to be too much delay before resorting to the knife, and the force employed in the taxis is often too great. It should, therefore, be remembered that delicacy of manipulation will generally succeed better than force, and that the ultimate success of the operations for the relief of strangulation, has been most marked in those cases where it was not delayed until positive and high inflammatory action was established. Dessault assumed it as a maxim that "success might always be anticipated in a hernia which had not been touched before operating,* and was

* Œuvres Chirurgicales, as quoted by Parrish on Hernia. Philad., 1836.

often successful where strangulation had existed five days, but almost constantly failed when strong efforts had been previously made in the taxis. The resort to cold combined with moderate pressure, and continued for a half hour, has frequently succeeded even when judicious taxis had failed; and it may be readily accomplished by the application of a flat-iron upon the swelling. But the dangers of delay should always be borne in mind, even when these means are employed, though they are less likely to excite inflammation than the repeated pressure of the fingers in the taxis. Dr. Joseph Parrish, of Philadelphia, whose experience in hernia was quite large, coincided in the opinion of Mr. Hey, "that he had often had occasion to regret performing the operation *too late*, but never *too early*."*

In making taxis for the relief of strangulated hernia, it is important that the symptoms should disappear when the reduction is accomplished. Should they not do so, and yet the restoration of the parts within the abdomen be certain, it may be necessary to incise the canal and seek for the constricted tumor in the abdomen. The condition of the parts concerned in the reduction of hernia "en bloc" or "en masse," as the French describe it, requires prompt relief. Want of space must, however, compel me to refer the reader to other sources for information on this important subject. In the work of Dr. Parrish, and in an article by Dr. Geo. C. Blackman,† of New York, will be found many valuable details.

§ 2.—OPERATION IN STRANGULATED INGUINAL HERNIA.

The operation of dividing the stricture in order to relieve the constriction of hernia, consists in dissecting the different coverings of the tumor, and then nicking the constricting part, so as to enable it to yield to the pressure subsequently made on the contents of the tumor, avoiding a large incision of the ring, lest the patient be subsequently unnecessarily exposed to a further escape of the viscera.

PRELIMINARY MEASURES.—Before commencing the operation, the surgeon should properly prepare such instruments as may be re-

* Parrish on Hernia, p. 28.

† Am. Journ. Med. Sciences, vol. xii. N. S. p. 386, 1846.

quired, as well as the dressing. In most cases, he will find it useful to select one good scalpel, one sharp-pointed bistoury, one director, one pair of dissecting forceps, one Cooper's bistoury (Plate XXXV. Fig. 16), or one probe-pointed bistoury wrapped to within an eighth of an inch of its point, and not sharp; a tenaculum, ligatures, needles, and sponges, together with adhesive strips, a piece of linen spread with cerate, a compress and a bandage sufficiently wide to form a spica of the groin.* Then the hair should be shaved from around the tumor, so as to prevent its interfering with the subsequent dressings, the bladder emptied of its contents, a narrow table, well covered, so arranged that the patient's hips can be brought near to its end, and his feet be supported on chairs, room being left for the operator to stand between the knees. Should the operation be demanded, as is often the case, after sunset, several sperm candles should be added to the other general arrangements. Three assistants will prove useful, one to aid the operator in his incisions, one to sponge blood from the wound, and one to attend to the etherization, or to the wants of the patient.

Ordinary Operation.—In commencing the operation, the selection of a mode of incising the skin must depend upon the abilities of the operator. If the surgeon is dexterous, its division may be effected by holding the scalpel in the first position, or like a pen, and cutting in the axis of the tumor from the upper to the lower portion. But if this is not the case, and especially if the patient is fat and the skin thick, it will be better for him to pick up a fold of it transversely to the axis of the tumor, between the thumb and fingers of his left hand, whilst the assistant raises the opposite end of the fold in a similar manner (Plate XLIV. Fig. 4), and thus keep the integuments elevated from the subjacent parts. Then puncturing this fold in its middle, with a scalpel, incise it by cutting from within outwards, so as to expose the fascia superficialis to the full length of the proposed incision; or if the cut, as thus made, is not long enough, then extend it at its angles by raising the sides of the incision in the same manner. After exposing the fascia, the distinctive characters of each of the subjacent layers may or may not be readily made out, according to the changes that have been created in the part by the complaint. To guard against error, the subsequent layers should, therefore, be picked up with

* See Smith's Minor Surgery.

PLATE XLIV.

A VIEW OF THE OPERATIONS PERFORMED FOR INGUINAL HERNIA.

Fig. 1. The first step in Gerdy's operation for the radical cure of reducible Inguinal Hernia. 1. The needle, with an eye near the point, in the act of transfixing the integuments as inverted by the forefinger. 2. The first loop of the ligature.

After Bernard and Huette.

Fig. 2. The second step in the same operation. 1. The needle about to form the second stitch. 2. The first loop as placed. 3. The second loop as drawn from the needle.

After Bernard and Huette.

Fig. 3. The last step in this operation. Quills having been placed in the proper position, the ligatures have been tied upon them so as to retain the pouch of skin at the ring. 1, 2. The quilled suture.

After Bernard and Huette.

Fig. 4. The first incision in Inguinal Hernia. A fold of the skin having been raised transversely over the tumor is about to be divided by the scalpel from without inwards.

After Bernard and Huette.

Fig. 5. Mode of dividing the layers. A director having been introduced at the opening made by nicking the tissue, the scalpel or bistoury is passed along it so as to slit up each layer to a sufficient extent.

After Bernard and Huette.

Fig. 6. Opening the Hernial Sac. 1. Forceps picking up a fold of the sac, and drawing it from the tumor. 2. The scalpel placed flatwise, and about to nick the portion thus raised.

After Bernard and Huette.

Fig. 7. One mode of dividing the stricture. The forefinger-nail being passed beneath the stricture, the probe-pointed bistoury wrapped to near its point is passed flatwise upon the finger as a director, and its edge being turned up, the nick is made by bringing the handle, 2, towards the hand, 1, so as to give it a gentle rocking motion.

After Bernard and Huette.

Fig. 9. Mode of dividing the stricture upon a broad director, when the constriction is too tight to permit the passage of the finger beneath it. 1. The director. 2. The bistoury.

After Bernard and Huette.

Fig. 8. Relations of intestine and omentum in an entero-epiplocele. 1. Intestine. 2. Omentum. 3. Director in the act of depressing the tumor so as to pass between the contents and the stricture.

After Bernard and Huette.

Plate 44.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

the forceps, so as to form a little fold at the most prominent point of the tumor, and this being nicked by pressing the scalpel against it, whilst the surface of the blade lies flat upon the tumor, an opening may be made and a director passed into it so as to enable the operator safely to slit up the layer both above and below to the extent that may be desired. (Plate XLIV. Fig. 5.) Next, picking up another layer in the same manner, treat it likewise, and proceed to divide the laminæ until the contents of the tumor can be distinctly felt, or perhaps indistinctly seen beneath the serous layer or sac, the latter being more or less thickened according to circumstances, although it never presents the shining appearance of peritoneum on its outside, owing to the changes produced by the complaint. In the division of each layer, attention should always be given to its appearance, and especially to the presence of muscular fibres, as these will generally show the position of the cremasteric lamina, and serve as a most important point of reference. On reaching the last layer, or that which is believed to be the sac, pick it up with the forceps and rub it between the thumb and fingers of the left hand, so as to be sure that there is no other portion of structure included; nick it, introduce the director, and slit it up (Plate XLIV. Fig. 6), when the bowel or omentum will be fully displayed, the first presenting a sort of doubling or knuckle, and being more or less of a reddish-brown or gray tint, and the latter looking not unlike a mass of fat and cellular tissue, or like the structure usually seen in front of the intestines when *in situ*, unless it has been very much engorged by the constriction.

Having thus reached the contents of the tumor it only remains to divide the stricture, the position of which, though varying somewhat, may generally be discovered by passing the forefinger into the wound in the line of the spermatic cord of the male, or of the round ligament of the female.

If the stricture is seated, as is often the case, at the neck of the sac, it may be felt at the external ring, or below it, or at the internal ring, the latter being, especially in old hernia, directly behind the external ring. Then, as it is difficult to tell whether the hernia has been direct or oblique, and, of course, whether the epigastric artery is on the outer or inner side of the neck of the sac, pass the forefinger as far up as possible, and endeavor to get the finger-nail between the constriction and the bowel, depressing the latter by bearing on it with the back of the finger, whilst an assistant also keeps it as much as possible out of the way, or the director may be substi-

tuted for the finger, if the stricture is very tight. With the probe-pointed bistoury, wrapped to within a few lines of its point, or with Cooper's bistoury (Plate XXXV. Fig. 16), and with the cutting edge of it rather dull than sharp, the operator may now free the stricture by passing the blade flatwise along the palmar surface of the fore-finger, or along the groove of the director, and carrying the point beneath the stricture, when, having accomplished this, it only remains to turn its edge *directly upwards*, so that it shall be parallel with the external margin of the rectus abdominis muscle. Then, depressing the handle, cause the edge of the blade to press a little against the sharp constricting border of the ring, so as to nick it, (Plate XLIV. Fig. 7), or give the blade a gentle rocking motion, so as to repeat the cut, and when there is the least sensation of rending turn the knife again flatwise, withdraw it, and endeavor to dilate the stricture by means of the finger, or endeavor to replace the intestine or omentum, if its condition is suitable, by making the taxis as before directed. If the nick of the stricture has not been sufficient, a similar manipulation of the bistoury may then be repeated until the opening is sufficiently enlarged to allow the hernia to pass, though usually the ring will yield to pressure as soon as its thickened edge is notched.

After freeing the stricture, the condition of the contents of the tumor should be attentively examined, before attempting either its restoration or the dressing of the wound, and it is especially important that the operator should see that the stricture is not continued by the neck of the sac, as is sometimes the case, an instance of which is related by Dr. Parrish. If there are one or more small and pea-like spots, which present the appearance of positive sphacelation, these points should be picked up in the forceps, and tied by encircling them with a fine ligature, which, after being cut off close to the knot, should be left upon the part, and returned into the abdomen with the intestine, when, by ulcerating through the coats of the latter, they will be discharged per anum, and the opening that would otherwise have resulted, be filled with lymph, as the result of the inflammation thus excited. But if the sphacelus is more extended, say half an inch, then it may be advisable to attach the coats of the bowel to the side of the wound by a suture, lest the intestine should escape into the cavity of the abdomen, and the separation of the slough give rise to peritonitis. If fastened in the wound, the sloughing of the bowel can only produce an artificial anus, the heal-

ing of which will often be accomplished by nature, or may be effected by some other means, as will be hereafter directed. Many experienced surgeons have, however, regarded the use of this suture with distrust, Dessault and others having shown that the inflammation which preceded the gangrene caused sufficient effusion of lymph to retain the bowel at the neck of the sac:* the resort to the stitch is, therefore, a rare event.

Should the contents of the tumor be omentum instead of intestine, and the strangulated portion of this have become sphacelated, then the mortified part should be ligated, and the portion beyond the ligature cut off, the remainder being left as a plug in the opening, after which the dressing may be made as before directed.

Dressing.—If the operation has been promptly done, and the intestine is simply congested, the middle and upper angle of the integuments should be united by a point or two of the interrupted suture, leaving the sac in its place, and a morsel of lint being introduced into the lower angle of the wound to prevent the skin healing, and also to preserve a vent for the subsequent suppuration, the adhesive strips, cerate, compress and spica bandage may be applied, and the patient carefully placed in bed, the thigh being flexed on the pelvis by folding a pillow, and placing it beneath the ham.

After Treatment.—When the parts have been returned into the abdomen, and freed from the constriction, it generally happens that the circulation is restored, and the structure resumes its original condition. But in some instances inflammation is developed, and general peritonitis follows the operation. Under these circumstances, an active and appropriate medical treatment will be essential to the preservation of the patient. When this is not the case, and there is no reason to apprehend perforation of the bowel, it will merely be necessary to administer a laxative enema, or some mild purgative, as castor oil, or rhubarb and magnesia, on the second day, the patient being compelled to keep in bed, and use a bed-pan or some other convenience, when it operates, and during the first week the diet should be strictly restricted to light and farinaceous articles. When three or four days have elapsed after the operation, the condition of the wound may be inspected, and its subsequent treatment regulated by the general principles applicable to the cure of wounds; but when suppuration is established, the diet should be increased to such meats as are easy of digestion, the patient being

* Parrish on Hernia, p. 104.

confined to the supine posture until the part has healed sufficiently to bear the pressure of a light truss over the compress and bandage.

Remarks.—In the account just furnished of the operation required for the relief of strangulated inguinal hernia, the effort has been made to limit the description to such details as are most frequently demanded. Several complications have, therefore, been intentionally omitted, lest reference to them should tend to embarrass the mind of the young surgeon, and render the operation unnecessarily difficult. It should, however, be remembered that all hernia are liable to peculiarities, arising either from the duration of the complaint, the size of the tumor, the peculiar habit of the patient, or the means employed in the treatment (as violent taxis), or from the existence of other diseases, as hydrocele, or from the hernia being congenital, or from adhesions, or from the formation of bands at the mouth of the sac: but an examination of any of the valuable monographs that have been presented on this complaint, will soon enable any medical man who contemplates the possibility of performing this operation, to obtain a knowledge of these peculiarities. Little has also been said of the appearances of the parts under different degrees of strangulation, as these, together with many similar points, would have extended this account beyond its proper limits. Let it, therefore, suffice to say that, in every case where the experience of the operator has not been sufficient to qualify him for contending with such difficulties, he should, if possible, obtain the advantages of a consultation with some older practitioner. To be able to anticipate every peculiarity that may be met with in these cases, requires a combination of fortunate circumstances that none but those who have been widely engaged in surgery, or enjoyed the observation afforded by following the cases in large hospitals, or in the practice of old surgeons, can obtain. But as a general rule, the well-educated practitioner will not err in the treatment of strangulated hernia, if he opens the various layers cautiously, divides the stricture only so far as will relieve the obstruction to the circulation of the part, and does not restore the contents of a hernia into the abdomen before he is certain that its circulation is being restored, as may be told by its brighter or more natural color, a livid or ash color usually indicating a tendency to sphacelus. The division of the stricture without opening the sac, has been sanctioned by Mr. Key, and others, of high au-

thority, but the propriety of it, as an operation adapted to the inexperienced surgeon, is deemed by many others a matter of doubt. The greatest objection to it is the risk that is always run of reducing the hernia "in mass," when, if strangulated by the neck of the sac, death will probably ensue. The subcutaneous division of the stricture, as advised by Guerin, is, in my opinion, a dangerous and uncertain operation.

§ 3.—Statistics.

In order to present some idea of the usual results of this operation, the following cases have been selected from various sources, and arranged so as to readily indicate the result.

STATISTICS OF THE OPERATION FOR STRANGULATED INGUINAL HERNIA.

			CURED.	DIED.	ARTIF. ANUS.
South*	reports	8 cases.	6	2	
Astley Cooper‡	"	11 "	8	2	1
Geoghegan⁂	"	3 "	2	1	
Lawrence‖	"	9 "	5	4	
Brand¶	"	2 "	1	1	
Percival Pott**	"	1 "	1	0	
Scarpa††	"	7 "	6	1	
Richter‡‡	"	1 "	1	0	
		42	30	11	1

From this it appears that, out of forty-two cases of strangulated inguinal hernia, which were operated on, more than two-thirds have recovered.

* Chelius, by South, vol. ii. p. 312.
‡ Treatment and Anat. of Inguinal Hernia.
⁂ Commentary on Treatment of Ruptures, by Ed. Geoghegan.
‖ Treatise on Ruptures.
¶ Chirurgical Essays.
** Treatise on Ruptures.
†† Treatise on Hernia; also Arnaud.
‡‡ See Scarpa.

CHAPTER XVI.

STRANGULATED FEMORAL HERNIA.

FEMORAL or crural hernia is that form of rupture in which the protrusion occurs at the anterior inferior portion of the abdominal parietes, or at those points where the external iliac vessels pass from the cavity of the pelvis out upon the thigh. On reaching this point, a hernia will generally follow the course of the sheath of the femoral vessels and then pass out at the opening of a superficial vein (vena saphena), till, reaching the exterior surface of the aponeurotic expansion which covers the muscles of the thigh (fascia lata femoris), it takes a position a little below the line of the groin. The contents of this tumor, like that described in the preceding chapter, may be either intestine or omentum, though, from the position of the cœcum, a portion of the large intestine has occasionally been found in the sac, instead of the smaller bowels, as is the case in inguinal hernia.

SECTION I.

ANATOMICAL RELATIONS OF FEMORAL HERNIA.

The boundaries of the region concerned in femoral hernia, are formed posteriorly by the iliacus internus and psoas magnus muscles, covered by a condensed fascia, which, as it follows the course of the muscle, is hence called iliac fascia. Anteriorly, we find that portion of the tendon of the external oblique muscle of the abdomen (Poupart's ligament), which extends from the anterior superior spinous process of the ilium to the horizontal portion of the pubis, where it is attached by a broad insertion, the exterior edge of the insertion (Gimbernat's ligament), forming the boundary of the opening for the passage of the femoral vessels (femoral or crural ring). The attachment of the anterior parietes of the abdomen to Poupart's ligament, and the continuity of these parts with the

fascia of the thigh, constitute the remainder of the structures forming the front of this region. Of these, the extra peritoneal fascia (fascia transversalis), in its course behind the abdominal muscles, is brought so closely in contact with the fascia covering the iliac muscle, as to adhere to it, the two (iliac and transversalis fascia) sending a prolongation of their structure upon the course of the femoral vessels, and thus forming the commencement of their sheath. As the abdomen is a considerable cavity, and the space occupied by the escape of the femoral vessels a long and narrow one, the relations of these parts has been compared to that of a funnel, of which the abdomen forms the body and the course of the femoral vessels the spout, whilst the extension upon the vessels of the process of the iliac fascia behind, and the fascia transversalis in front, has given to the portions of these tissues which surround the vessels, the name of "infundibular fascia." It will, therefore, be readily seen that, as Poupart's ligament forms an arch in stretching from the anterior superior spinous process of the ilium to the pubis, there would be a considerable space between it and the bones (Plate XLV. Fig. 1), were it not filled up by the iliacus internus and psoas magnus muscles, and their fascia. These parts, by diminishing the distance between the anterior spinous process and the pubis, leave merely an opening for the vessels (crural ring), which is bounded behind and externally by the iliac muscle and fascia, internally by Gimbernat's ligament, and anteriorly by the fascia transversalis, as well as by the under edge of the tendon of the external oblique (Poupart's ligament.) This opening, thus circumscribed, and giving exit to the femoral or crural vessels, is, therefore, correctly designated as the femoral opening or ring, and is the point through which a communication is established between the thigh and the cavity of the abdomen. In health, the adhesions of the surrounding parts, together with cellular substance and lymphatic glands, close it entirely; but the action of any of the causes which would force the abdominal contents towards this point, may cause these adhesions to yield, and then the following results may be noted. The abdominal contents being behind the peritoneal sac, must, in their course outwards, press before them first a portion of the peritoneum (hernial sac), then the cellular tissue of the opening, or the extra peritoneal cellular tissue (fascia propria), in which are found the small vessels and deep lymphatic glands of the part, and when the tumor thus formed escapes from the abdomen

into the course and sheath of the femoral vessels, it has no other covering. As the psoas and iliacus muscles are on the outer side of the vessels as they pass beneath Poupart's ligament (crural arch), the tumor naturally tends towards the pubis (Gimbernat's ligament), and is, therefore, usually found on the pubic side of the vessels, the femoral vein being next to it, and the femoral artery outside. (Plate XLV. Fig. 4.)

If the sheath of the femoral vessels was perfect, the tumor would continue to be covered by it, but in order to admit lymphatic vessels and the superficial veins, this sheath is perforated at numerous points (cribriform fascia), through which the tumor, by gradual distension, is enabled to escape. Here again the hernia would continue to be covered by the fascia lata of the thigh, were it not that the latter is so arranged as to permit the saphena vein to pass beneath it and join the femoral vein, and at this point (saphenous opening), where this vein enters, the tumor escapes (Plate XLV. Fig. 3), and thus getting outside. The fascia lata lies directly beneath the fascia superficialis and skin of the thigh, at a point close to but below the line of the groin, or Poupart's ligament. (Plate XLV. Fig. 4.)

In the minute anatomical examination of femoral hernia, the peculiar arrangement by which the saphena vein gets through the fascia lata femoris has received considerable attention, and unfortunately been named in every possible point; thus, though all the muscles of the thigh are covered by the fascia lata, the portion of it over the sartorius muscle has been designated as the Sartorial fascia, whilst that over the pectineus muscle is called the Pectineal fascia. The sartorius muscle being also above the level of the pectineus, the portion of the fascia lata covering it is compelled to double itself and take the form of a crescent, in order to expand upon the pectineus muscle, and this crescentic margin has, therefore, been named by Mr. Burns "the Falciform process" of the fascia lata, whilst the extreme point of the horn or crescent has received the appellation of "Hey's ligament." An ordinary observer will often fail to notice these points, but a close dissection, and removal of the loose cellular tissue, with some traction from the knife-handle, will make them and many other little details perfectly apparent to any one who will look for them.

From the looseness of the cellular tissue between the fascia superficialis and the fascia lata femoris near the pubis, this hernia is most

apt to rise upwards towards the groin, instead of following the downward course of the saphena vein, and it therefore approaches the lower edge of Poupart's ligament.

The relations of the different parts in this region are usually simple. At the crural ring, counting from the outside of the pelvis (anterior inferior spinous process), there is first the femoral artery, then the femoral vein, then the hernia, and lastly, Gimbernat's or Hey's ligament, the two being closely attached to each other. At the point where the external iliac artery becomes femoral, or directly beneath Poupart's ligament, we also usually find the epigastric artery, which consequently is at the outer margin of the hernial tumor, or above it.

The obturator artery arising from the internal iliac, gets out of the pelvis at the thyroid foramen, and sending a branch to the pectineus and adductor muscles, may, therefore, be at the inner side of the tumor, whilst the internal circumflex, if it should arise from the epigastric, would be in front of it.

Such an arrangement is, however, very rare, the usual relations of the vessels to the tumor being such as present the femoral vein outside, the epigastric artery also outside, but a little nearer to Poupart's ligament, and the obturator artery inside or near the edge of Gimbernat's ligament. The division of any stricture at these parts should, therefore, be made very slightly but directly upwards, and at the middle of the ring, especially in males, because the position of the structures at the inner and upper side of the ring might, in any other incision, expose the spermatic cord and vessels to the edge of the knife. Women being, however, by far more subject to this form of hernia than men, the division of the stricture upwards, and a very little inwards, may be practiced without injuring any artery, unless the obturator is very peculiarly placed. But as variations are occasionally found in the arrangement of all the vessels near the seat of stricture, it is the safer plan to proceed cautiously, and feel, if possible, with the finger, the portion to be nicked, or the tissues around it, before making any incision at the ring.

SECTION II.

OPERATIONS FOR THE RELIEF OF STRANGULATED FEMORAL HERNIA.

These operations, like those described for the relief of the other forms of hernia, consist in the Taxis, and in the division of the stricture.

§ 1.—TAXIS IN FEMORAL HERNIA.

The general details of the performance of taxis having been already given in connection with inguinal hernia, it is only necessary at present to refer to the peculiar direction in which these efforts should be made.

The greatest diameter of the tumor in femoral hernia being transverse, in consequence of the development of the subcutaneous cellular tissue of the part, it is generally requisite to resort to a peculiar manipulation and position of the patient in order to favor this operation. Thus, on flexing the thigh on the pelvis, whilst the patient is in the recumbent position, Poupart's ligament, or the front of the crural ring, will be made less tense in consequence of the weight of the viscera not being thrown upon the abdominal parietes ; whilst the psoas and iliacus muscle will be less apt to compress it from behind. By carrying the limb of the affected side also a little towards that of the other side, and by turning the toes of the foot on the hernial side, very much inwards, the sartorius, pectineus, and adductor muscles will be relaxed, and the parts about the saphenous opening and Hey's ligament placed in as favorable a position as possible. Therefore, when the patient is thus placed, and well etherized, it only remains for the surgeon to press the tumor gently downwards and inwards, in the line of the saphena vein, in order to free the hernia from the projecting edge of the falciform process, and then, with the fingers of the other hand, to push it upwards in the line of the femoral canal. (Plate XXXIX. Fig. 7.) The tightness of the parts through which femoral hernia passes, and the sharp edge of the constricting part, renders, however, every case of this kind of hernia much more dangerous than that of the inguinal region, and strangulation therefore usually supervenes much more rapidly.

Less effort should, also, be made in the taxis of this hernia than in the preceding class, and when the tumor does not promptly yield to the judicious application of the means before mentioned, the operation of dividing the stricture should be promptly resorted to.

§ 2.—OPERATION FOR STRANGULATED FEMORAL HERNIA.

As the tumor in femoral hernia is formed by the sac and its contents escaping at the saphenous opening, and then rising up towards Poupart's ligament, it usually presents itself a little below the line of the groin. In order to expose its contents, various modes of proceeding have been recommended, all based on the general direction of incising the integuments in a line parallel with the great diameter of the tumor. In the external incision, this direction has been slightly modified by different surgeons; thus, Sir Astley Cooper advised that the skin, after being shaved, should be cut directly over the middle of the tumor in a line corresponding with the line of the groin, the incision being extended from the groin to a point a few lines below the lowest part of the tumor, either by picking up a fold of integument and dividing it with the bistoury by transfixing it, or if the tumor was so large as to render the skin tense and difficult to raise, by incising it with the scalpel as in an ordinary dissection. When the tumor is small, or not larger than an egg, a single incision may suffice to open the skin over it, but in larger protrusions, or in those found in corpulent patients, it will be better to make a transverse cut at the base of the first, like a reversed ⊥, so as to dissect off the two flaps laterally. The saphena vein being behind and at the outside of the tumor, is not likely to be involved in this manner of operating.

Pelletan and Dupuytren preferred a crucial cut for the division of the skin, and Mr. Lawrence one which, beginning an inch above the crural ring, ran obliquely downwards and outwards. After freeing the skin, the superficial fascia may be recognized by its containing several inguinal glands together with more or less fat; and from infiltration, or other causes, is often quite thick. In order to divide it as well as the fascia propria, or in order to divide safely every structure between the skin and the sac, each layer should be separately elevated by the forceps, and the portion raised incised by placing the blade of the knife flat to the surface of the tumor, so as to nick its

PLATE XLV.

PARTS CONCERNED IN THE OPERATION OF FEMORAL HERNIA.

Fig. 1. Position of Crural Ring and attachment of Poupart's Ligament. 1. Anterior superior spinous process. 2. Ilio-pectineal ridge. 3. Femoral ring. 4. Septum between femoral vessels and iliac muscles diminishing the size of the crural arch. 5. Poupart's ligament. 6. Anterior inferior spinous process.

After Bernard and Huette.

Fig. 2. A view of the relations of the Superficial Fascia to Femoral Hernia. 1. External oblique muscle. 2. Its tendon cleared of the fascia. 3. Fascia lata femoris. 4, 4. Superficial femoral fascia everted. 5. Cribriform structure for transmission of lymphatics. 6, 6. Superficial vessels.

After Bernard and Huette.

Fig. 3. A view of the deeper seated parts of the same region. 1. External oblique. 2. Its tendon. 3. Fascia lata. 4. Its cribriform structure raised up. 5. Sheath of vessels. 6. Femoral artery. 7. Femoral vein. 8. Saphena vein.

After Bernard and Huette.

Fig. 4. Positions and relations of a Femoral Hernia. 1. Integuments of abdomen. 2. Tendon of external oblique. 3. The muscle. 4. Spermatic cord. 5. Femoral artery. 6. Femoral vein. 7. Intestine protruding at saphenous opening. 8. Hernial sac. 9. Sartorius muscle. 10. Pectineus muscle.

After Bernard and Huette.

Fig. 5. Position of a Double Hernial Sac. 1, 1. Ring. 2. Fundus of principal sac. 3, 3. Cavity of peritoneum. 4. Fundus of second sac.

After Bernard and Huette.

Fig. 6. Commencement of the formation of an Artificial Anus, showing the relations of the Mesentery to the protruding knuckle. 1. Ring. 2. Intestine. 3. Mesentery.

After Bernard and Huette.

Fig. 7. Relative position of the Vessels in Inguinal and Femoral Hernia. 1. Tendon of external oblique. 2. Poupart's ligament. 3. Psoas and iliacus in course to their insertion. 4. Femoral artery. 5. Femoral vein. 6. Spermatic cord.

After Bernard and Huette.

Fig. 8. A posterior view of the reflections of the Peritoneum upon the abdominal parietes. 1. Bladder. 2. Reflection over round ligament of bladder. 3. Reflection over same on opposite side. 4. Reflection over urachus. 5. Position of indirect inguinal hernia. 6. Oblique inguinal. 7. Ventro-inguinal. 8. Femoral artery. 9. Femoral vein.

After Bernard and Huette.

Plate 45.

Fig. 1.

Fig. 2.

Fig. 3.

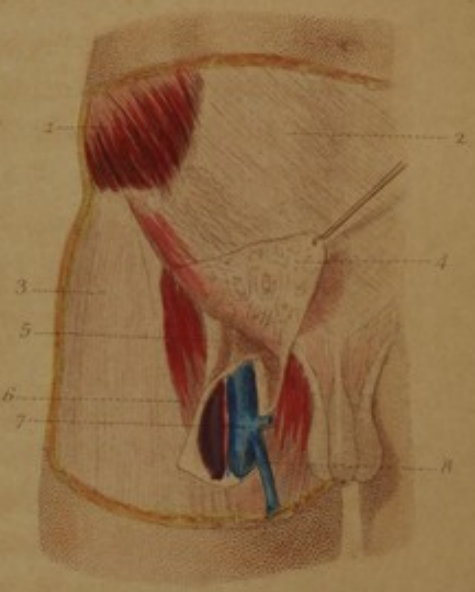


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

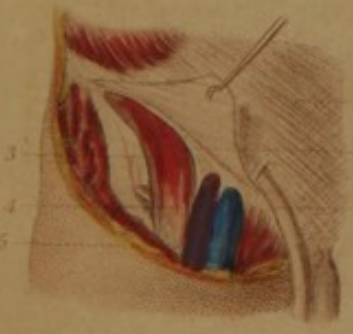
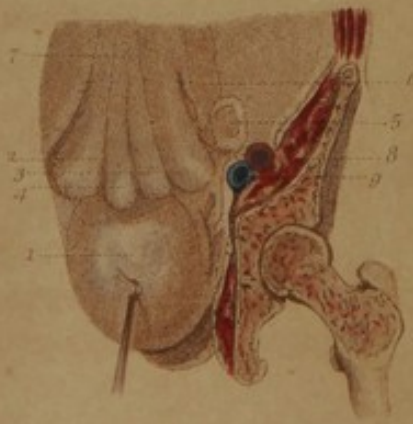


Fig. 8.



coverings. The director being then passed into the opening and beneath the layer, the probe-pointed bistoury should be passed along the groove of the instrument until the parts are laid open to near the same extent as in the first incision. On reaching the sac, which may usually be recognized by the characters spoken of in connection with inguinal hernia, it should be cautiously raised at the more depending portion of the tumor, where the liquid usually found within it naturally gravitates and separates the peritoneum from the intestines; but as the amount of fluid in the sac in femoral hernia is much less than that found in the inguinal variety, more caution is requisite, because the sac being much nearer to the contents of the tumor, the latter are more liable to be wounded. A nick being now made in the portion raised in the forceps, a director should be introduced, and a bistoury carefully passed along it, so as to open the sac freely in a manner similar to that pursued in the division of the other layers. On exposing the contents of the tumor, pass in the forefinger of the left hand and feel for the seat of stricture, which may generally be found as a sharp and defined edge near the interior and inferior portion of the circumference of the ring, or at the points corresponding with Hey's ligament (point of crescentic edge of falciform process of the fascia lata femoris), or at the saphenous opening, or, deeper and higher in the wound at the seat of Gimbernat's ligament. On finding the stricture, pass the point of the probe-pointed bistoury beneath it, in the manner directed for the same step in inguinal hernia; or, if the stricture is so close as to prevent the use of the forefinger, resort to the director found in the pocket-case, or to a spatula; and thus protecting the bowel, get the bistoury flatwise beneath the constricting margin, turn its edge up and nick the stricture very slightly upwards, if it is introduced at the middle of the ring; or upwards and a little inwards, if the nick is to be made at its inner margin. But the best direction for dividing the stricture has been a point on which the surgeons have often differed. Mr. Lawrence states that Dupuytren and Richerand preferred an incision upwards and outwards; Gimbernat advised the nicking of the edge of the ligament named after him; and Mr. Hey the incisions of the most interior part of the stricture.

In order to comprehend these different opinions on a point which it might be supposed would be certainly settled by daily observation, the varying course of the obturator and epigastric arteries should

be recollected, as well as the tendency in all operators to insist upon the observation of certain fixed rules, which are often predicated only on their own modes of demonstrating the anatomical relations of the part. As the stricture may generally be overcome simply by pressure, after its thick sharp edge has been nicked, to speak of the cut that is produced by the edge of the bistoury as an incision is liable to mislead, as the so-called division of the stricture is, in most cases, only a notch in its edge, which is intended to facilitate such subsequent laceration as will permit the restoration of the contents of the tumor. The use of a dull bistoury, and the direction of its edge upwards for merely a line, at several points of the ring, as advised by Velpeau, no matter in what portion of the circumference of the ring the stricture is most marked, will suffice for the relief of the constriction, as may be readily tested on any subject.

The stricture being divided, the condition of the contents of the sac should be inspected and treated as directed for inguinal hernia, after which, the wound should be closed by a suture, adhesive strips, cerate, compress, and bandage, and the patient dieted as before directed.

Remarks.—Femoral hernia, from its peculiar position, is liable to mislead the surgeon in his diagnosis, and also to confuse him in operating, in consequence of the changes produced by various causes in the surrounding inguinal glands and vessels. Buboes, aneurism, hydatid cysts, foreign bodies, as needles,* psoas abscesses, or one or more sacs, or the retention of the hernia in the sheath of the femoral vessels, and its being covered by the fascia lata, are all cases that have been recorded, and may, therefore, reasonably be expected to present themselves again. The frequency of the position of the obturator artery on the front or inner side of the tumor at the seat of stricture, as is the case when it arises from the epigastric artery, is quite marked, it having been found by Mr. Cloquet, after examining two hundred and fifty subjects, one-half of which were females, to be thus situated about once in every three cases.†

Owing to these circumstances, the operation on this class of hernia is usually regarded as more dangerous than that performed for the relief of strangulated inguinal hernia; but with the anatomical knowledge that should be possessed by every surgeon, and with pro-

* Mott's Velpeau, vol. iii. p. 691, note by Townsend.

† Lawrence on Hernia, p. 434.

per caution and coolness, the operation cannot be considered as an especially difficult one. With a patient in a state of anæsthesia there need certainly be no haste, even if the operator should deem it right under other circumstances; and if the incisions are slowly and cautiously performed, they will doubtless be safely done. Should a severe hemorrhage result, which cannot be traced directly to a wounded vessel, the introduction of a small linen sac into the crural ring, and the subsequent stuffing of it with lint or cotton, so as to press like a finger on the bleeding point for a few days, as advised by Boyer,* may suffice to arrest it.

§ 4.—STATISTICS OF THE OPERATION.

A reference to the subjoined table will prove that the operation for femoral hernia has certainly succeeded better than most surgical operations, and practice will probably satisfy any medical man that the risk of it has been much exaggerated.

STATISTICS OF THE RESULT OF THE OPERATION FOR STRANGULATED FEMORAL HERNIA.

	CASES.	CURED.	DIED.
Gimbernat†	4	4	0
Lawrence‡	6	6	0
Scarpa§	2	1	1
Monro, Sen.‖	4	4	0
C. Bell¶	1	1	0
	17	16	1

All but one of these reported operations were successful.

* Velpeau, Med. Opératoire.
† New Method of Operating for Femoral Hernia, by Antonio de Gimbernat.
‡ Lawrence on Ruptures.
§ Treatise on Hernia, by Antonio Scarpa.
‖ Observations on Crural Hernia, by A. Monro, Sen.
¶ Operations for Strangulated Hernia.

CHAPTER XVII.

UMBILICAL HERNIA.

THE term umbilical hernia being generally applied to such protrusions of the abdominal contents as occur immediately in the neighborhood of the navel, as well as to those seen directly in the course of the vessels of the cord, there is a liability to error as regards the seat of this class of tumors, if the surgeon does not recall the difference shown in the structure of the part as seen in the infant and as found in the adult. This difference having been referred to in the general account of the complaint, need only be here briefly hinted at. In the infant, umbilical hernia may protrude either beneath the skin at the margin of the navel or a little further on along the cord, where it is usually surrounded simply by the envelops of the latter. In the adult, these vessels having been removed, and the surrounding parts firmly cicatrized, a hernia can only escape by distending some of the openings in the linea alba directly around this firm cicatrix, the appearances of which must be familiar to every dissector. These openings being generally on one side of the navel, the point of protrusion is often situated near the superior portion of the circle. As the hernia tends to sink by its own weight, the opening into the abdomen will often be found enlarged and depressed, and thus lead a careless observer to think that the tumor has really escaped at the space left for the vessels of the umbilical cord.

SECTION I.

SURGICAL ANATOMY.

After the umbilical vessels have entered the abdomen of the fœtus at the opening left for them in the linea alba, the arteries run downwards towards the bladder, whilst the vein courses over to the right side along the free margin of the suspensory ligament, to enter the

umbilical fissure of the liver where it terminates in the left sinus of the vena portarum. Like the other bloodvessels in the abdomen, the umbilical arteries and vein are on the outside of the peritoneal sac, and do not perforate this membrane; consequently, any protrusion of a viscus at this point must be covered by a layer of the peritoneum, and have, at least in its early stages, a perfect sac like the other hernia. The variety of opinions on this point, and especially those of the distinguished surgeons who have doubted the existence of a sac may, therefore, all be explained by the fact that, under distension, the sac may be perforated, as related by Sir Astley Cooper, or gradually thinned or absorbed, as mentioned by Monro and others.*

The pressure of large and old hernia in the adult may also lead to a similar diminution in the density of the fascia superficialis abdominis, or even the skin, a case being related by Arnaud, "in which the bowel adhered so closely to the skin as to cause it to be cut in dissecting the parts after death.† No bloodvessels are situated near the course of a hernia in this region except it may be abnormal veins, as have been seen by Manec, Maniere, and Velpeau.‡

As the opening through which umbilical hernia escape is altogether in the linea alba, there is no umbilical canal, nor is there much liability to the production of a stricture at the neck of the sac.

SECTION II.

OPERATIONS FOR UMBILICAL HERNIA.

Taxis in umbilical hernia requires merely the pressing of the contents of the tumor directly into the abdomen.

§ 1.—STRANGULATED UMBILICAL HERNIA.

The existence of this complaint being rare, except in the cases of adult females, the description of the operation may be confined to this class of patients.

OPERATION.—The patient being placed in the recumbent position,

* See Lawrence, p. 453.

† Lawrence.

‡ Velpeau, Med. Opératoire, tome 3me.

and the proper preliminary steps taken, pick up a fold of the skin, if it is loose, and rubbing it between the fingers, so as to be sure that no other tissue is included, incise it with the bistoury from within outwards, as before directed. But if, as is often the case, all the coverings of the tumor are evidently thinned, then the incision should be made in the line of the linea alba by light touches of the scalpel from without inwards, the size of the tumor regulating the selection either of a crucial, T or ⊥ incision. On opening and dissecting back the skin sufficiently to expose the part to a moderate extent, the remaining tissues, to wit, superficial fascia, fascia propria, and sac, or such of them as can be made out, should be most cautiously divided, as detailed in the preceding classes of hernia, and any portion of the opening in the linea alba, nicked to a sufficient extent by means of a director and probe-pointed bistoury, the intestine or omentum being then treated as the circumstances may indicate, after which the flaps may be dressed as directed in femoral hernia.

Artificial anus, though rare, may occur at the umbilicus as elsewhere, and be cured solely by cicatrization, of which an example has been cited by Dr. R. G. Wharton, of Mississippi,* as occurring in a negro child a few days after birth. Amyand, Pelletan, Scarpa, and others,† have also seen this condition of the part in the adult, but there is greater difficulty in healing it at this point than elsewhere, owing to the adhesions of the intestine to the abdominal parietes, and the absence of a canal like that seen in the groin.

Remarks.—Nothing has been said in connection with the above form of hernia in relation to the cure effected by the reduction of the protrusion, and the application of a ligature to the sac, as this is generally applicable only to the reducible umbilical hernia of children, and analogous, therefore, to the ordinary tying of the cord, the main difference being in the application of the ligature close to the abdomen instead of a short distance from it, as is usual before separating the child from the mother. At this age the operation, however, exposes the infant to the risks of inflammation of the umbilical vein, or of the liver, by its extension along the suspensory ligament, and it has, therefore, been formally proscribed by many. According to the opinion of Dr. Physick, nature is capable of curing these cases alone.‡ In a case where a ligature was applied by Dr. Par-

* Am. Journ. of Med. Sciences, vol. vi. N. S. p. 256.

† Opus citat., p. 487.

‡ Parrish on Hernia, p. 189.

rish, the child was radically cured, though not without creating considerable anxiety.* In large umbilical hernia, Dr. Physick proposed to open the integuments by a crucial incision as far as the neck of the sac, then open the upper part of the sac so as to see its contents and reduce them, if possible, without dilating the ring; but when this could not be done, he divided the stricture outside of the sac. After reducing the contents, a ligature should be drawn around the neck of the sac, with a view of closing its cavity. Dr. Wistar is reported to have thus operated with success; but in a case operated on by Dr. William Gibson, death ensued.† Sir A. Cooper has succeeded by similar means in two cases.‡ In most cases, however, the application of a ligature should be omitted, and the restoration of the parts without opening the sac avoided, as exposing the patient to death from internal strangulation.

§ 2.—STATISTICS OF THE RESULT OF THE OPERATION FOR STRANGULATED UMBILICAL HERNIA.

	CASES.	CURED.	DIED.
Lawrence	3	2	1
Scarpa	1	1	0
Dessault	3	3	0
	7	6	1

From this it appears that, out of seven cases operated on, only one died.

§ 3.—SUMMARY OF THE OPERATIONS FOR STRANGULATED HERNIA.

	CASES.	CURED.	DIED.	ARTIF. ANUS.
Inguinal	49	34	14	1
Femoral	17	16	1	
Umbilical	7	6	1	

On examining the total of the cases thus collected, it is seen that the cures in Inguinal Hernia were only about two-thirds of those operated on, whilst in Femoral and Umbilical all but two were cured.

* Opus citat.

† Gibson, Institutes of Surg., vol. ii. p. 129. Sixth edition.

‡ Lawrence, p. 489.

The explanation of this difference must be a matter of conjecture, but the facts, which have been carefully collected during an examination of the sources mentioned, are those shown above.

CHAPTER XVIII.

ARTIFICIAL ANUS.

Artificial anus is the name applied to two distinct conditions of the body: in one of which an opening is formed by nature from the bowels through the skin, in consequence of the mortification resulting from a strangulated hernia; whilst in the other the opening is made by the surgeon, in order to give exit to fecal contents, which may have been prevented by various causes from escaping at the orifice of the rectum. As the occurrence of the artificial anus which results from strangulation of the intestinal contents of a hernia is the most frequent, and also that most directly connected with the preceding subject, it may properly receive the first consideration.

SECTION I.

ARTIFICIAL ANUS RESULTING FROM MORTIFIED INTESTINE.

Pathology.—When a portion of the intestine sloughs, there is usually found sufficient inflammation in the surrounding parts to glue the gut fast to the sides of the ring, or to the abdominal parietes, so that after the slough of the bowel has separated the fecal contents pass directly onwards to the skin, where the ulcer may present either one moderate sore with a fistulous orifice, or numerous openings of the same character. When the point of a knuckle of intestine is the seat of the slough, the opening through the anterior intestinal parietes causes the part to take the appearance of a double-barreled gun, the septum between the two sections of intestine being composed of that portion of the gut to which the mesentery is attached. (Plate XL. Fig. 6.) But if, instead of a knuckle, it is the parietes of a straight portion of the gut which is opened, then there will be but a single tube. (Plate XL. Fig. 7.)

When the opening in the integuments is large, there is also a tendency in the gut to prolapse, in consequence of which a tumor formed by everted mucous membrane is found at the orifice in the skin. The double-barreled kind of anus requires that the septum which separates the two ends of intestine should be removed, in order to allow the fecal contents to pass from one to the other, without escaping from the end of either barrel, but the straight tube or single piece of intestine demands merely the closing of the opening in the parietes, in order to fit the gut for the transmission of its ordinary contents. The treatment of these two forms of the complaint is, therefore, quite different, the first demanding the closure of the orifice until nature can heal it, the second requiring the destruction of the septum ("spur or buttress") found between the two compartments. Owing to the ulceration of the intestinal parietes extending each way, it occasionally happens that the anterior edge of the septum projects, and materially interrupts the regular course of the contents of the bowels. To relieve such cases Dessault employed pressure, which was applied against the anterior edge of the septum, both in order to force it backwards, as well as to compress it, tents and similar means being introduced through the external orifice.

Operation of Dr. Physick.—The existence of the septum between the two tubes of a knuckle of that intestine in which the artificial anus existed being the great obstacle to the downward course of the fecal matter, Dr. Physick decided to induce sufficient inflammation to glue together the adjoining peritoneal surfaces of the gut, and then, when they were adherent, to cut away the septum.

Accordingly, in January, 1809, Dr. Physick passed a ligature through the septum in the intestine of Jno. Axillius, a patient in the Pennsylvania Hospital, and forming a loop, drew it moderately tight by tying it upon the anterior edge of the septum, allowing the thread to remain one week, so as to keep the two sides of the bowel in close contact. Then cutting away a portion of the septum at the point of union of the sides, so as to create a hole, and stopping the external orifice, the feces resumed their natural channel, and the patient recovered.*

Operation of Dupuytren.—In 1813, Dupuytren resorted to the operation proposed by a German surgeon, named Schmakhalden, in

* Dorsey's Surgery, vol. ii. p. 96; also North. Am. Med. and Surg. Journ., vol. ii. p. 269, in a paper by Benj. H. Coates, M. D.

an inaugural essay which he made public in 1798,* to wit, to cut through the septum by means of a ligature passed through it by a curved needle, when, traction being made upon the ligature, it gradually cut its way out in a longitudinal direction, as is the case in the treatment of fistula in ano. Finding that there was risk of the needle going beyond the protecting adhesions, and opening a portion of the tube communicating with the cavity of the peritoneum, Dupuytren invented an enterotome (Plate XXXV. Fig. 18), which acted like a pair of forceps, the blades of the instrument being closed by a screw in the handles.

Operation.—After placing the patient in the position for the operation of strangulated hernia, expose the two orifices of the intestine, by passing in two fingers or two female catheters, and turning them over each other, the resistance to their approximation will indicate the position of the septum. Then take one branch of the enterotome, pass it along the sound to the depth of two inches or more, according to the projection of the septum, and let an assistant hold this whilst the other blade is introduced in the same manner and to the same depth, into the other orifice. Then turning the screw at the handles gently, so as to compress the portion of intestine between the blades (Plate XL. Fig. 2), colicky pain will supervene, but usually soon pass off, though each turn of the screw will be liable to produce the same pain. But as the length of the parallelism of the tube is increased, solid adhesion of the two sides will be induced, and about the eighth day the instrument will become movable and fall off, leaving a brown dry eschar in the wound, of the same length as the portion compressed by the instrument. When this separates, the remainder of the septum may be felt as a hard and undulated ridge at each side of the opening, through which the passage of the feces should be favored by the free use of enemata.†

After Treatment.—After both these operations the opening left in the integuments requires treatment, in order to favor its closure, and this may be attempted by the use of such means as will favor the healing of fistulous orifices generally, such as cauterization by the nitrate of silver, or sulphate of copper, or by compression, or by the quilled suture, or by anaplasty.

Operation for Artificial Anus, by Dr. J. R. Lotz, of Pennsyl-

* Velpeau, Méd. Operatoire, tome 4me, p. 149.

† Malgaigne, p. 428, Phil. edit.

VANIA.*—An ingenious modification of the instrument and operation of Dupuytren has been made by Dr. Lotz, of New Berlin, Pennsylvania. His instrument consists of two blades with fenestra, each of which is about an inch long, and a quarter of an inch wide, and surrounded by a solid rim about a line thick, the whole length of the instrument being about six inches, and its weight nine drachms. The two blades being introduced separately, should then be brought together and closed by means of two screws, so as to preserve the parallelism of the blades, after which the plates may be gradually approximated or slackened, according as they induce pain or nausea. On the third day after the introduction of the plates, the patient having continued comfortable, the portion of bowel compressed between the fenestra may be divided by means of a gum lancet, and an opening at once established in the septum at the point which corresponds with that existing in the blades of the instrument. The compression being now gradually removed, as it had been gradually applied, the instrument may be taken away, when the patient will be found to have a smooth, round hole, of about the dimension of an inch, with the sides of the bowel firmly adherent all round it.

OPERATION OF DR. J. MASON WARREN, OF BOSTON.—A female, aged thirty-four years, had an artificial anus to form after strangulation of a crural hernia of the right side. The feces, in a very liquid state, were constantly running out through two openings in the groin, and three in the posterior part of the thigh; the limb being drawn up nearly to a right angle with the body, and the whole thigh much enlarged and hardened. The skin was also thickened almost to callosity, and excoriated, and the openings were so small as hardly to admit a common director. After dilating the principal openings by sponge tents, applied very gradually, and continued for a month, the two ends of the intestine were discovered. A gum-elastic bougie being then passed into the upper orifice, and another into the lower, were made to penetrate a thick callous mass of integument, and then passed through the abdominal parietes for about an inch, when the septum or spur which separated the two ends of the bowel was encountered and with difficulty entered, being so closely applied to the abdominal parietes as to prevent the least passage of matter from the upper into the lower part of the bowel.

* Am. Journ. Med. Sciences, vol. xviii. p. 367.

As the intestinal ends seemed to lie parallel to each other, the exploring bougies made a very slight angle with each other.

Operation.—Having made sure of the lower opening by a director, the male branch of Dupuytren's enterotome was carried into the lower intestine, the director withdrawn, and the female branch readily introduced into the upper, but as the two parts of the instrument occupied nearly the whole caliber of the dilated passage leading to the gut, it was necessary to separate and loosen them, and this was found to be impossible, as the jaws of the female portion would not allow of sufficient motion at the hinge to lock with the other blade.

This instrument was therefore withdrawn, and another, which was about two inches shorter than Dupuytren's introduced; but this instrument, instead of having one blade received into a groove in the other, was serrated like polypus forceps for the space of three inches. The blades being now introduced and locked without difficulty were, therefore, at once brought together as tightly as the screw would permit. For a few hours the patient complained, but next day was free from pain; the fecal matter passed by the side of the instrument; warm water was injected daily into the wound to prevent any obstruction, and she also had an enema administered, to keep the lower bowel in action.

Three days after its application the instrument came away, bringing with it a blackish slough two inches and a half long, four lines wide, and about three thick, which had the impress of the teeth.

The finger being now passed into the orifice readily distinguished an opening between the two ends of the intestine, corresponding in size to the slough, the edges of which were greatly thickened and fleshy, and unlike the delicate valvular septum which previously existed.

On the following day there was a discharge per anum; a compress was applied to the orifice of the wound, and the patient ultimately recovered.*

§ 1.—Statistics.

According to Dupuytren,† the following is the result of his experience:—

* Am. Journ. Med. Sciences, vol. xvi. N. S. p. 116. 1848.

† Liston's Surgery, by Gross, p. 446.

Of forty-one cases treated by himself and others, there were thirty-eight cured, and three died.

Of the thirty-eight cured, twenty-nine were radically cured in from two to six months, and the remaining nine continued to suffer from fistulous orifices, notwithstanding every effort to heal them. The mortality following the use of his enterotome was one in fourteen.*

Remarks.—As the palliative treatment of artificial anus affords only temporary relief, and is the result of the application of a compress or truss to the external orifice, such means do not require much notice; but as the radical cure, by the means above detailed, was an operation which relieved the patient from a most loathsome complaint, it naturally excited considerable attention at the period when it was introduced, and the claims to priority of invention on the part of Dr. Physick and Dupuytren have, therefore, been strongly contested. In the United States, no one questions the originality of the operation of Dr. Physick, the thesis of Schmakhalden having, in all probability, been limited in its circulation, and not extended to a country, the intercourse with which was at that time very irregular. But whilst advocating the rights of Dr. Physick, the advantages of each mode of operating need not be overlooked. From an examination of various facts, there is good reason to think that, from the various degrees of obliquity seen in the two tubes in different instances, the selection of any operation must be decided by the peculiarities of the case. As a general rule, I would give the preference to the instrument of Dr. Lotz, of Pennsylvania (which is, as has been shown, a modification of that of Dupuytren), in all cases where the two tubes are not perfectly parallel; but when they are thus situated, the operation of Dr. Physick has the following advantages over that of Dupuytren.

1st. There is no inconvenience caused to the patient, by having an instrument projecting from a tender ulcer during the period of eight days.

2d. There is a better chance of exciting solely adhesive inflammation by the use of the ligature, than there is by compressing the structure, the slough created by the instrument of Dupuytren being liable to extend beyond the width of the blades of the instrument.

3d. The division of the septum by a cutting instrument, as prac-

* Ibid. Note by Samuel D. Gross, M. D., Louisville.

PLATE XLVI.

A VIEW OF THE OPERATION FOR THE FORMATION OF AN ARTIFICIAL ANUS.

Fig. 1. A front view of the surgical relations of the Colon. 1. Integuments. 2. External oblique muscle. 3. Internal oblique. 4. Transversalis muscle. 5. Lower edge of the liver. 6. Distended cœcum. 7. Transverse colon. 8. Descending colon, with sigmoid flexure seen below.

After Bernard and Huette.

Fig. 2. A posterior view of the parts concerned, as shown by removing the dorsal structures. 1. Peritoneum. 2. Kidney. 3. Mesentery. 4. Bowels. 5. Colon. 6. Spine.

After Bernard and Huette.

Fig. 3. Lettre's Operation, or the formation of an Artificial Anus at the right groin. 1, 1. Outline of colon. 2, 2. Extent of inguinal incision in the integuments. 3. An instrument passed beneath the distended colon in order to bring it to the front of the wound. 4. The point of the bowel which is to be perforated.

After Bernard and Huette.

Fig. 4. Amussat's Operation, or the formation of an Anus in the left lumbar region. 1, 1. Outline of descending colon. 2, 2. Incision in integuments. 3. Instrument placed beneath the bowel to render it prominent. 4, 4. Ligatures passed through the bowel in order to attach it to the sides of the wound before it is perforated.

After Bernard and Huette.

Fig. 5. Shape and appearance of the Anus formed by Littre's Operation. The long diameter of the opening corresponds to the line of the groin, and the bowel is so attached to the edges of the incision in the abdomen as to prevent contraction of the orifice or the escape of the bowel into the abdomen.

After Bernard and Huette.

Fig. 6. Appearance of the Artificial Anus formed in Amussat's Operation, showing the position of the sutures and the character of the opening.

After Bernard and Huette.

Plate 46

Fig. 1

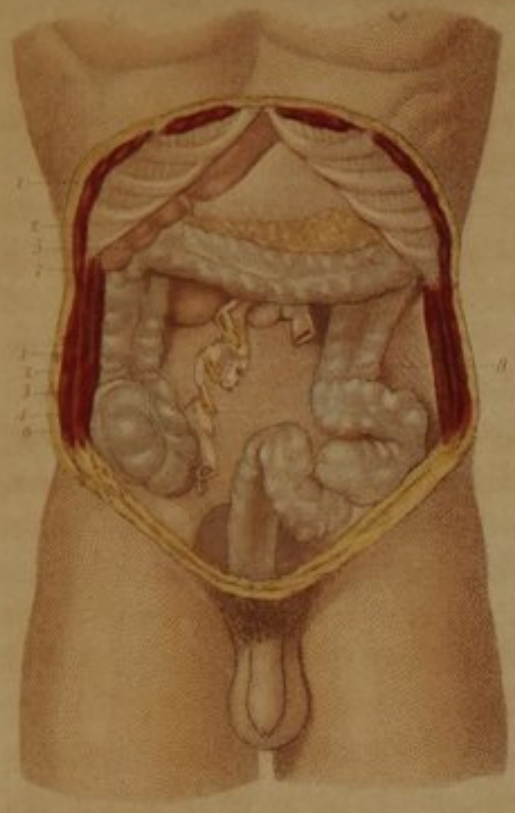


Fig. 2

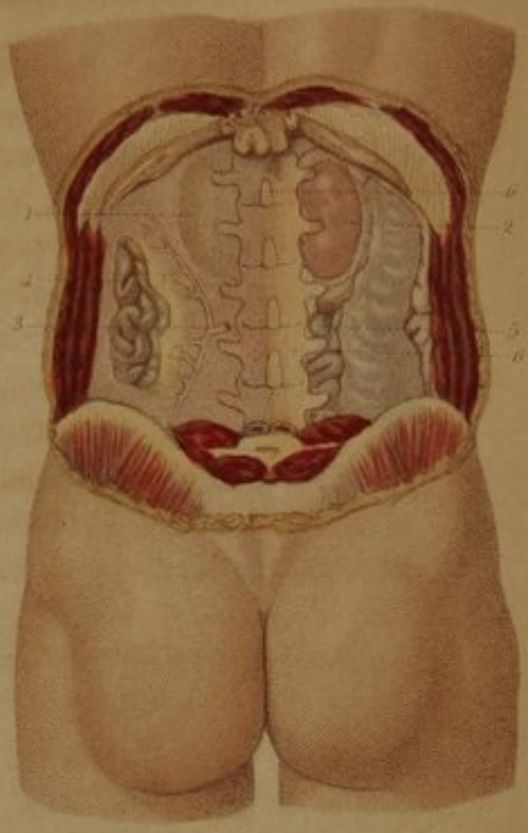


Fig. 5

Fig. 6

Fig. 3

Fig. 4

ticed by Dr. Physick, is preferable to the irregular orifice produced by the separation of the slough formed between the blades of the enterotome of Dupuytren.

In cases where the obliquity of the bowel does not present anything like an intermediate or double-barreled septum, neither of the preceding operations for the radical cure would be available, the treatment in this case requiring merely a palliative operation, or such an one as would favor the contraction and cicatrization of the orifice in the intestine as well as in the skin.

SECTION II.

FORMATION OF AN ARTIFICIAL ANUS.

The formation of an artificial anus, in order to give vent to such contents of a bowel as have been prevented from pursuing their natural course, either in consequence of a congenital defect, or by the development of an obstruction in the lower part of the intestinal canal, is purely the result of surgical skill, based upon an accurate knowledge of the position of the portions of the alimentary canal which are best adapted for the safe formation of such a vent as will give exit to fecal matter, with the least possible inconvenience to the patient.

Without alluding to the various causes which may render this operation necessary, or explaining at present the steps of such methods as are demanded by congenital occlusions of the rectum, it is proposed to call the reader's attention to two operations, in both of which the intestine is opened at points more or less closely connected with the regions at which hernia may be developed.

§ 1.—FORMATION OF AN ARTIFICIAL ANUS AT THE GROIN.

From the details presented of the relative position of the abdominal viscera to the groin, as connected with hernia, there is but little occasion for more than a brief allusion to the part of the intestine usually opened.

The colon arising in the right iliac region by the cœcum, passes upwards on the right side, then transversely across the abdomen, to

descend to the left iliac region, where it terminates by the sigmoid flexure. As the groin presents a point to which the attention of the patient may be readily given, it has generally been regarded as furnishing the most favorable point for the formation of an opening, which must subsequently be closed by artificial means, and which must require the patient's personal attention, in order to preserve proper cleanliness. At these points the cœcum or the sigmoid flexure is covered only by the abdominal parietes. (Plate XLVI. Fig. 1.) Thus we find the skin, superficial fascia, tendon of the external oblique muscle of the abdomen, internal oblique, and transversalis muscles, fascia transversalis, and peritoneum, presenting here the same relative layers that have been referred to in connection with hernia. Through these layers an incision should therefore be made, the intestine attached to the sides of the wound, and then such a perforation practiced as will permit the subsequent contraction of the parts, and give sufficient vent to the obstructed contents of the bowels.

This operation dates back to the year 1720, when it was suggested by Littre;* since which period it has been performed by other surgeons; some of whom, either through ignorance or inadvertence of the proposition of Littre, have considered themselves as the originators of the idea.

Operation of Littre.—The patient being placed upon the back, with the thighs extended, the surgeon should place himself in a position similar to that demanded for the operation of strangulated hernia, and, commencing the incision on a level with the anterior superior spinous process of the ileum, carry it inwards and downwards towards the pubis, and in the line of the groin, for the extent of two or two and a half inches. After incising the skin and superficial fascia, he should next make a small opening in the tendon of the external oblique, pass in a director, and incise the tendon upon the latter instrument by means of a probe-pointed bistoury. After incising in a similar manner the fibres of the internal oblique and transversalis muscles, and tying any branch of the circumflex iliac artery that accident may bring into the line of the incision, let him next cautiously divide the fascia transversalis, and then with the same caution the peritoneum, incising both upon the director or finger in order to avoid the intestines. If the gut, which is usually

* Velpeau, Méd. Opératoire, tome 4me.

distended with feces, now presents itself, it may be distinguished from the small intestines by its reddened color, if congested, or by the yellowish-green appearance which is often noted in this bowel after death, as well as by its peculiar shape. By passing the finger around it, the bowel may then be brought well forward (Plate XLVI. Fig. 3) into the opening, and a ligature being passed through the mesocolon so as to prevent its escape, a puncture may be made into the gut, and then this opening enlarged by an incision parallel with that in the integuments. The contents of the bowel being now evacuated, the mesocolic thread should be securely fastened to the parietes of the abdomen, and the intestine thus left until the third or fourth day, when adhesions having formed between the surface of the colon and the front of the peritoneum, it only remains to prevent the tendency of the wound to contract and close the opening, by the use of a tent.

The subsequent dressing should be such as will protect the skin from excoriation and guard against the constant escape of the fecal matter, and may be accomplished by a compress and bandage, or by a truss, if the parts can tolerate it.

§ 2.—FORMATION OF AN ARTIFICIAL ANUS IN THE LUMBAR REGION.

The descending colon passing from the left hypochondriac region to the left sacro-iliac symphysis is covered by the muscles of the loins behind, and by the peritoneum in front, the attachment of the latter to the muscles immediately around the crest of the ileum being by a loosely developed cellular substance. "In its general course this bowel corresponds to the groove between the quadratus lumborum and transversalis muscles, and as this is near to the external border of the common mass of the sacro-lumbalis and longissimus dorsi, it may be easily recognized in moderately fat subjects. Sometimes the colon is more internal, and, in great part, concealed by the quadratus lumborum."* (Plate XLVI. Fig. 2.)

The layers to be divided are the skin and subcutaneous fat, the latissimus dorsi behind, the external oblique in front, then the internal oblique and transversalis fibres, then the fascia transversalis, then fat, and lastly, the intestine itself; the left colon being devoid

* Malgaigne.

of peritoneum in the posterior third of its circumference, especially when distended.*

Operation of Amussat.†—The patient being laid on his belly, and slightly inclined to the right side, a transverse incision should be made in the skin two fingers' breadth above the crest of the ileum, commencing at the external border of the mass common to the sacro-lumbalis and longissimus dorsi, and following it outwards to the extent of four or five fingers' breadths. After incising the skin and subcutaneous tissue, divide the latissimus dorsi transversely in the posterior third of the incision, the external oblique in the anterior two-thirds, and then the internal oblique and transversalis muscles and fascia, cutting them transversely and then vertically, so as to obtain a crucial incision. On reaching the adipose tissue, which envelops the colon, raise it cautiously and search carefully for the intestine, which may be told by percussion, or by its color, or by feeling the resistance caused by its contents.

After certainly recognizing it, traverse the exposed portion with two needles, so that the bowel may be stitched with two loops of thread about an inch apart, and pierce it in the interval of the loops and divide the intestinal parietes crucially, so as to secure a free evacuation of its contents, aiding this, if necessary, by injections of warm water. Then drawing the intestinal opening well forward by means of three torsion forceps, fasten it to the skin by four points of the interrupted suture. (Plate XLVI. Fig. 4.)

Remarks.—The formation of an artificial anus for the purpose of giving vent to the fecal contents of the bowels, when prevented from escaping by the natural orifice, is an operation which evidently exposes the patient to loss of life, and, at best, prolongs it only at the expense of a most loathsome condition. That the bowels may be thus opened is certainly an evidence of the efforts of the surgeon towards relieving the defects of nature, but the results are by no means positive that the operator can secure to the patient even a continuance of a miserable existence.

§ 3.—STATISTICS OF THE OPERATION.

In the United States, the formation of an artificial anus has been attempted, but, as far as I can learn, without much success. In a

* Op. citat. † Malgaigne, Philadelphia edit., p. 448.

case operated on by Dr. Warren, Sen., the patient died.* In one operated on by Dr. J. M. Bush of Kentucky, the patient also died on the fourteenth day;† and of eight cases reported by Velpeau,‡ six died and two recovered.

With such results it may be doubted whether it is advisable to submit a patient to this operation, and whether if left to nature the chances of life might not be quite as great as those resulting from the operation. The inflammation extending from the distended bowel to the surrounding parts might obviate the chances of a general peritonitis, and if the patient's strength could sustain the sloughing consequent on a rupture of the intestine, nature would doubtless make for herself an external vent. In such hopeless circumstances the judgment of each one at the moment can alone decide upon the advantages of the operation.

CHAPTER XIX.

LIGATURE OF THE ILIAC ARTERIES.

THE application of a ligature to the Iliac arteries has been successfully performed at various points, from the origin of the common iliac along the main trunks of both its internal and external branches.

SECTION I.

SURGICAL ANATOMY.

The Primitive Iliac Arteries arise about the lower part of the fourth or fifth lumbar vertebra, and extend to within an inch of the sacro-iliac symphysis, where they divide into the Internal and External Iliacs. In this course, the Primitive Iliac is bounded on the outer side by the psoas magnus muscle, behind by the primitive iliac

* Dr. Warren in MS.

† See Bibliography.

‡ Med. Opératoire, tome 4me.

vein, and when of full length is crossed at its lower part by the ureter. The right artery crosses in front of the root of the left iliac vein. (Plate XLVII. Fig. 1.)

The Internal Iliac Artery extends from its origin near the front upper part of the sacro-iliac symphysis to the lower part of the same articulation, being bounded behind by the sacral plexus of nerves, and being about one inch in length before it gives off any branches.

The External Iliac extends from the bifurcation of the primitive iliac to Poupart's ligament along the internal margin of the psoas magnus muscle. In the commencement of its course, it is anterior to the external iliac vein, but gets to its outer margin as it approaches Poupart's ligament. At this point it is about half way between the anterior superior spinous process of the ileum and the symphysis pubis, having the vein on its inside, and the anterior crural nerve half an inch from its outer margin.* (Plate XLVII. Fig. 1.)

These arteries are behind the Peritoneum, the attachments of which to surrounding parts is generally by loose cellular tissue.

SECTION II.

OPERATIONS UPON THE ILIAC ARTERIES.

The interruption to the circulation of the blood through these arteries by means of compression, has occasionally been resorted to, but the ligature can only be regarded as especially demanding operative skill, compression requiring rather good surgical judgment than manual dexterity.

§ 1.—LIGATURE OF THE EXTERNAL ILIAC ARTERY.

Operation of Abernethy.—The patient being laid on his back, and a little inclined towards the sound side, so as to relax the abdominal muscles and throw the intestines from the incised side, an incision should be made about four inches long in the adult, commencing an inch and a half from and on the inner side of the ante-

* Horner's Anatomy, vol. ii. Eighth edition.

rior superior spinous process of the ileum, and extending obliquely towards the outer column of the external abdominal ring. After dividing the skin and superficial fascia, tie any of the small arterial branches that may require the ligature, open the tendon of the external oblique, introduce a director, and divide it in the course of the external incision. Then carrying the forefinger beneath the fibres of the internal oblique and transversalis muscles, divide them with a probe-pointed bistoury, and commencing at the iliac margin of the wound, press the peritoneum towards the median line of the body so as to overcome its cellular attachments to the iliac fascia. After exposing the artery about two inches above Poupart's ligament, pass the aneurismal needle under it, from within outwards, or from between the vein and artery towards the ileum. (Plate XLVII. Fig. 3.)

Operation of Sir Astley Cooper.—This surgeon began his incision near the anterior superior spinous process of the ileum, and continued it to a point a little above the inner edge of the external abdominal ring, giving it a semi-elliptical shape.

After dividing the tendon of the external oblique, he followed the course of the spermatic cord with his finger, entered the internal abdominal ring, and, depressing the peritoneum, isolated the artery as before.

Operation of Bogros.—By an incision two or three inches long, equidistant at each end from the pubis and spinous process of the ileum, and immediately over Poupart's ligament, the skin and superficial fascia were divided, a director passed beneath the tendon of the external oblique, the spermatic cord raised, and its adhesions separated, the finger following the course of the cord to the internal ring, where the epigastric artery may be readily found on the inside of the ring. Tracing with the finger the course of this artery to its origin, it only remains to push aside the adhesions of the cellular tissue, and ligate the vessels as before directed.

Operation of Dr. John Syng Dorsey, of Philadelphia, in 1811.*—An incision three inches and a half long was made, beginning an inch and a half above the anterior superior spinous process, and one inch within it, and also four inches and a half distant from the umbilicus, so as to extend obliquely downwards, and terminate about one inch above the aneurismal tumor, which was situ-

* Dorsey's Surgery, vol. ii. p. 216. This was the first operation on this artery in the United States.

PLATE XLVII.

VIEW OF THE PARTS CONCERNED IN THE OPERATION OF LIGATING THE ILIAC ARTERIES.

Fig. 1. Surgical anatomy of these Arteries. 1. Aorta. 2. Right primitive iliac. 3. Right external iliac. 4. Left primitive iliac vein. 5. Ascending vena cava. 6. Spermatic vessels. 7. Ureter crossing iliac artery. 8. Internal iliac artery. 9. Lymphatics and glands. 10. Anterior crural nerves. 11. Section of abdominal muscles. 12. Anterior superior spinous process. 13. Fascia lata. 14. Psoas muscle. 15. Iliacus internus. 16. Circumflex iliac artery. 17. Epigastric vessels. 18. Sheath of femoral vessels. 19. Saphena vein. 20. Lymphatic vessels of thigh. 21. Spermatic cord. 22. Bladder.

After Bernard and Huette.

Fig. 2. Appearance and position of an Aneurismal Tumor of the Femoral Artery, showing the effect upon the superficial vessels, &c. Ligature of the external iliac was required.

After Auvert.

Fig. 3. Ligature of the External Iliac Artery. 1. Artery distended, and with the needle beneath it. 2. Incision of skin. 3, 4. Divided edges of muscles and fascia of abdomen. 5. Peritoneum everted. 6. External iliac vein.

After Bernard and Huette.

Fig. 4. Operation of ligating the Primitive Iliac Artery, as shown upon the subject. The artery has been raised a little by a ligature towards the orifice of the wound, in order to show it more distinctly.

After Nature.

Fig. 5. Ligature of the Internal Iliac Artery, as shown upon the subject, the arteries being filled with wax.

After Nature.

Fig. 6. A view of the condition of the Bloodvessels, as found in the patient upon whom Dr. Edward Peace tied the right Primitive Iliac Artery, showing by what means the circulation was carried on. 1. Aorta. 2. Primitive iliac, that on the right side, as well as the right external and internal iliacs, being obliterated. 3. Middle sacral much enlarged. 4. Aneurismal sac. 5. Epigastric artery much enlarged. 6. Enlarged ilio-lumbar. 7. Circumflex iliac. 8. Obturator artery. 9, 9. Lumbar arteries much enlarged.

After Nature.

Fig. 7. A view of the left Iliac Vessels of the same patient. 1. Aorta. 2, 2. Primitive iliacs. 3. Middle sacral, as seen in the previous drawing. 4. Left internal iliac, with all its branches much increased and anastomosing freely with right side. 5. Left external iliac. 6. Left epigastric displaced in the preparation. 7. Poupart's ligament. 8. Left femoral.

After Nature.

Plate 47

Fig. 1

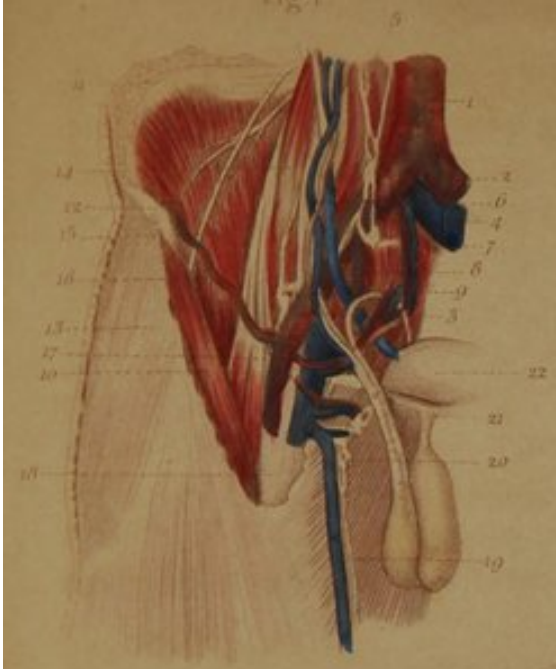


Fig. 3

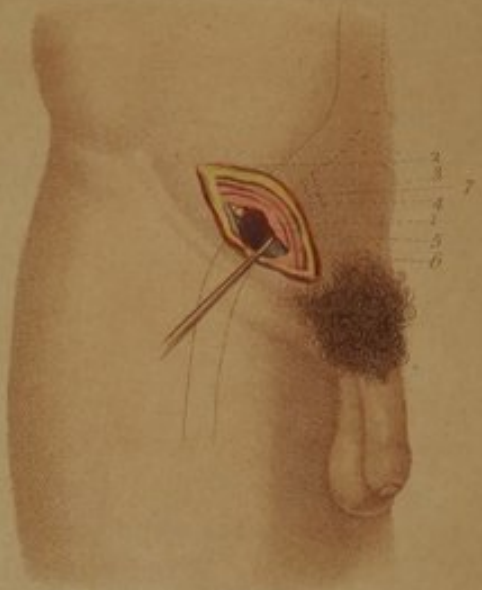


Fig. 2

Fig. 6

Fig. 7

Fig. 4

Fig. 5

ated immediately below Poupart's ligament. After dividing the skin, superficial fascia, and external oblique tendon, the internal oblique muscle protruded at the wound, and, together with the inferior edge of the transversalis, was divided nearly up to the highest point of the wound. The cellular adhesions of the peritoneum being then overcome by the forefinger, the artery was readily felt pulsating, and was then separated gently from the adjoining parts without denuding much of it, when the vessel was secured by Physick's needle and forceps. (Plate XLVII. Fig. 3.)

Three knots being made upon the ligature, the ends were left at the external wound; and a strip of adhesive plaster, a pledget of lint, and a compress, completed the dressing. The patient was then put to bed with the thigh moderately flexed on the pelvis, and the limb covered with carded wool and flannel. On the thirteenth day the ligature separated, and on the twentieth he was able to rise in his bed.

Operation of Dr. Wright Post, of New York.—A laborer, aged 41 years, entered the New York Hospital, October, 1813, with an inguinal aneurism of the left side. After general treatment, the operation was performed, January, 1814, as follows:—

Operation of Dr. Post.—An incision being made through the integuments with some degree of obliquity, beginning a short distance above the tumor, and extending upwards externally to a middle line between the umbilicus and superior anterior spinous process of the ilium, so as to give it a length of between three and four inches, the abdominal muscles were cut through, until the peritoneum, at the lower part of the wound, was fully exposed. An endeavor was then made to detach this membrane from the crural arch, so as to get at the artery without opening the cavity of the peritoneum, but failed, as the strength and thickness of the membrane, at this point, were much greater than usual, and its adhesion to Poupart's ligament so firm that the separation, which is usually so easy, was found in this case to be impracticable, in consequence of the pressure caused by the tumor. It was, therefore, necessary to cut through the peritoneum in order to arrive at the artery, which was done on account of the difficulties before referred to. The omentum protruded, was easily replaced, and the artery felt; but every effort to detach the peritoneum from the sheath of the artery, by means of the finger-nail, failed, and it only remained to pass a ligature under the artery by pushing the needle

through the coverings of the vessel.* To effect this, the point of the finger was placed on the inside of the artery, and a needle being conveyed along this as a director, it was made to pierce the coverings of the vessel, pass under the artery, and come out on the outside of it, by employing the forceps of Dr. Physick. After tying the ligature with care, so as to avoid including any portion of the intestine, the wound was closed with adhesive strips, lightly dressed, and the patient put to bed, the limb being covered with carded cotton. Pulsation returned in the tumor, but the aneurism did not increase, the ligature upon the artery not having arrested the circulation in the tumor, but only lessened it, though the patient ultimately recovered the use of a limb which had before been useless to him.

Remarks.—By reference to the Bibliographical Index, it will be seen that the operation of ligating the external iliac artery has been frequently performed with success in the United States, the names of many of those who have attempted it being there given. An operation upon the External Iliac, by Dr. Peace, of Philadelphia, has, however, been accidentally omitted, whilst, by an oversight, its reference has been attached to the operation of the same gentleman on the Common Iliac.†

§ 2.—STATISTICS OF THE APPLICATION OF A LIGATURE TO THE EXTERNAL ILIAC.

The results of the operation of ligating the iliac arteries have varied somewhat according to the branch tied, though the external iliac, from being the most superficial, as well as that most directly connected with the femoral and popliteal arteries, has been more frequently ligated than either or both of the others. As the circulation can be readily carried on by other vessels when this branch of the iliac is tied, the subsequent difficulties have been less, and the success attendant on the operation such as establishes the propriety and advantage of ligating this vessel for aneurism, or wounds of the femoral artery.

The following cases have been collected from the works of the surgeons whose names are mentioned.

* Am. Med. and Philosoph. Register, vol. ix. p. 443, 1814.

† See Ligature of Common Iliac, as hereafter detailed.

LIGATURE OF EXTERNAL ILIAC.

	CASES.	CURED.	DIED.
Abernethy*	4	2	2
Freer†	3	3	0
John C. Warren‡	4	3	1
Mott§	7	4	3
	18	12	6

From this summary, it appears that of eighteen cases operated on, twelve have been cured and six died, or two-thirds of the cases operated on have been cured.

Of one hundred and eighteen cases reported by Dr. Norris,‖ eighty-three were cured and thirty-three died, three who recovered undergoing amputation, which also shows more than two-thirds cured.

In the Bibliographical Index will be found a reference to most of the American operations.

SECTION III.

LIGATURE OF THE COMMON ILIAC ARTERY.

The ligature of the common iliac artery, is one which dates back only to the year 1812, when it was first performed for the arrest of traumatic hemorrhage, by Dr. Wm. Gibson, of Philadelphia (then residing in Baltimore), but without success.

§ 1.—SURGICAL ANATOMY.

The common iliac artery being the terminating branches of the abdominal aorta, are about an inch long, where they divide into the external and internal iliacs. Most commonly, the primitive iliac

* Observations on Aneurisms, by J. Abernethy.
† " " George Freer.
‡ MS.
§ Transactions Am. Med. Assoc., vol. iv. p. 269.
‖ Am. Journ. Med. Sciences, vol. xiii. p. 20.

arises about the fourth lumbar vertebra, though sometimes it comes off as low as the inferior edge of the fifth. These arteries rest upon the parts about the alæ of the sacrum, or side of the sacro-vertebral angle, having the psoas magnus muscle upon the outer side, and being crossed at their lowest portion by the ureter. On the right side the primitive iliac vein is outside, and then behind the artery, but on the left the vein lies upon the inside of the vessel, though it does not reach this point until it has passed under the root of the right iliac artery. The peritoneum covers the vessels, and they are easily approached simply by overcoming with the finger the loose attachments of this membrane to the part.

§ 2.—OPERATION OF LIGATING THE PRIMITIVE ILIAC.

The approach to this artery may be accomplished by a slight extension of such incisions as have been recommended for the ligature of the external iliac. In the operation of Dr. Mott, in 1827, which was the first successful operation ever performed, as well as the first done for the relief of aneurism, the following plan was pursued:—

Operation of Dr. Mott.*—The aneurismal tumor, though of only ten days' standing, occupied the whole extent of the external iliac, extending from within Poupart's ligament to some distance above the origin of the internal iliac artery, was of large size, and protruded the belly considerably at the iliac region.

By an incision which extended from the external abdominal ring to one or two inches above the crest of the ilium, the skin and muscles were divided, and the peritoneum cautiously detached with the fingers without being injured. The artery being then examined, the aneurismal dilatation was found to cease at about half the distance between the bifurcation of the aorta and the origin of the internal iliac branches. The ligature was, therefore, passed around the vessel from the outside so as to avoid the iliac vein, by means of the Philadelphia needle (Plate XXXV. Fig. 2), and after tying the knot, the wound was held open in order to satisfy those present of the exact situation of the ligature, which was just below the bifurcation of the aorta, and on the side of the sacro-vertebral promontory. The wound being lightly dressed, the patient was put to bed, means

* Philad. Journ. Med. and Phys. Sciences, vol. xiv. p. 176. 1827.

employed to preserve the heat of the limb until the circulation was restored, and the patient ultimately cured.

In the case of Dr. Gibson, in 1812, the artery was tied by means of a ligature passed around it, by means of an eyed probe, the original wound being enlarged to the extent of seven inches. This patient died on the fifteenth day of hemorrhage, and on dissection it was found that two ligatures had been placed on the common iliac artery of the left side, about half an inch below the bifurcation of the aorta. The upper ligature was found detached, but no union had occurred in the vessel.*

Operation of Dr. Ed. Peace, of Philadelphia.†—A man, aged thirty-six years, was admitted into the Pennsylvania Hospital in August, 1842, with an inguinal aneurism of the right side, created by a strain in lifting stone, to relieve which it was decided to ligate the common iliac artery.

Operation.—An incision seven inches long was made through the integuments, commencing at a point on a level with the umbilicus, two inches within and three inches above the anterior superior spinous process of the ilium, approaching to within an inch of Poupart's ligament, and terminating one half inch above the external ring. This divided the arteria ad cutem abdominis, which was twisted by the artery forceps. The superficial fascia being next divided, the tendon of the external oblique was nicked and incised upon a director, the whole length of the first incision as far inwards as the spermatic cord. Considerable difficulty was now experienced in raising the lower edge of the tendon of the internal oblique and transversalis, owing to the induration of tissue from the pressure of the tumor, but this was finally accomplished by means of the knife-handle, and the parts being then carefully divided, the peritoneum was reached. When this was cautiously detached from the tumor, the latter was found to involve a large portion of the external iliac artery, but by raising the peritoneum a sound part of the artery was found, about half an inch above the bifurcation of the common iliac.

The artery being now separated from the vein by the finger-nail, a silk ligature was passed around it by Gibson's needle (Plate XXXV. Fig. 12), but notwithstanding the precautions taken to evacuate

* Med. Recorder, vol. iii. p. 185.

† Am. Journ. Med. Sciences, vol. v., N. S., p. 269. 1843.

the bowels, and the length of the incision, it was difficult to see the point of the needle under the artery, on account of the protrusion of the bowels, and the projection of the tumor. Finally, by means of broad-curved spatulæ (Plate XLVII. Fig. 4), the parts were seen, and the ligature being tied with a double knot, both ends were allowed to hang out of the wound, which was then closed by adhesive strips, three points of the interrupted suture, lint, &c. The patient was then placed in bed with his shoulders slightly raised, his body flexed and inclined to the affected side, and the limb flexed upon a pillow under the knee. In fifteen days the ligature came away, and the patient recovered perfectly.

This patient dying subsequently, Dr. Peace succeeded, after much trouble, in injecting the bloodvessels, and in making a dissection of the part. Although, from the opposition of the patient's friends, the preparation was imperfectly made, it yet shows the means by which the circulation was carried on. From this preparation I have been enabled, through the politeness of the operator, to have the two sketches made as represented in Plate XLVII. Figs. 6, 7, and from inspection of the collateral branches of the artery as seen after the operation, as well as from the minuteness with which the operation has been detailed by the operator, much valuable information may be gained by those who may hereafter desire to repeat it.

The paper containing the account of this operation will be found as above quoted, and not, as stated in the Bibliography, under the head of operations on the common iliac, the reference there given being that of the ligature of the external iliac, as has been before stated in the note.

Remarks.—A knowledge of the great amount of the circulation which would be cut off from the lower extremity, by the application of a ligature to this vessel, at first led surgeons to believe that it would be impossible to preserve the vitality of the limb after this operation. The credit of demonstrating the contrary is, therefore, due to the surgeons of the United States, who, in the cases operated on by Drs. Mott and Gibson, conclusively showed that nature was able to remedy even this serious obliteration of the natural channel of the blood.

§ 3.—STATISTICS.

Since these primary operations, thirteen others have been reported by Dr. Norris,* as occurring in Great Britain, in the hands of Crampton, in 1828; Liston, in 1829; Guthrie, 1833, and Syme, 1838; by Salomon, of St. Petersburg, in 1837; Deguise, of Paris, in 1840; Post, of N. Y., also in 1840; by Bushe, of N. Y., and Perogroff, of ——; by Peace, of Philadelphia, in 1842; by Hey, in 1843; by Stanley, 1846, and two by Dr. Garviso, of South America.

Of the sixteen cases above specified, eight were cured and eight died; showing, as it is thought, the justifiable character of the operation under circumstances similar to those which have before been required.

§ 4.—LIGATURE OF THE INTERNAL ILIAC.

The ligature of the internal iliac artery has been occasionally performed for the relief of aneurismal tumors in its gluteal or ischiatic branches. As there is an ample supply of vessels through which the circulation may be conducted, the application of a ligature to this artery would not, in all probability, be attended by serious consequences, were it not from the risk of peritonitis necessarily created by the operation.

The plans proposed for the application of the ligature have varied considerably from those suggested in connection with the external iliac, chiefly because the latter vessel has most frequently been tied in its lower part. As the external and internal arteries come off at the same point, it is evident that a slight prolongation of the ordinary operation upon the external branch of the artery would enable the operator also to tie the internal. The plans employed have, however, differed materially from those pursued in ligating the former vessel, and have therefore taken the position of a distinct operation.

Operation of Stevens, of Santa Cruz.—In the case of a negress who labored under an aneurismal tumor of the left buttock, of the size of a child's head, Dr. Stevens proceeded as follows:—

* Am. Journ. Med. Sciences, vol. xiii., N. S., p. 24. 1847.

Operation.—By an incision, five inches in length, made in the course, but a little to the outer side of the epigastric artery, the abdominal parietes were divided, the attachment of the peritoneum, from the spine of the ilium to the left sacro-iliac symphysis, overcome by pressing upon it with the finger, and the origin of the artery being felt by the fore-finger, the internal iliac was tied by passing a ligature around it, about half an inch below its origin. This patient was cured in three weeks; and, ten years afterwards, when she died, the preparation was sent to London, but the aneurism was found to have been in the ischiatic instead of the gluteal, as had been supposed.*

Operation of Dr. H. J. Bigelow, of Boston.—A middle-aged woman was stabbed by her husband in the right buttock, which led to the formation of an aneurism of the gluteal artery, to relieve which the internal iliac was tied as follows:—

Operation.—By an incision above, but parallel to Poupart's ligament (Plate XLVII. Fig. 5), the skin, muscles, and fascia were divided, the peritoneum separated from its attachments to the iliac fossa, and the artery readily attained and tied, instantly relieving the aneurismal symptoms; but the patient died of peritonitis on the eighth day. The autopsy exhibited the ligature as placed around the internal iliac, just above its branches, with a satisfactory clot extending from this point to the bifurcation at the common iliac artery.†

Remarks.—The internal iliac artery has been tied in the United States by Dr. M. P. White, of Hudson, successfully; and subsequently by Dr. Mott, also successfully, although the peritoneum was opened during the operation; the operations of Drs. Bigelow and Kimball of Massachusetts, were unsuccessful. The great dangers of the operation are to be found in the tendency to peritonitis, and in the injury to the vein in the immediate neighborhood of the artery.

Statistics.—Of seven cases of ligature of this artery reported by Dr. Norris,‡ in his table on the ligature of the iliacs, four were cured and three died, all being done for aneurism.

* Velpeau, Méd. Opératoire.

† Amer. Journ. Med. Sciences, vol. xvii. p. 29. 1849.

‡ Ibid., vol. xiii. p. 23. 1847.

CHAPTER XX.

OPERATIONS PRACTICED ON THE BACK.

THE posterior surface of the trunk of the body presents no points of structure which require more than a passing allusion, the great number and mass of the muscles, together with the arrangement of the vertebræ, being matters of universal knowledge. The operations, also, which are performed upon this region do not demand any especial caution, unless it may be in the complaints due to the disorders of the spinal canal. In order, however, to continue the unity of description which has been sought for in the arrangement of this volume, some of the more important cases requiring operative aid will be detailed, as illustrating the operations required in the complaints of this region.

SECTION I.

SUPERFICIAL TUMORS OF THE BACK.

The integuments and muscles of the back are liable to very much the same class of tumors as are found in similar tissues elsewhere, and require for their removal precisely the same means, to wit, such an incision of the skin and subsequent dissection as will create as little disturbance as possible of surrounding parts. As illustrative of the operation required by the wens of this region, the following case is cited:—

REMOVAL OF A LARGE STEATOMATOUS TUMOR, BY DR. JOHN SYNG DORSEY, OF PHILADELPHIA.—The patient, a negress, aged about 45 years, was admitted into the Pennsylvania Hospital, in 1815, with a tumor upon the back, the dimensions of which are as stated in the Bibliographical Index, and the weight of which, after removal, was twenty-five pounds. (Plate XLVIII. Fig. 3.)

OPERATION.—After administering an opiate, the patient, at the suggestion of Dr. Physick, was placed upon her face on the table

PLATE XLVIII.

EXTERNAL CHARACTERS OF TUMORS OF THE NECK AND BACK.

Fig. 1. Congenital Tumor of the Veins about the Neck. This child was twelve months old; the tumor filled the whole neck; projected beyond the chin, and felt like a coil of vessels folded in every direction on each other, or like a bundle of round worms.

After Warren.

Fig. 2. A view of the appearance and position of a Large Hygroma of the Back of the Neck. This tumor was noticed in a child some months after birth, and was supposed to be due to an injury of the part, caused by the application of the forceps. It was relieved by puncture.

After Auvert.

Fig. 3. Appearance presented in Julia Richards, a negress, who had a large Sarcomatous Tumor upon the back, which was removed by Dr. Dorsey, of Philadelphia, in 1815. The tumor had existed eighteen years, grown gradually, and never been painful, but its size compelled her to walk as if carrying a large and heavy sack upon her back. The surface of the tumor was tolerably regular, but very large and numerous veins were seen in various parts of it. The narrowest part of the tumor was thicker than the patient's waist, and its base was very extensive. After being emptied of blood its weight was twenty-five pounds. The dimensions of the tumor are stated in the text.

After Dorsey.

Fig. 4. A view of the position and external characters of Spina Bifida in the Loins. This tumor was of very considerable size, the drawing representing it as only one-fourth of its natural size. It was seated in the lumbar region, nearly on a line with the crest of the ilium, and was accompanied by a deficiency in the spinous processes of several of the adjoining vertebræ.

After Froriep.

Plate 48.

Fig. 1.

Fig. 2.

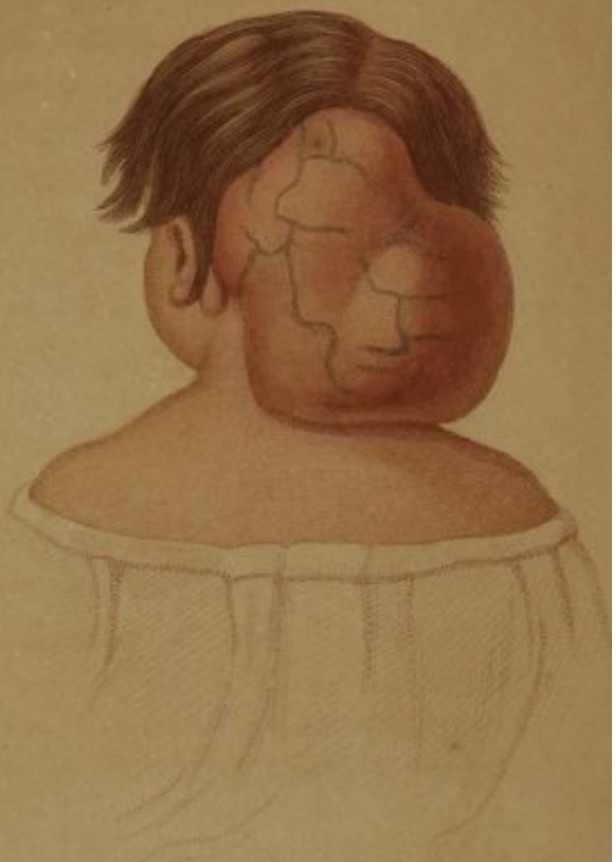


Fig. 3.

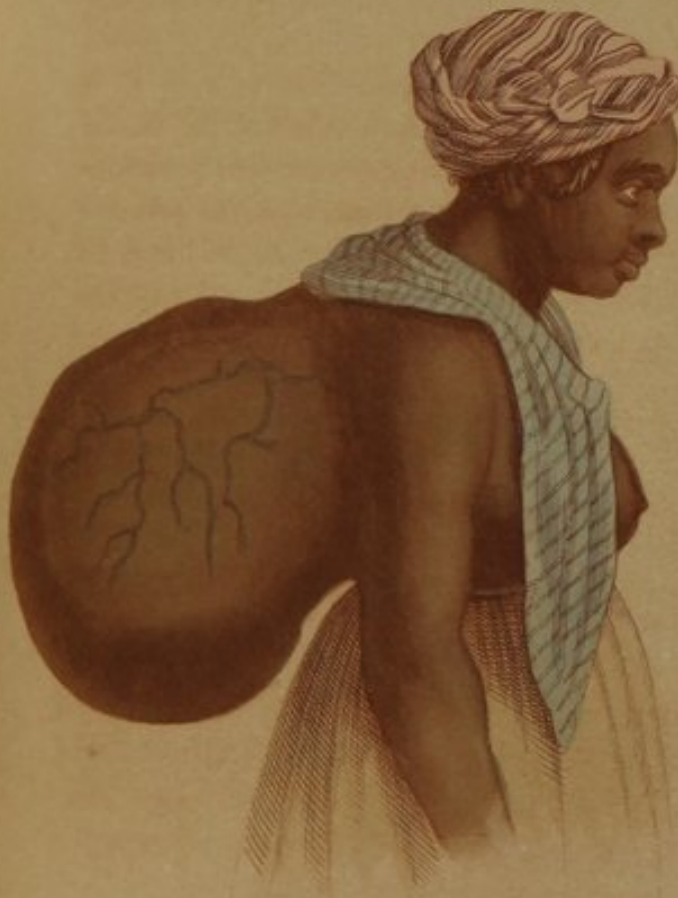


Fig. 4.

for fifteen minutes, whilst assistants elevated the tumor so as to empty it as completely as possible of blood. Then external incisions, calculated to preserve sufficient skin to cover the surface, were made; the skin dissected off from the tumor and turned back, and the tumor freed from its attachments by large and rapid incisions, although it adhered somewhat to the spinous processes of the vertebræ, and to the muscles and tendons near the spine. After cleansing the parts thoroughly, the skin was closed by adhesive straps and a bandage, and the wound healed to a considerable extent by the first intention.*

Remarks.—Steatomatous, encysted, and hygromatous tumors are also sometimes found upon the back of the neck, and may be treated by very much the same method. Some caution, however, is requisite in forming a diagnosis in these cases, lest they be confounded with Spina Bifida, the development of which is occasionally seen in this region.

In Plate XLVIII. Fig. 2, may be seen an example of one of these tumors (Hygroma), which caused doubts in the mind of Auvert as to its true character.

In wounds and fractures of the vertebral column, the surgeon may also be required to deliberate upon the propriety of such mechanical interference as may afford the hope of relief. In the cases of depressed fracture of the spinous processes the soft tissues have been incised, and an attempt made to draw out the fractured portion;† but there is so little reason to anticipate any permanent benefit from such operations, that it must suffice merely to mention the fact of their having been performed.

SECTION II.

TUMORS OF THE SPINAL CANAL, OR SPINA BIFIDA.

Spina Bifida, or Hydrorachis (ὑδωρ, water, and ῥαχις, the spine), is a disease, characterized by the presence of a soft, fluctuating, and often transparent tumor, formed by the membranes of the spinal marrow being distended by liquid, and caused to protrude beneath the integuments or directly upon the back (Plate XLVIII. Fig. 4),

* Med. Record, vol. i. p. 400. 1819.

† See cases of Drs. Alban G. Smith and Rogers. Bibliog. Index, p. lxviii.

in consequence of a congenital deficiency of some of the spinous processes of the vertebræ, whence the name of spina bifida or bifid spine. From the observation of Chaussier, it appears that of one hundred and thirty-two children born during a period of five years, twenty-two suffered from spina bifida; and Billard has seen this complaint seven times in one year among the children in the Foundling Hospital of Paris.* Without entering upon an account of the pathology of the complaint, my present limits will compel me merely to say that it is, in many points, analogous to that of hydrocephalus, and often, though not always, conjoined with this disease, and is sometimes due to mere cysts of the part. Various means of treatment have been resorted to, among the most successful of which may be mentioned pressure and acupuncturation.

§ 1.—OPERATIONS FOR THE CURE OF SPINA BIFIDA.

The various methods of treating this complaint, as practiced in Europe, seemed to have obtained but a very limited success; and the following results obtained by surgeons in the United States are, therefore, more deserving of attention, especially as they have occurred under circumstances where there could be no doubt in regard to the nature of the changes induced by the disease, or in the correctness of the diagnosis.

Operations of Dr. Amassa Trowbridge, of New York.†—A child, aged twenty-one months, was presented for advice in June, 1827, laboring under Spina Bifida. The tumor was seated over the lower cervical vertebræ; was as large as an egg; entirely covered with cellular substance, and fluctuating.

Operation.—A small silver wire being placed in a loop around the base of the tumor, the ends were passed through a short canula and drawn moderately tight, so as to produce slight inflammation on the surface at the base. In forty-eight hours, the wire was drawn tight enough to destroy all circulation in the tumor; twelve hours after which, the child became restless and feverish. In another forty-eight hours the tumor was dark-colored; suppuration had commenced around the wire, and the latter disappeared in the divided integuments, when the tumor being excised above the loop, the

* Dict. de Méd., tom. xvi. p. 49.

† Boston Med. and Surg. Journ., vol. i. p. 753. 1829.

wire came off and left an inflamed portion three-quarters of an inch in diameter, with an aperture, through which there was discharged turbid lymph or serum, with a slight arterial hemorrhage, which required the use of lint. A preternatural opening into the spinal canal being now discernible, situated between the two lower cervical vertebræ, the dressing of lint was left on for forty-eight hours, and then changed, as the fluid continued to discharge; but in twelve days more the wound had healed, and the child was subsequently as healthy as other children.

In a second case, aged two years and six months, the tumor was situated over the three lower cervical vertebræ, was represented as having been very large at birth, and now measured seven inches in circumference at its outer portion, something less at its base, and was about four inches in height. It was covered with integuments and natural skin, and fluctuation was quite distinct.

Being operated on in the manner just detailed, the ligature was allowed to remain four days after its first application, and drawn tighter three days after this, the child suffering from symptoms of phlegmonous inflammation. Nine days after the application of the ligature, the sphacelated tumor was excised, a wineglassful of turbid and bloody serum spouted out through the opening and bleeding from an artery following which required the ligature. Under a similar treatment to that first detailed, the fluid was discharged from the aperture for eight days, after which the opening gradually diminished, and in four weeks from the operation the whole wound had cicatrized. A spinous process was found wanting in the vertebral column, and there was an opening through the vertebræ which admitted the point of the little finger.

In a third case, aged four years and three months, the tumor, which was situated over the sacrum, and three of the lower lumbar vertebræ measured thirteen inches in circumference at the base, and seven in its projection from the back.*

Operation.—Incisions being made through the integuments, which were about an inch thick, from the upper portion of the base quite to the lower part over the sacrum, sufficient flap was left to cover the wound in a manner similar to that pursued in excising the female breast. On dividing the integuments, a cavity was found which contained several cysts filled with fluid, and attached to the

* Opus citat., p. 754.

spinous processes of the third lumbar vertebra. The spinous processes above and below were wanting. There being no communication with the spinal canal, the cysts were dissected out and the child recovered perfectly.*

Remarks.—Dr. Trowbridge reports having seen about thirty cases of spina bifida in all points of the vertebral column, and has tried puncture, compression, ligature, incision, &c., and often failed, but "prefers the ligature (as above directed) in all cases where the base of the tumor admits of its application."† By not tightening the ligature too much at first, only moderate inflammation is induced and the sympathetic disturbance is diminished.

Operation of Dr. Charles D. Skinner, of North Carolina.‡—The patient, aged seventeen months, presented a tumor on the spine more than three and a half inches long, two and a half wide, and one and a half deep, extending from a level with the iliac crest to near the verge of the anus, the contents of which, by firm pressure could be mostly compressed into the spinal canal. At first, puncture with a very fine needle drew off a few drops of liquid; two days subsequently a larger needle drew off a drachm; at another period half an ounce, then an ounce, and then an ounce and a half, after which pressure was applied around the base of the tumor. After about seventy punctures had been made without any serious accident, and the tumor had become reduced to one-fourth of its original size, an indiscretion of diet induced diarrhœa, under which the patient sank.

Operation of Dr. Alexander H. Stevens, of New York.§—A child eight months old, presented a tumor nearly similar in position and size to that just described. Being punctured with an iris knife, about four ounces of clear serum issued from the opening, without causing inconvenience. Three days subsequently the operation was repeated, but not more than an ounce escaped. The next day it was again punctured in three places, and about four ounces escaped without bad symptoms, and continued to ooze for nearly twenty-four hours after the operation, the child showing some febrile symptoms, but which were thought to be partly due to teething. Evaporating lotion was then kept applied to the tumor and the sac was not again punctured. These febrile symptoms soon

* Opus citat., p. 755. † Ibid., p. 757.

‡ Am. Journ. Med. Sciences, vol. xix. p. 109. 1836.

§ Ibid., p. 527. 1843.

disappeared, and the child, when seen several months afterwards, showed nothing except a small lump of indurated and corrugated integument. In this case the fluid was always evacuated very slowly, that is, at the rate of about three drops in a second, about one-third being left in the sac, and slight pressure being made after each operation, and much of the success of the treatment is ascribed by Dr. Stevens to this mode of proceeding.

Operation by Dr. D. Brainard; Injection of Iodine.*—An idiotic girl, aged thirteen years, had a tumor at the top of the sacrum nine inches in circumference, and about three in height, with thin walls; had been paralytic in her lower limbs, but recovered a partial use of them a short time previous to the operation. All her discharges were passed without attention to cleanliness. Under these hopeless circumstances the operation was performed.

Operation.—A small puncture being made with a lancet on the sound skin about half an inch from the base of the tumor, a trocar and canula the size of a common knitting-needle were carried into the sac. Through the canula a solution of water ʒi, iodide of potash grs. j, and iodine grs. ss, was thrown into the sac and the instrument withdrawn. A severe pain followed, but soon subsided; compresses and a bandage were applied to prevent the escape of the fluid, and the child was laid in bed. Redness, heat, and tension of the tumor with tenderness, and some fever supervened, but in the course of a week these symptoms subsided, and the tumor became soft, yielding, and diminished in size. Compression was then applied with as much force as could be borne. Fifteen days after the operation, the tumor was half its original size, when a second injection, half the strength of the first, was thrown in, and caused but little heat and pain, compression being continued. Nineteen days subsequently the fluid was so far absorbed, as to render it easy to press the tumor nearly to the level of the surrounding skin, when a spring truss was applied to the part, and under this the child improved.

Remarks.—The success attending the treatment of the cases just recited, is certainly sufficient to justify the surgeon in resorting to similar means when similar circumstances demand it. The injection of iodine into the cavity of the tumor, as practiced by Dr. Brainard, is due to the analogy supposed to exist between spina bifida

* Amer. Journ. Med. Sciences, vol. xvi. N. S., p. 262. 1848.

and hydrocele, and the result may, perhaps, authorize a repetition of this operation; but as this resemblance is not perfect, great care should be employed lest death ensue from an inflammation of the spinal canal. In encysted spina bifida, or that in which the communication between the sac and the cavity of the spinal canal is obliterated, the injection may prove to be an excellent plan of treatment. But in spina bifida complicated with hydrocephalus, or in that where the medullary canal is pervious, inflammation of the pia mater, or of the spinal marrow itself, should be anticipated, and then the propriety of exposing the patient to such a risk carefully weighed. The operations of Drs. Trowbridge, Skinner, and Stevens, are certainly safer and better adapted to the cure of the majority of the cases presented for treatment.

OPERATIVE SURGERY.

PART IV.

OPERATIONS ON THE GENITO-URINARY ORGANS AND RECTUM.

PART IV.

OPERATIONS ON THE GENITO-URINARY ORGANS AND RECTUM.

CHAPTER I.

OPERATIONS ON THE MALE GENITO-URINARY ORGANS.

The genito-urinary organs in man being intended for the performance of two distinct functions, to wit: the conveyance of sperm into the female, and the evacuation of the urine, occasionally demand the aid of the surgeon, either in order to remedy congenital defects, or to relieve the evils resulting from disease. Of the operations performed upon them, some are intended for the relief of deformities, and are limited solely to the body of the penis; whilst others, being intended to favor urination, are confined to the urethra. Some are limited to the testicles, and others to the removal of foreign bodies from the bladder; the latter having a special importance, will be referred to in a distinct chapter.

From the varied character of the structures concerned in these operations, it is apparent that anything like a detailed account of each part would necessarily lead into the domain of special anatomy; but, as it may facilitate the reader's comprehension of the steps of operations, subsequently to be described, I shall present a brief account of their general relations to each other.

SECTION I.

SURGICAL ANATOMY OF THE MALE ORGANS.

The genito-urinary organs of man consist in the testicles and vesiculæ seminales, and in the penis, urethra, and bladder, the penis being common both to procreation and urination.

§ 1.—THE PENIS.

The penis is attached to the front of the bones of the pelvis, at and below the symphysis pubis; is formed of skin, loose cellular tissue, corpora cavernosa, corpus spongiosum, and the urethra, and varies in size according to the vascular condition of the corpora cavernosa.

The skin of the penis is loosely attached to the body of the organ by a cellular tissue which permits great freedom of motion. At the glans penis, or anterior extremity of the organ, it is thrown into a duplicature or fold (prepuce), the inner layer of which is blended or lost in the mucous membrane covering the glans penis. In consequence of this the prepuce consists of two laminæ, the inner of which is inserted at the base of the corona glandis. Between these two layers, is a loose cellular tissue, liable to a serous or lymph-like infiltration, which sometimes materially interferes with the mobility of the part. Ordinarily, the prepuce may be retracted, or drawn forward so as to expose or cover the entire glans, though congenital defects or diseased action may so limit this movement as to prevent the exposure of the glans to any extent. The corpora cavernosa and corpus spongiosum are not sufficiently connected with the operations usually practiced on this part to require further reference at present.

I. THE URETHRA.

Although the urethra is actually a portion of the structure of the penis, the direct connection existing between it and the bladder, has led anatomists to describe it as if it were an appendage of the bladder. The importance of the canal, and the danger ensuing upon its obstruction, owing to its being the only channel for the escape of the contents of the bladder, has, however, led surgeons to a specific study of it, and to the establishment of certain regional divisions, the limits of which are useful, though purely optional.

The extent of the penis being very varied, a considerable diversity of opinion exists in reference to the average length of the urethra, or the true distance from its orifice to the neck of the bladder.

According to Blandin,* its length varies from eight to nine inches, as measured in a median section of a flaccid penis whilst laid upon the abdomen, and, of course, a little elongated.

Malgaigne,† on measuring it also in the flaccid condition, but hanging down upon the scrotum, found it to be, on an average, six, or six inches and two-fifths long. In old men, hypertrophy of the prostate augments it two-thirds of an inch, or even more.

Dr. Pancoast, of Philadelphia,‡ has found that, in the negro or mulatto, the average length is about seven inches, measuring from the end of the urethra to the neck of the bladder in the flaccid penis, and about one inch more when elongated by moderately stretching the organ; but as the genital organs of the negro are generally more developed than those of the white, it may be safely inferred that six, or six and a half inches, in white men, measuring from the orifice of the urethra, should suffice to place the point of an instrument within the neck of the bladder.

The regional division of the urethra into fossa navicularis, bulbous, prostatic, and membranous portions having reference to certain points of the genital organs through which the canal passes, does not require detailed reference in connection with operative surgery, but belongs more especially to the descriptions of special anatomy. It must therefore suffice to say that, according to Malgaigne,§ the prostatic portion of the urethra is from seven to eleven lines in length, and the membranous from six to nine lines, the bulbo-cavernous portion being the only part which is influenced by stretching the penis.

II.—THE TESTICLES.

The Testicles being suspended from the abdomen by the spermatic cord, are covered by the serous coat (tunica vaginalis testis), as well as by the dartos and scrotum.

The tunica vaginalis testis is generally a clear, smooth, and translucent serous membrane, which in the healthy condition secretes

* Anat. Topographique, p. 384.
† Philadelphia edit., p. 467.
‡ Pancoast, Wistar's Anat., vol. ii. p. 170.
§ Philadelphia edit., page 469.

merely sufficient halitus to facilitate the motion of the gland, though it may be rendered thick, firm, and even osseous by disease, and, in one instance, under my own observation, was fully two lines thick, and as firm as cartilage. Under such circumstances, great caution is requisite to prevent a mistake in diagnosis.

The cord is formed by the vas deferens, spermatic artery, veins, nerves, and lymphatics, covered in by the fatty and cellular structure designated as tunica vaginalis communis, and by the fibres of the cremaster muscle.

The spermatic artery comes out of the abdomen and pursues a tortuous course to the testicle, being surrounded by and adherent to the spermatic veins throughout the extent of the cord. The spermatic veins extend from the testicles to the abdomen; are larger than the artery, anastomose freely with the superficial veins of the scrotum, and, enveloping the vas deferens and the artery, constitute the great bulk of the cord. They are without valves and largest on the left side, in consequence probably of the pressure made upon them in their passage behind the sigmoid flexure of the colon.

The surgical relations of the bladder and perineum of the male will be reserved for the account of Lithotomy in the ensuing chapter.

SECTION II.

OPERATIONS ON THE PENIS.

The operations practiced on this organ, consist of those required for phymosis, paraphymosis, division of the frænum, and amputation.

§ 1.—PHYMOSIS (φιμος, a muzzle.)

When from congenital defect, or as the result of inflammatory action, a patient is unable to retract the prepuce and uncover the glans penis, he is liable to be incommoded either in voiding the urine, or by the impediment which it offers to sexual intercourse. To relieve this state of the parts, several operations have been suggested, that of circumcision, as practiced by the Jews, or as slightly modified, being the most ancient.

I.—CIRCUMCISION.

In the operation of circumcision, as originally performed, the prepuce, after being drawn forwards, in advance of the end of the glans, by the fingers of the operator, was inserted in the cleft of a sort of spatula, the protruding portion excised by the sweep of a knife, and the mucous lining, torn open to the corona glandis, a strip of linen to prevent adhesion, completing the dressing.

As usually performed by surgeons of the present day, circumcision is accomplished as follows:—

Operation.—The prepuce being first drawn well forwards, the projecting portion is seized in a pair of dressing-forceps, and then excised on a level with the blades of the instrument, either by means of a bistoury or scissors, a few stitches of the interrupted suture, to unite the mucous coat to the skin, and a piece of lint, completing the dressing.

Remarks.—Several slight modifications of this operation have been suggested by Velpeau and Ricord, but as they are sufficiently explained in Plate XLIX., further reference is here unnecessary.

II.—INCISION.

Various plans of slitting up the prepuce have been suggested by different surgeons, in order to free the glans, and yet not create deformity. The selection of one method rather than another, will therefore depend mainly on the complications of the case, and especially on the existence of chancre.

Ordinary Operation.—In the mode of operating resorted to under ordinary circumstances, the patient is so placed that he cannot move from the surgeon, when the latter, after carefully introducing a director between the prepuce and the glans as far back as the corona glandis, passes a sharp-pointed bistoury along it, punctures the skin from within outwards at the end of the director, and then slits open the membrane from behind forwards in the median line, upon the dorsum of the organ (Plate XLIX. Fig. 2). The glans being thus exposed, it only remains to unite the fold of skin and mucous membrane together by three stitches of the interrupted suture, and treat the wound as a simple sore.

Operation of J. Cloquet.—In consequence of the wings, or

PLATE XLIX.

OPERATIONS PRACTICED ON THE PENIS.

Fig. 1. Section of the Frænum when too short. 1. The bistoury transfixing the prepuce, so as to shave it off from behind forwards.
After Bernard and Huette.

Fig. 2. Ordinary operation for Phymosis. 1. The director carried between the glans penis and the prepuce, as far back as the corona glandis. 2. The bistoury puncturing the prepuce behind, and about to slit it open on the median line from behind forwards. After Bernard and Huette.

Fig. 3. Excision of the flaps created by the preceding operation. 1. Rat-tooth forceps holding both the mucous lining and skin of the prepuce. 2. Scissors in the act of excising the flap. After Bernard and Huette.

Fig. 4. Cloquet's operation, sometimes assigned to Liston, but also described in Celsus. 1. The director passed between the glans and prepuce, alongside of the frænum. 2. The bistoury slitting up the prepuce.
After Bourgery and Jacob.

Fig. 5. Ricord's operation for Circumcision. 1. The forceps holding the prepuce in advance of the glans. 2, 2. Ligatures passed through the prepuce for the purpose of subsequently uniting the skin and mucous membrane.
After Bernard and Huette.

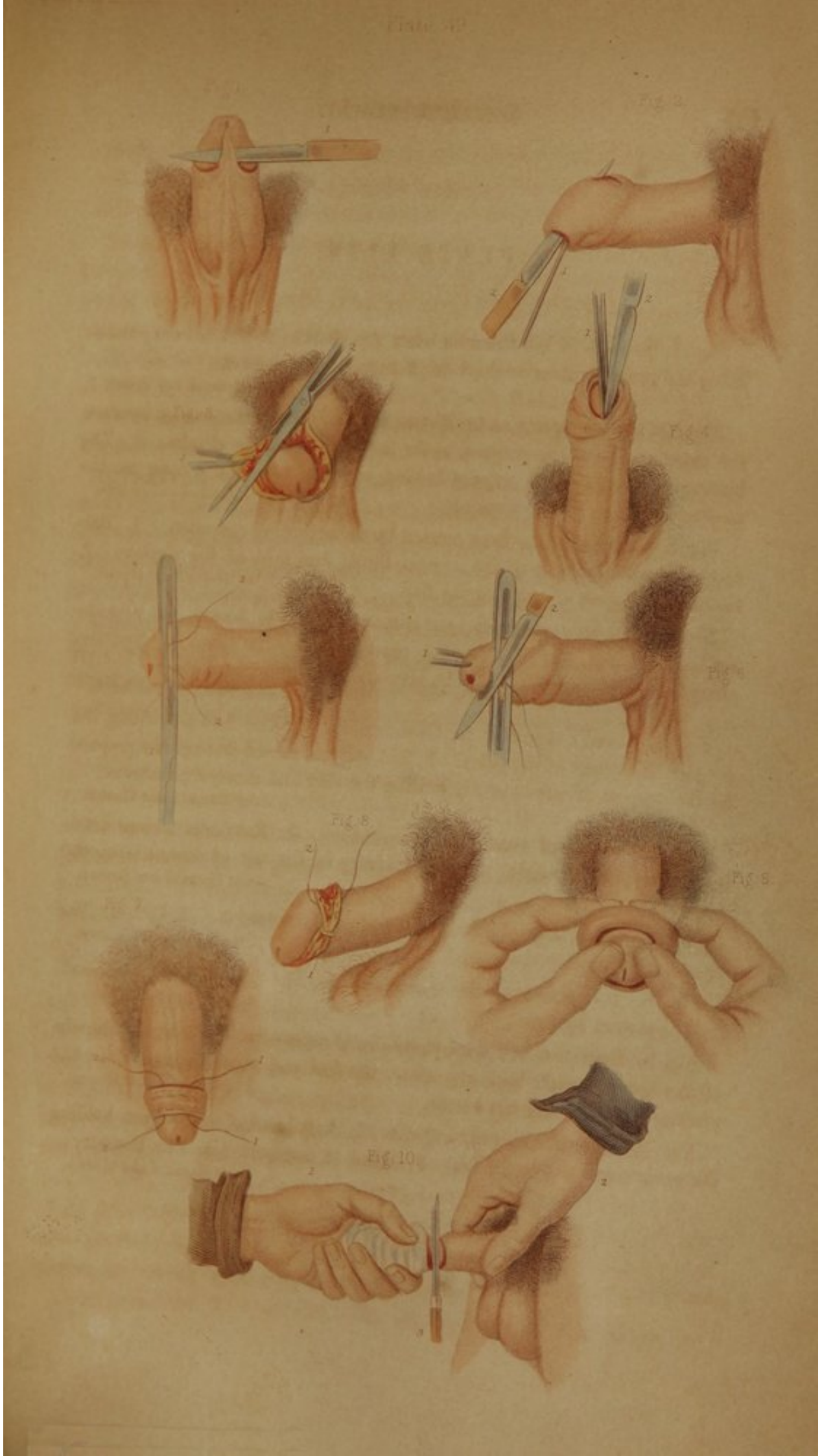
Fig. 6. The second stage of this operation. 1. Rat-tooth forceps drawing the prepuce forwards. 2. The bistoury in the act of circumcising the prepuce. After Bernard and Huette.

Fig. 7. Appearance of the Prepuce after Circumcision. 1, 1, 2, 2. The ligatures for uniting the wound. After Bernard and Huette.

Fig. 8. Completion of the operation. 1. The first suture as applied. 2. The second ligature. After Bernard and Huette.

Fig. 9. Reduction of Paraphymosis by Compression. Whilst the thumbs of the operator push back the glans, the first and second fingers draw the prepuce forwards over the corona. After Bernard and Huette.

Fig. 10. Amputation of the Penis. 1. Left hand of the surgeon holding the penis enveloped in a cloth. 2. Hand of assistant. 3. The Bistoury.
After Bernard and Huette.



lateral lumps, left by the preceding method, Cloquet suggested the following operation, which has since been frequently performed by Liston and others, and often spoken of as Liston's operation.

Introduce a director between the glans penis and prepuce, on the inferior side of the organ, and place it parallel with, and alongside the frænum, taking care that it is not by any mischance carried into the urethra. Then passing a sharp-pointed bistoury along it to the corona glandis, transfix the prepuce, and slit it up from behind forwards on the side of the frænum, when the glans will be fully exposed (Plate XLIX. Fig. 4). After this a point or two of the interrupted suture made so as to unite the skin and mucous membrane on the free side of the flap, completes the operation.

Operation of Cullerier.—As the constriction of the preputial orifice is often dependent on a contracted condition of the lining membrane of the prepuce, this surgeon operated by incising only the mucous membrane, commencing at its free edge and cutting backwards to a sufficient extent to permit the free expansion of the skin. A somewhat similar plan has been recommended by Dr. E. Peace, of Philadelphia, and found to be efficient.

Remarks.—Although the operations for the relief of phymosis are simple, the future usefulness of the organ, and the absence of evident deformity will depend somewhat upon the plan selected. Where the defect is a congenital one, the selection of the method is entirely in the power of the surgeon, and, under these circumstances the advantages of the different plans should be well considered, especially if the patient is an adult. In the operation of circumcision, as usually practiced, the cicatrization of the wound is apt to leave such a constriction of the mucous membrane as prevents the free exposure of the gland, and has occasionally led to the production of a new phymosis. To obviate this, it will, therefore, be found advantageous, where circumcision is practiced, to pursue the Jewish plan of operating, and, after excising the skin, to tear up the mucous membrane longitudinally on the dorsal surface of the penis, instead of incising it, by which means the constriction of the cicatrix will be prevented, in consequence of the more tardy union of the lacerated surface.

Frequent opportunities of testing the advantages of the plan of Cloquet having satisfied me of its value, I do not hesitate to recommend it as that best adapted to the adult, because it fully exposes the glans, and leaves little or no lateral deformity, as is frequently the case in the dorsal incision. Should the existence of chancres near

the frænum, or other circumstances, prevent its performance, and compel the adoption of the dorsal cut, I should prefer excising the two flaps and uniting the mucous membrane and skin at the line of the corona, so as to leave the glans permanently uncovered.

§ 2.—PARAPHYMOSIS.

PATHOLOGY.—The word Paraphymosis (παρα back, and φιμοσις a bridle) is employed to designate that state of the penis in which the prepuce is drawn back and contracts the corona glandis, so that it cannot be again brought forward. In many instances, this condition is owing to a difference between the two layers of the prepuce, the skin being the narrowest, though it may be caused by the constricted margin of the prepuce being so distended by the shape of the head of the penis, that it readily slips over to the corona, but cannot subsequently be drawn forwards in consequence of the congestion and enlargement of the glans which ensues upon its constriction.

When a paraphymosis is allowed to continue, the prepuce may slough, or adhesions form, so as to render the thickened folds behind the glans a great deformity, and two means of treatment may be resorted to for its relief; one (compression), having for its object the diminution of the bulk of the head of the penis; the other (incision), the division of the constricting ring or margin of the prepuce.

I. COMPRESSION.

After bathing the part in cold water, or keeping cold cloths constantly on it, compression may be attempted as follows:—

OPERATION.—Place a piece of soft linen upon the retracted prepuce, seize it just behind the glans between the first and second finger of each hand so as to draw it forwards, and at the same time apply the thumbs against the extremity of the glans so as to knead and force it backwards, when, after a gentle perseverance success will, in many instances, be obtained (Plate XLIX. Fig. 9). Where there is much œdema of the prepuce and the mucous membrane is highly tumefied, I have often found it advantageous to puncture the latter at numerous points, so as to give exit to the

serum and allow of the more ready movement of the one layer upon the other, after which I practice compression as before.

II. INCISION.

Occasionally, however, the constricting prepuce is so tight, or the adhesions so close as to require the knife.

Operation.—Let one assistant retract the skin of the penis as much as possible towards the pubis with one hand, and draw the prepuce forwards with the other so as to display, if possible, the seat of stricture, after which the surgeon may nick it with a bistoury, cutting from behind forwards; or introduce a director, and cut upon it; or, what is more easily done, make a vertical cut through the prepuce from above downwards and from the mucous membrane to the skin, until the constriction is freely divided. The latter operation, by enlarging the prepuce, prevents a reproduction of the disease.

§ 3.—DIVISION OF THE FRÆNUM.

When from congenital defect the frænum extends as far forwards as the extremity of the urethra, it may depress the point of the glans, and cause inconvenience in sexual intercourse; or the irritation and laceration of the part, or mental anxiety in regard to the defect, may lead the patient to insist upon its section. Under these circumstances the operation may be performed as follows:—

Operation.—After arranging the patient so that his motions can be controlled, retract the prepuce, and let an assistant hold it back and support the penis, whilst the surgeon, drawing the frænum from the glans with his left hand, transfixes it with a bistoury held in the right (Plate XLIX. Fig. 1), so as to cut from behind forwards and shave it off. A piece of linen to prevent adhesion is all that is requisite, or the surface may be lightly cauterized.

§ 4.—AMPUTATION OF PHE PENIS.

Amputation of the penis may be demanded by wounds, gangrene, &c., as in the operation practiced upon the extremities, though can-

cer is the most frequent cause of its performance. When demanded, the anatomical relations of the organ should be borne in mind, especially the loose attachment of the skin, and the tendency of the penis to shrivel up and contract upon itself, after being stretched. The latter circumstance is often a source of trouble where means are not taken to obviate it, the surgeon being worried by the unexpected difficulty found in arresting the bleeding, or annoyed by the excess of skin over the stump, in consequence of his elongating the organ during his incisions. When the amputation is to be performed low down, or near the pubis, especial care should be taken to avoid drawing the skin too much forwards, lest that over the pubis or scrotum be removed unintentionally.

Operation.—Having prepared a small catlin, together with ligatures, tenaculum, and forceps, the hair should be shaved from around the part, and the glans and free end of the organ wrapped in a bandage so as to give the operator a good hold upon the member. Then whilst the patient is in a convenient position, the surgeon, without drawing upon the portion held in his left hand, should pass the catlin rapidly round so as to divide the skin (Plate XLIX. Fig. 10); then cut through the upper part of the corpora cavernosa, ligate the arteries, and, resuming the knife, finish the operation by dividing the remainder of the organ at one sweep.

Dressing.—After arresting the hemorrhage, a catheter may be passed into the urethra, and the stump dressed like any other stump, the catheter serving to keep the patient dry, and steady the organ during the dressing. As, however, the urine will do no harm to the wound, and irritability of the bladder may render the use of the catheter objectionable, a resort to it must be decided upon at the moment by the judgment of the operator.

Remarks.—The performance of amputation of the penis at the pubis does not differ materially from the plan just detailed for the operation upon the body of the organ. An elliptical incision will, however, be preferable to the circular one above mentioned, care being taken to avoid encroaching too much upon the skin of the scrotum. When the penis is removed near the pubis, the patient is also more apt to be annoyed by the urine passing upon his thighs and perineum, unless he places himself in a sitting position. Under all circumstances, the mental depression after the operation is often sufficient to prevent proper digestion and assimilation, and, the return of a malignant disorder being thus hastened, it may be

doubted whether, in the case of cancer, anything is gained by the operation. In one patient, under my own observation, though life lasted for nearly two years after the removal of the organ in consequence of cancer, his existence was one of extreme unhappiness, the man being constantly distressed by mental anxiety and bodily pain, and the disease showing itself in the stump in a few weeks after the amputation.

SECTION III.

OPERATIONS ON THE URETHRA.

The necessity of passing through the urethra in order to accomplish the treatment of some of the complaints of the bladder, has caused many operations to be placed under this head that do not strictly belong to this region; such, therefore, as involve disorders of adjacent parts may be advantageously referred to a subsequent section. At present catheterism, stricture, and congenital malformations of the canal will alone be considered.

§ 1.—CATHETERISM.

The removal of urine through the hollow tube called a catheter constitutes the operation of Catheterism, and is one which in the normal condition of the canal, and in skilful hands, is easily performed. Various details may, however, be given, in order to facilitate the progress of those who are inexperienced.

I. CATHETERS.

The selection of the catheter (either of silver or caoutchouc) is so purely a matter of personal opinion, that nothing need be said in reference to the material, except to discountenance the use of gutta percha, which is dangerous from its brittleness. When the surgeon, especially in the country, is so placed as to find it desirable to evacuate a patient's bladder whilst unable to obtain the regular instrument, the following practice, suggested and occasionally advised by the

PLATE L.

INSTRUMENTS FOR OPERATIONS ON THE URETHRA.

Fig. 1. A Male Silver Catheter. The eye is better than the perforations usually made, as such an opening will not clog with mucus. Schively's pattern.

Fig. 2. Curve of the catheter adapted to old men with enlarged prostate. After Dorsey.

Fig. 3. Small silver sound for the purpose of dilating or detecting a stricture of the urethra. Schively's pattern.

Fig. 4. Largest size sound for same purpose. " "

Fig. 5. Smallest size of the instrument. " "

Fig. 6 Flexible lead bougie for dilating strictures; it may be retained in the bladder many hours without creating irritation. Schively's pattern.

Fig. 7. French Bougie with a "porte empreinte" for taking a cast of a stricture. 1. The "porte empreinte." From the instrument.

Fig. 8. Amussat's instrument as applied to dilate a stricture; being introduced closed, the loop is expanded by the screw. Schively's pattern.

Fig. 9. Chew's stylet for dividing stricture. It is to be introduced into a silver catheter, like Fig. 14. Schively's pattern.

Fig. 10. French-pointed gum-elastic bougie for dilating stricture. From the instrument.

Fig. 11. Physick's stylet for incising stricture in the spongy portion of the urethra. 1. Slide to mode the blade. Schively's pattern.

Fig. 12. Steel bougie silvered, and of double curve, to dilate strictures; there are two ends, of different sizes, embraced in each instrument. Schively's pattern.

Fig. 13. Lallemand's porte-caustic for cauterizing the urethra. 1. Cup for the caustic. Schively's pattern.

Fig. 14. A curved catheter and stylet for dividing strictures near the neck of the bladder. Schively's pattern.

Fig. 15. Extra end of another curve. " "

Fig. 16. Physick's Bougie Catheter for entering the bladder in cases of stricture. After Dorsey.

Figs. 17, 18. Shape of the piece of wax-cloth before it is rolled into the bougie, and attached to the catheter. After Dorsey.

Fig. 19. The complete instrument. " "

Plate 50.

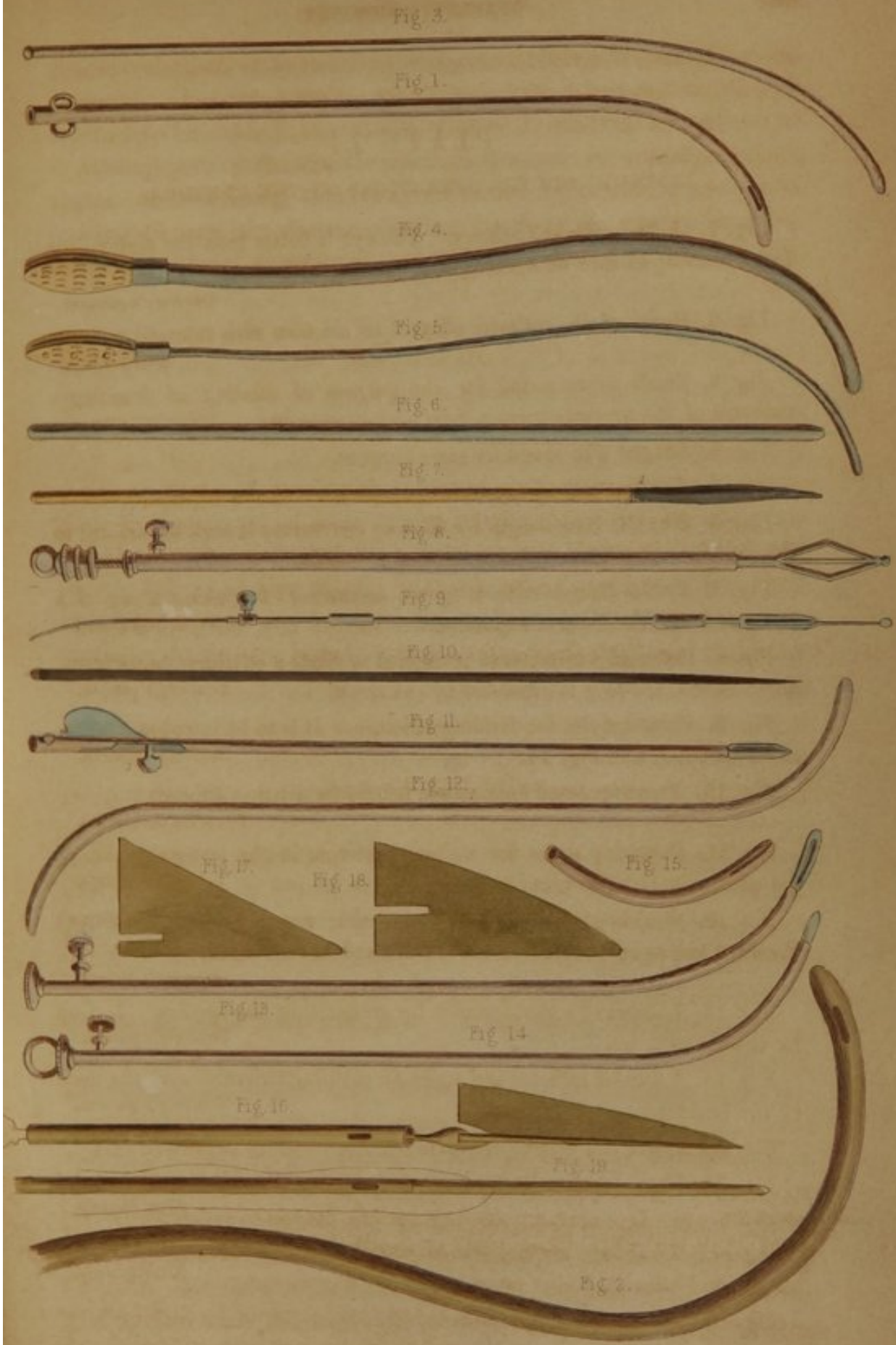


Fig. 3.
Fig. 1.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 17.
Fig. 18.
Fig. 15.
Fig. 13.
Fig. 14
Fig. 16.
Fig. 19.
Fig. 2.

late Dr. Physick, may prove worthy of being noted. In a case of great emergency this distinguished surgeon resorted to a common article of dress, and formed a catheter by regularly extending the elastic spiral wire often found in the suspenders of gentlemen, covering it with a piece of muslin which had been dipped in melted beeswax, and then cutting eyes near the point.*

Another excellent contrivance, suggested by a surgeon in the United States whose name has escaped my recollection, is to hammer out a piece of sheet-lead and roll it round a large knitting-needle, and then make eyes in it as required.

II. ORDINARY OPERATION OF CATHETERISM.

Whilst the patient is lying down with the shoulders elevated, the knees flexed, and breathing freely, so as to insure relaxation of the abdominal muscles and prevent straining, the surgeon should place himself upon the left side, oil the instrument, and seize the corona glandis between the ring and second fingers of the left hand in a state of supination (Plate LI. Fig. 1), or between the forefinger and thumb; then seizing the handle of the catheter with the right hand, so that the fingers are below and the thumb on top, introduce its point into the urethral orifice, perpendicularly to the pubis, the body of the instrument being held parallel with the median line of the abdomen, and its concavity presenting to the pubes. After gradually elevating the right hand and keeping the point of the instrument in contact with the superior side of the urethra, press the catheter towards the bladder, bringing the handle from the horizontal to the perpendicular position, and thus carrying the point through the bulb of the urethra. Then gradually depressing the handle so as to bring it parallel with the thighs of the patient, cause the point to mount over the triangular ligament, when the gush of urine may be checked by the thumb placed over the orifice of the instrument until a vessel is held to receive it. In this movement the end of the instrument should be made to describe the arc of such a circle, as will enable the point to pass readily behind the pubes (Plate LI. Fig. 4). After evacuating the bladder keep the end of the catheter closed with the thumb until the

* Dorsey's Surgery, vol. ii. p. 167.

instrument is removed from the patient and held over a vessel, when on freeing it, the urine which has filled the instrument will escape without soiling the patient.

The "tour de maitre" or "master-stroke" has no advantages over the plan just described, and savors somewhat of charlatanism. Any rapid movement in the introduction of instruments into the urethra should be discouraged, as unnecessarily exposing the patient to danger.

III. OBSTACLES TO CATHETERISM.

Although the introduction of an instrument into the bladder is under ordinary circumstances a very easy operation to one perfectly familiar with the anatomical relations of the part, it may be rendered one of great difficulty in consequence of certain peculiarities which will now be mentioned.

If the instrument is a fine one, its point is liable to enter an enlarged lacuna. To obviate this it will be necessary to withdraw the catheter a little and elongate the urethra; or, its point may be made to bear so much on the inferior side of the urethra, in consequence of a too sudden elevation of the handle, that it will strike against the triangular ligament or be driven through the membranous portion between the bladder and rectum; or, a false passage may lead it, as I saw in one instance in the hands of an ignorant practitioner, out towards the *tuber ischii*. Again, especially in old men, there may be such a condition of the third lobe of the prostate as will prevent the entrance of the instrument into the bladder.

To overcome this latter difficulty, it is absolutely necessary that the point of the instrument should be made to curve upwards a little more behind the pubis than is usually required, and various means of accomplishing it have therefore been suggested. The simplest of these is to introduce the left forefinger into the anus and press up the instrument: but where the flexible catheter with a wire stylet is employed, Mr. Hey, of England, accomplished the same object by gently withdrawing the wire a little, and pushing the catheter onwards, a practice which has often been successfully resorted to. The proper curve may also be obtained by introducing the end of the wire for the extent of a quarter of an inch into the tube of a key, and then gently bending up the point, before it is inserted into the catheter.

As a flexible wax bougie, by adapting itself to the condition of the part, will often pass more readily than a catheter, Dr. Physick was accustomed to attach a bougie point to the catheter in the following manner:—

PHYSICK'S BOUGIE CATHETER.*—Cut off the point of a flexible French (gum-elastic) catheter, so as to leave the canal open throughout the instrument; then rolling up a piece of waxed linen so as to form a conical pointed bougie, make a slit half an inch long in its lower end, so that the rolled part may be inserted into the catheter. The other portion of the linen being now wrapped around the outside of the instrument, and fastened with a strong thread (Plate L. Fig. 16), the latter should be stitched through the end of the bougie and brought out of the open end of the catheter, so as to secure the extraction of the point, if accidentally broken off.

Should these means, judiciously employed, fail to empty the bladder, its contents may have to be evacuated by cutting instruments, in the manner hereafter shown.

§ 2.—STRICTURES OF THE URETHRA.

PATHOLOGY.—Strictures of the urethra have been divided into those dependent on spasm of the part and those due to such morbid changes in the parietes of the canal as result in a progressive diminution of its calibre, until at last it offers a marked obstacle to the escape of the urine from the bladder. The latter class of strictures, being the result of marked changes in the part, are usually designated as permanent strictures, and may be due to any cause capable of inducing inflammatory action in or around the mucous coat of the canal. Whether this action results in a simple bridle or thread-like deposit, or in one of greater breadth and extent, there is usually noted more or less thickening of the mucous membrane, as well as solidification or induration of the adjoining tissues. In front of a stricture there may be but little departure from the normal condition of the lining membrane of the urethra up to the edge of the obstruction; but behind it the canal is often considerably dilated, either in its entire circumference or on one side, whilst the adjoining lacunæ and entire mucous coat indicate the effects of these changes,

* Dorsey's Surgery, vol. ii. p. 170.

by their various departures from the natural state. It has also been asserted that softening and dilatation is often present at one or more points adjacent to the stricture of the urethra as well as in that of the œsophagus.*

The most frequent seat of the permanent stricture is behind the bulb or at the commencement of the membranous portion, though it is also found at other points, and especially at the middle of the spongy structure, where the canal is liable to be bent in the attacks of chordee which accompany gonorrhœa.

Diagnosis.—The existence of stricture, though often indicated by marked symptoms, can only be accurately told by such an exploring operation as brings an instrument directly in contact with the obstruction. To do this correctly it is essential that the operator should have a correct knowledge of the natural relations of the part; that the instrument first employed be sufficiently large to distend the canal and thus cause its point to escape the orifice of any enlarged lacuna, and that the ordinary difficulties referred to in catheterism be borne in mind. After establishing the existence of the complaint it is also essential that its position, extent, character, and permeability be accurately learned before deciding on the plan of treatment.

Various means have been suggested in order to demonstrate accurately the condition of a stricture, among which the use of soft bougies, or those formed of waxed linen, have been the most prominent. When one of these instruments—of the full size—is oiled, carried down to and pressed firmly against a dense stricture for a few minutes, it softens by the heat of the body, and takes such an impression as will show accurately the position of the obstruction. But as the less dense strictures are incapable of marking their own position upon such an instrument, the following plan, which is a slight deviation from that suggested by Ducamp, will prove serviceable.

To take a Cast of a Stricture.—Take a piece of silk ribbon about two inches wide and three inches long, and cut it obliquely across (Plate L. Fig. 17); then pull out all the transverse threads to within three-fourths of an inch of the length of the piece; next melt equal parts of beeswax, shoemakers' wax, and resin in a cup; fasten the sound part of the ribbon to a wax bougie, by a stitch, or by thread wound around it, and, dipping it into the melted mixture,

* See page 274, Part III.

saturate the longitudinal threads of the ribbon with the wax; dip this into cold water, and then mould it, by pressure with the thumb and fingers, into a conical shape (Plate L. Fig. 7). On carrying a bougie thus armed down to a stricture and pressing it gently against it, a perfect cast of the part may be taken, provided the bougie and waxed end are large enough to fill up the canal.

TREATMENT.—Having learned the character and position of the disease, attempts may now be made to overcome it, either by dilatation, incision, or the use of caustic.

I. DILATATION.

As the dilatation of a stricture can only result from a force which acts from within, it is evident that this mode of treating the complaint is only applicable to such as are sufficiently free to permit the entrance of the bougie, and sufficiently flexible to permit of their being distended. Dilatation is therefore usually accomplished by first passing a large bougie down to the stricture, in order to show its distance from the fossa navicularis; then passing one sufficiently fine to penetrate it, and then another, each of them being allowed to remain a moderate length of time, when they should be withdrawn, and subsequently replaced by those of greater bulk, until at last the stricture is sufficiently distended to permit the free passage of the urine.

Bougies, made of the bark of the Ulmus Fulva, have been suggested within the last few years by Dr. Waters, of Maryland, as especially advantageous in dilating strictures; but personal experience has shown me that they are brittle, dangerous, and have no advantage over the bougie of gum-elastic. Those of gutta percha are also objectionable, and have been broken off in the canal.

II. INTERNAL INCISIONS.

As some strictures are, however, too dense to admit of dilatation, or so tight or so situated as to render it difficult or impossible to enter them, it has been suggested that it would be preferable to cut through the induration by means of a lancet applied so as to act through the canal itself. Such an incision is especially demanded

in cases where it is required to evacuate the bladder promptly, or in those where the resistance forbids the hope of any advantage from dilatation.

Instruments.—Among the various instruments resorted to by surgeons for the purpose of dividing a stricture, I shall select as especially good the lancet, or stylet catheter, of Dr. Physick, of Philadelphia, and that of Dr. Chew, of New Orleans.

Physick's Stylet Catheter for Dividing Strictures.—This instrument consists of a silver catheter, curved so as to pass readily as far as the stricture, in which is concealed a lancet that may be protruded at pleasure. (Plate L. Fig. 11.)

Operation.—The catheter, being passed down to the stricture, is pressed against the obstruction, the lancet protruded to the extent of two or three lines, so as to cut into the thickened part, the blade retracted, and the catheter again pushed forwards in the opening thus made, until at last it can pass beyond the obstruction, and restore the permeability of the channel. A common catheter being afterwards introduced, should be allowed to remain a few days, until the incisions have healed; when, by repeated introductions of a dilating bougie, the subsequent contraction of the part may be prevented.

Chew's Instrument for Incising and Dilating a Stricture.—A useful modification of the stylet of Physick may be found in the instrument of Dr. Chew, of New Orleans (Plate L. Fig. 9). This instrument consists of a silver catheter, open at the point, and split so as to permit a double-edged knife to be projected from it. The point of the knife is blunt, and pierced for the passage of a probe-pointed wire. The knife and probe being closely withdrawn within the point of the catheter, the latter is passed down to the stricture, the probe, gradually protruded, passes within it, and the knife, guided in the proper course by the probe, is pushed on gradually, until it divides the stricture; when, being retracted, the catheter is pushed on into the bladder, and the parts subsequently dilated by the constant use of bougies.

III. EXTERNAL INCISIONS.

In some cases of stricture where it was impossible to pass an instrument, and especially in patients who had stricture in advance

of the bulb, the older surgeons made a button-hole incision from without inwards, as follows:—

Operation.—A director or sound, being passed down to the stricture, was there held by an assistant whilst the surgeon made an incision through the inferior portion of the parietes of the urethra, upon the point of the sound. Then directing the patient to endeavor to urinate, the surgeon passed a probe in at the bottom of the wound, and searched for the portion of the urethra behind the stricture, or cut backwards until he found it; after which a catheter was carried into the bladder through the penis, and the opening in the urethra closed upon the catheter by sutures.

Remarks.—This mode of treating stricture yet has its advocates; but it is especially adapted to such as are situated near or in advance of the bulb.

IV. CAUSTIC.

The removal of stricture by the application of caustic is a mode of treatment that has much to recommend it, and may be accomplished by various instruments, according to the character, position, and extent of the stricture, the principal object being to retain the caustic in contact with the constricted part sufficiently long to produce an eschar. When caustic potash is employed, thirty seconds will usually be sufficient, after which its further action should be arrested by injecting sweet oil: but, when the nitrate of silver is used, from one to three minutes may be required, the time varying according to the density of the stricture and the inflammatory tendency of the patient.

The instruments employed to introduce these caustics have been very varied, but need not be specially referred to, the selection of any one being influenced mainly by the taste of the operator. I shall therefore merely mention the mode of applying it recommended by Ambrose Paré and Hunter,* as it is one which personal experience has taught me is sufficient for the ordinary varieties of stricture at any point where an instrument can be applied.

Operation.—Select a metallic canula or catheter, open at both ends, of sufficient size to distend the urethra to its utmost extent, and pass it down to the obstruction; then arm securely a smaller canula

* Mott's Velpeau, vol. iii. p. 1060.

with a morsel of caustic, so that it may project about two lines beyond the canula. Pass the smaller within the larger canula, carry it down to the stricture, retain it in contact with the obstruction for the time above directed, and, withdrawing it, inject oil or salt and water into the urethra through the larger canula, before the latter is withdrawn. After the caustic has been applied in this manner, at intervals of from three to eight days, according to the inflammation which may have been induced, forcible catheterism, if judiciously performed, will generally perforate the obstruction; after which, lateral cauterization, occasionally practiced by means of Lallemand's or some similar instrument, will diminish the risk of subsequent contraction.

Remarks.—The treatment of strictures of the urethra by any of the means just detailed is an operation requiring much judgment on the part of the operator, lest the force applied through the instrument lead to a perforation of the walls of the urethra and the production of a false passage. But when the surgeon is guided by a correct knowledge of the structure concerned, as well as of the changes produced in the canal by disease, any of the plans just mentioned may be safely employed; the selection of one rather than another being mainly the result of the peculiarities of the case.

In estimating the value of any plan, it should, however, be recollected that a permanent stricture is a diminution of a canal which is due to inflammatory thickening; that this thickening, or obstruction, often presents us with a species of inodular tissue, or organized lymph similar to it; and that, like ordinary cicatrices in the skin, the parts about it do not lose their contractile tendency for months. If, then, even in a moderately tight stricture, dilatation is resorted to, and forced catheterism practiced, a passage may be created and gradually enlarged under mechanical force, and yet so little change effected in the vital action of the part that, on the cessation of the dilating means, the stricture will be liable to return, as is daily seen in cases where the occasional use of the bougie is not pursued by the patient after leaving the hands of the surgeon. When, therefore, patients who have had small and tight strictures, and are barely able to urinate, have, whilst treated by a gradual augmentation in the size of the instrument, been enabled to void a full stream, and to receive a full-sized instrument readily, they should not be allowed to return home impressed with the certainty of their cure, but should be made aware of the risk of neglecting the intro-

duction of the instrument, as it is not uncommon to find them in twelve months, more or less, afflicted by a reappearance of many of their old symptoms. Dilatation, therefore, though very prompt and useful in many cases, is a plan of treatment liable to induce a false security, as it merely palliates, but does not radically remove the complaint unless persevered in for a long period.

When incisions are made through a stricture, either by internal scarifications, as practiced with the stylet of Physick, or by the button-hole incision of the older surgeons, or by that which has lately been so highly lauded by Mr. Syme, of Edinburgh, there is also little change made in the action of the part that can induce a hope of the permanent removal of the obstruction. As a means of insuring the prompt evacuation of the bladder, these incisions are highly serviceable, and that resulting from the use of the stylet of Physick does away with the necessity of tapping the bladder through the rectum, but it does little towards curing a stricture. The creation of internal or external incisions necessarily gives rise to new cicatrices, and these cicatrices ultimately increase the tendency to contraction. Although useful as a means of forming a communication with the bladder, I would yet caution the inexperienced operator against the omission of dilatation for a long period, after the passage is apparently perfectly permeable.

The application of caustic is, I think, the best means of removing the diseased structure, and has many points worthy of deliberate and unprejudiced consideration. When an eschar is formed, either by the rapid action of the potassa fusa, or by the slower effects of nitrate of silver, a certain amount of action is induced in the surrounding parts, which increases the activity of the absorbents, and hastens a permanent cure. Enlargements of all kinds, even of bones, have often yielded to a similar stimulus, whilst the ulceration resulting from the separation of the eschar always tends to union by granulation rather than by actual contact, as is the case in incisions. But the application of caustic requires much care, as its action may extend to the sound parts, unless carefully watched; and on this account its employment is objected to by many operators. By fully distending the sides of the urethra in the manner mentioned, and applying the article as above directed, it is, however, difficult for the article to touch any other part than that which is directly in front of it, whilst the introduction of oil after the use of caustic potash, or of salt and water after that of the nitrate of silver, will effect such a change as

PLATE LI.

OPERATIONS PRACTICED ON THE URETHRA.

Fig. 1. Catheterism. The penis is held in the left hand between the thumb and forefinger, so as slightly to elongate the urethra, and prevent the presence of folds of the mucous membrane, whilst the second and third fingers push back the prepuce. The point of the catheter is about to enter the orifice of the urethra. After Bourgery and Jacob.

Fig. 2. A section of the pelvis and abdominal parietes to show the relation of the parts, and position of Lallemand's porte caustic, whilst passing through the prostate, in the operation of cauterization. After Bourgery and Jacob.

Fig. 3. A similar section, showing the position of a catheter when being introduced into the bladder. The vertical line represents the plane of the symphysis pubis. The first position of the catheter, when its point has reached the membranous portion of the urethra, makes an arc of from 60° to 80° as at 1. Depressing it yet more, about 25° or 30°, as at 2, elevates the point beneath the pubis, and carries it into the neck of the bladder. The circle 1, 2, 3 shows the line of motion of the mouth of the instrument; if the mouth is depressed more than the angle marked at 3, the instrument will drag on the suspensory ligament, and may injure the third lobe of the prostate, and the bladder. After Bourgery and Jacob.

Fig. 4. Puncture of the bladder through the urethra by means of the stylet catheter of Physick. 1. Course above the prostate in consequence of the too early depression of the mouth of the instrument. 2. Puncture through the prostate near the natural line of the urethra. 3. Course below it. After Bourgery and Jacob.

Fig. 5. A button-hole opening made in order to remove a stricture in the urethra. 1. A director passed down the urethra to the front of the stricture. 2. Another director introduced through the perineal puncture. 3. The bistoury enlarging the perineal incision. After Bourgery and Jacob.

Plate 51.

Fig. 1.

Fig. 2.

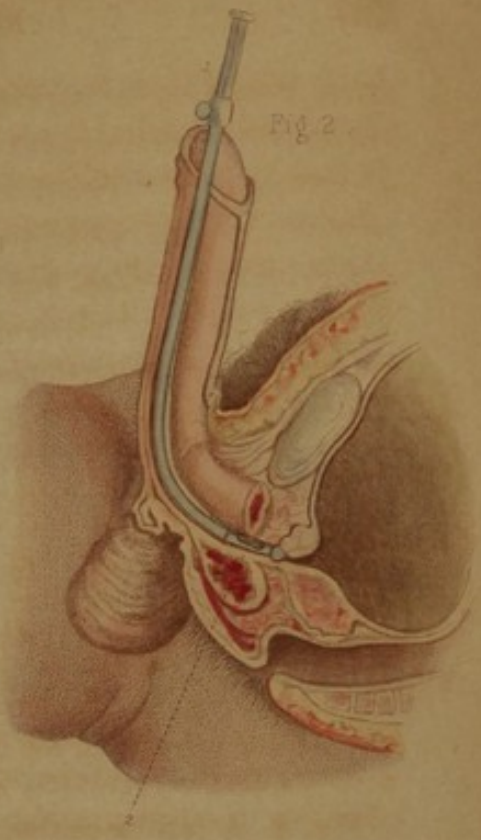


Fig. 3.

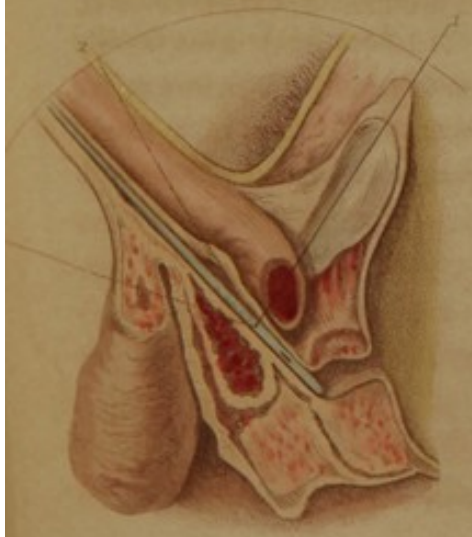


Fig. 4.

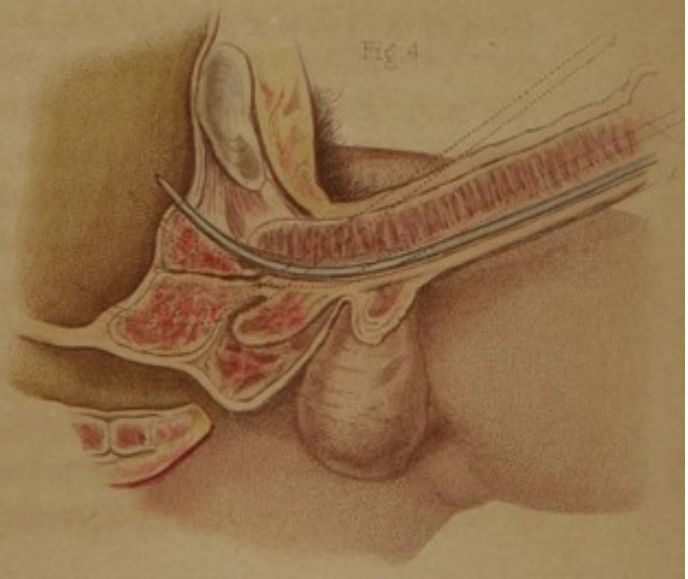


Fig. 5.

will neutralize either article. In the treatment of old and dense strictures, I should prefer, therefore, the treatment by cauterization; in those which are small and recent, the employment of bougies for the purposes of dilatation; but in impervious strictures, or in a bad case of retention of urine, I would resort to Physick's stylet.

§ 3.—FISTULA IN PERINEO.

PATHOLOGY.—When the existence of a deep-seated stricture has led to a dilatation and rupture of the urethra behind it, the following effects may be noted: The urine, when expelled from the bladder, escapes into the surrounding cellular tissue, and either creates such violent inflammation as results in gangrene, or in more favorable cases leads to the formation of an abscess, which, breaking outwardly, leaves an ulcerated opening, through which most or all of the urinary secretion is subsequently voided. This opening constitutes a perineal fistula, and continues because the flow of urine prevents such adhesive action as would heal it. Sometimes the fistula communicates directly with the urethra, though most frequently the hardening, contraction, and adhesions of the surrounding parts give it a more winding course, and render it difficult to trace it with a probe. When a perineal fistula has existed for a few weeks, the urethra in front of the stricture is often disposed to contract and close up, so that a channel, which was previously quite pervious, not unfrequently becomes directly the reverse, rendering it impossible to enter the bladder by the usual route, and requiring high operative skill in order to restore its permeability.

OPERATION FOR PERINEAL FISTULA.—When a perineal fistula is so situated as to permit the introduction of a director into the bladder, and of a probe into the urethra in front of the stricture, (Plate LI. Fig. 5), the formation of a button-hole opening, as before referred to, will frequently prove sufficient to restore the continuity of the canal, especially if the subsequent use of the catheter is persevered in until the fistula has healed. But when there is a considerable distance between the bladder and the permeable portion of the urethra, the indurated perineum will sometimes defy all attempts to trace the course of the fistulous canal into the bladder, and the surgeon will be compelled to open the perineum, as in the

operation of lithotomy, and to divide the portion which intervenes between the neck of the bladder and the spongy portion of the urethra. As this operation is one in which anatomical knowledge is of the utmost importance, the incisions being regulated entirely by the judgment of the operator, it is usually regarded as one of the most difficult in surgery, and as far surpassing that of lithotomy. In many instances, surgeons have preferred trying other means, and, when these failed, have left the result to nature; but, as a cure can be accomplished, it is the duty of every one to acquire such experience as is essential to its success. In three instances, I have assisted in its performance, and, though satisfied of its difficulty, have been also pleased with the result, all the patients being cured both of the fistula and stricture. As characteristic of the operation, I cite the following method, as described by Dr. Wm. E. Horner, of Philadelphia,* and based upon his own dissections of the parts concerned.

Operation of Dr. Horner, of Philadelphia.

Anatomy.—By repeated observation, Dr. Horner has found that, from the top of the symphysis pubis to the anterior end of the membranous part of the urethra, the distance is two and three-quarter inches; to the posterior end of the bulb of the urethra, three and three-quarter inches; and to the urethral opening in the triangular ligament, three inches.

Operation.—With these measurements firmly fixed upon the mind, the surgeon, when desirous of overcoming the obstruction, should cut, (without any director, and in the line of the incision for lateral lithotomy,) for the membranous part of the urethra, just in front of the triangular ligament. This point being found, and the urethra punctured, a probe should be introduced into the bladder, and a small semi-cylindrical canula of tin passed in upon it to the same point, and then another larger canula on this, and then others one after the other, the preceding one in each case being withdrawn upon the introduction of its successor, until the stricture is fully dilated. As the stricture is generally at the junction of the membranous with the spongy portion of the urethra, the surgeon should now pass a sound through the urethra from the glans penis to the stricture, and slit the membranous part of the urethra from behind forwards to the tip of the sound, making this incision along the median line. The stric-

* Dr. Horner in MS.

ture being now relieved, let him next pass a flexible catheter along the whole line of the urethra into the bladder, the tin canula previously introduced being retained in order to give a certain direction to the catheter, when the latter should be secured as usual* for a few days, after which a leaden catheter may be put in its place, as it is much less irritating to the urethra. No catheter, however, should be withdrawn from the bladder for the first few days after the operation, without having previously slipped into it, from the perineum, a tin canula of sufficient size to act as a conductor to the next catheter.

Remarks.—During the last twenty-five or thirty years, Dr. Horner has operated frequently for perineal fistula on the plan just stated, with scarcely one failure, and he, therefore, recommends it strongly. When cured, however, the urethra should be dilated, at proper intervals, with a large sound, in order to prevent the recurrence of the stricture, or the contraction of the cicatrix, formed at the point where the urethra was opened.

§ 4.—HYPOSPADIAS AND EPISPADIAS.

An imperfect condition of the urethra is occasionally found as the result of a congenital defect, in which the canal terminates or opens by a slit upon some point between the scrotum and head of the penis. When the opening is upon the inferior portion of the penis, it takes the name of Hypospadias, but when situated on the dorsum it is called Epispadias.

Hypospadias, being the more common of the two, may be taken as the type of this deficiency.

Hypospadias may be found at any point, but it is especially seen at the fossa navicularis, near the middle of the penis, near its root, or between the penis and the scrotum.

Operation.—When the opening is near the glans, and the anterior portion of the canal is impervious, puncture the point of the glans with a bistoury, and push in a small trocar and canula until the perfect urethra is reached, taking care not to push the point of the instrument either towards the dorsum or under surface of the organ. After creating the canal, keep a catheter constantly in it until the parts have healed. The contraction consequent on cicatrization is,

* See Minor Surgery, by the Author, third edit., p. 401.

however, apt to cause a considerable diminution in the size of the new urethra.

When the opening is seated near the middle of the penis, and the urethra is patulous to near the fossa navicularis, the trocar may be introduced into the orifice and carried forwards to the point of the glans.

Sometimes the defect has consisted in a mere fissure, around which the corpus spongiosum was deficient. Although this is almost a hopeless case, the surgeon may deem it advisable to attempt a plastic operation, freshen the sides of the fissure, and unite the skin of the part over a catheter.

Remarks.—The rarity of hypospadias in such a position and to such an extent as presents much chance of success renders it difficult to assign any value to the modes of operating that have been described, few of them having accomplished perfect cures. In a little patient of eighteen months, who had an opening near the middle of the penis, but in whom the urethra was otherwise perfect, I have, however, succeeded in closing the fissure by freshening the edges and uniting them by the harelip suture; and Dr. Mettauer, of Virginia, has also reported* a case of rare deformity of the penis, which was relieved by an operation. As his account also contains an excellent description of some of the usual forms of this defect, the reader will derive much valuable information by referring to it.

SECTION IV.

OPERATIONS ON THE SPERMATIC CORD.

The operations practiced upon the spermatic cord are such as have for their object the arrest of the circulation in the bloodvessels of the testis, the ligature of the spermatic artery in cases of sarcocele, and the arrest of the venous circulation for the cure of varicocele, being such as chiefly require enumeration.

§ 1.—LIGATURE OF THE SPERMATIC ARTERY.

Operation of Maunoir.—By an incision in the line of the cord, the skin, superficial fascia, cremaster muscle, and tunica vaginalis

* Am. Journ. Med. Sciences, vol. i., N. S., p. 43, 1842.

communis were divided; the artery, which could be felt pulsating, separated from the other vessels and ligated, and then the wound partially closed (Plate LII. Fig. 1).

Remarks.—This operation does not always cut off the circulation from the testicle so perfectly as to insure its atrophy; and when performed for the relief of sarcomatous, or other degenerations, may require to be followed by castration.

§ 2.—LIGATURE OF THE SPERMATIC VEINS.

Enlargement of the spermatic veins of the cord, as well as those of the scrotum, sometimes leads to atrophy of the testicle, though more frequently it only creates pain, irritation of the skin, and such difficulty in walking as is characteristic of varicocele. To relieve this, it is sometimes sufficient to support the parts by a suspensory bandage, though various operations have been suggested in order to effect a more permanent cure, all having for their object the interruption of the circulation through the veins, and the restoration of the natural caliber of the vessels. Among these operations may be noted all that are applicable to varices in the extremities, as will be shown hereafter. At present, it must suffice merely to enumerate such as are most frequently applied to this region.

In all the operations upon the veins of the cord, it is important that the surgeon should first separate the vas deferens and spermatic artery from the bundle of veins. This may be readily done by gently compressing the cord between the thumb and fingers of one hand, and causing the vessels to slip laterally, when the vas deferens will readily pass to the inner side of the cord, and may be told by its cartilaginous consistence, the artery being known by its pulsation. The veins being then rendered distinct by the patient standing up, any of the operative processes which may be selected can then be readily attempted.

Operation of Velpeau.—After picking up the enlarged veins between the thumb and fingers, a pin is passed through the skin behind the veins, and surrounded by a figure of 8 suture, so that the scrotum and the veins may be compressed by the ligature upon the pin (Plate LII. Fig. 2). After two or three days have elapsed, and there is evidence of inflammation, this pin may be removed, as in the ordinary harelip suture. But, as the compression of

PLATE LII.

OPERATIONS PRACTICED ON THE TESTICLE AND CORD.

Fig. 1. Ligature of the Spermatic Artery. 1. The director passed beneath the artery. After Bernard and Huette.

Fig. 2. Velpeau's operation for Varicocele. 1. The pin as passed behind the vessels. 2. The figure of 8 ligature thrown around it. After Bernard and Huette.

Fig. 3. Ricord's operation for Varicocele. 1. The first loop of a double ligature carried between the veins and the skin. After Bernard and Huette.

Fig. 4. View of the Veins and Ligatures before the latter are drawn tight. 1. The enlarged veins. 2. The vas deferens. 3. The posterior ligature. 4. The anterior. After Bernard and Huette.

Fig. 5. A view of the Knot formed by drawing on the ends of each Ligature, after they have been passed through the opposite loop, and are about to constrict the veins. After Bernard and Huette.

Fig. 6. Operation of Vidal du Cassis for Varicocele. 1, 1. The enlarged veins. 2, 3. The two silver wires passed in front and behind them, so as to compress the vessels when they are twisted. 4. The vas deferens. After Bernard and Huette.

Fig. 7. A view of the arrangement of the wires. The larger one remaining firm, the smaller twists around and compresses the vessels upon it. After Bernard and Huette.

Fig. 8. The Veins as constricted, shortened, and rolled up by the twisting of the silver wires. After Bernard and Huette.

Fig. 9. Breschet's operation. 1, 1. The compressors. After Bernard and Huette.

Fig. 10. The operation of Castration. 1. The scrotum drawn back to favor the enucleation and dissection of the testicle. After Bernard and Huette.

Fig. 11. A side view of the operation of Tapping a Hydrocele. 1. Position of the left hand as it compresses the sac. 2. The right hand holding the trocar and canula. After Bernard and Huette.

Plate 52

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 6.

Fig. 4.

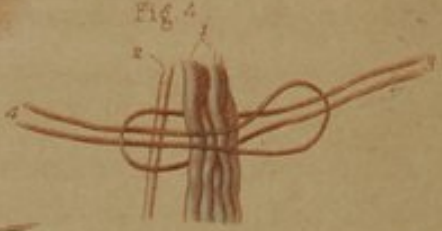


Fig. 5.

Fig. 8.

Fig. 7.

Fig. 9.

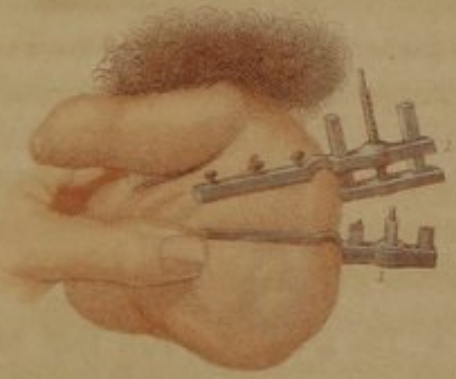


Fig. 10.

Fig. 11.

the integuments even for this period is liable to induce erysipelatous inflammation, Velpeau subsequently modified the operation by passing a double ligature in front of the veins beneath the skin, and placing the pin behind the vessel, slipped the loop of the ligature over one end of the pin, and tied its two ends around the pin so as to compress the veins directly upon it.*

Operation of Ricord.—After isolating the veins, Ricord operated as follows: Two needles being prepared, each threaded with a double ligature, the surgeon passes one of them *behind* the veins, so that the loop of the ligature projected a little outside of the scrotum (Plate LII. Fig. 3), and removed the needle. Then, passing the point of the second needle from the opposite side of the scrotum, but through the same puncture as that made by the exit of the first needle, he carried the second ligature in front of the veins, and thus formed two loops, one on each side of the scrotum. Then passing the free ends of each ligature through the opposite loop, and drawing upon them, the vessels were constricted by the approximation of the loops beneath the skin (Plate LII. Figs. 4, 5), the tightness of the compression by each ligature being preserved by tying its ends upon a small plate or pledget outside the skin.†

Operation of Vidal du Cassis.—This surgeon combines the subcutaneous ligature of the veins with diminution of their length, so as to prevent the subsequent return of the circulation in the following manner: A silver thread being passed with a needle behind the cord, another larger wire is made to pass through the same opening in front of it (Plate LII. Fig. 6), and the veins being thus placed between the two wires, beneath the skin, their extremities are twisted, until by the torsion they are brought closely together and strangulate the veins. By continuing the torsion, the metallic cord in its rotation draws in the parts comprised between the wires, so that the veins are rolled around them until, as the twist is continued, the testicle itself is raised (Plate LII. Fig. 7), its ascent being facilitated by the relaxed condition of the parts.

Finally, the two ends of the metallic cord are knotted on a pledget upon the skin, and a director being passed beneath the knot, the whole is twisted more and more, from day to day, until the wires cut through the skin and veins.‡ The advantages claimed for this mode

* Dictionnaire de Méd., tome 30me, p. 559.

† Opus citat.

‡ Dict. de Méd., tome 30me, p. 560.

of operating are a diminution in the length of the spermatic cord, and the section of the veins at the several points where they have been twisted.

Operation of Breschet.—By means of a pair of clamps or compressors, the circulation was interrupted, and sloughing of the vessels induced by the following operation:—

Pick up a fold of the scrotum, so as to include the enlarged veins, and inclose it in the branch of the forceps (Plate LII., Fig. 9), applying another pair in a similar manner, a short distance above the first. By tightening the screws from day to day, the constriction is sufficiently increased to result in sloughing, after which the ulcer is healed by the usual means.

Remarks.—The danger arising from operating upon varices in the limbs does not appear to follow the operation performed for the relief of varicocele, whilst the difference in the anatomical relations of the spermatic veins, and the absence of the free anastomoses that exist between the different veins of the extremities, usually render the operation permanently successful in this region. In selecting any one of the methods just described, the surgeon may be influenced by the peculiarities of the case; but, as a general rule, that of Ricord should be preferred, as there is less risk of erysipelas of the scrotum arising from it than from the operation of Velpeau. The latter I have, however, performed without any bad results, and obtained a perfect cure.

Compression, as advised by Breschet, has resulted in death* in several instances, and is now seldom or never resorted to. Indeed, it may be useful to the young surgeon to offer a word of caution in regard to the performance of any operation for varicocele, until cold astringent washes, the constant use of a suspensory bandage, and the exercise of the function of the testicle have been fully tried, as these means usually suffice for the cure of the complaint.

SECTION V.

OPERATIONS ON THE TESTICLE.

The operations practiced on the testicle are limited to such as are required for the relief of fluid collections within the tunica vaginalis testis, and those performed for the removal of the gland itself.

* Philad. Med. Examiner, vol. iii. 1840.

§ 1.—HYDROCELE.

The term Hydrocele (ὑδορ water, and κελη a tumor) is one strictly applicable to any accumulation of serum within the scrotum. A serous infiltration of the scrotal cellular tissue, such as is seen in dropsy, might, therefore, be considered as an Hydrocele were it not that usage has limited the name to such collections of serum as are entirely within the sac of the tunica vaginalis.

When, by a careful examination, the presence of serum in this sac has been positively established, its evacuation may be readily accomplished by a puncture of the cavity with a trocar or lancet; but, as the simple evacuation will not prevent the reaccumulation of the secretion, it is generally necessary to combine with it the production of such inflammatory action as will lead to the obliteration of the cavity by adhesion of its sides. The first or the simple evacuation of the liquid constitutes the palliative operation; the other is designated as the curative.

I. TREATMENT OF HYDROCELE BY INJECTION.

To accomplish the cure of Hydrocele by this means, there should be prepared two bowls, one empty, and the other containing the substance to be injected; a moderate-sized trocar and canula; a syringe with a nozzle, capable of fitting the canula; and such an irritating fluid as may be deemed most appropriate for the injection, such as port-wine and tepid water, a solution of sulphate of zinc, or corrosive sublimate and lime-water, or a solution of nitre, the latter having proved effectual in the hands of surgeons from an early period.

The experiments of Velpeau having shown the great advantages possessed by the diluted, or even the pure tincture of iodine, over most of the other articles, most surgeons now resort to it alone, and obtain a cure in about twelve days.

Operation.—After being satisfied of the position of the testicle, and the presence of the fluid, the patient should be made to sit upon the edge of a bed, table, or chair, with his thighs widely separated, or else permitted to lie on his back in bed with the limbs in the same position. The surgeon, then seizing the tumor with his left hand, and compressing it so as to render the tissues perfectly tense

* Velpeau, Op. Surg., by Mott, vol. iii. p. 717.

(Plate LII. Fig. 11), takes the trocar and canula, and punctures the swelling in front, but a little below its middle, directing the point of the instrument upwards and obliquely backwards and outwards, in order to avoid the testicle, which is generally situated behind, below, and towards the raphé, though occasionally it is in front or at the top of the swelling, where its position may be readily told by the sensibility shown on compression of the part. As soon as the free motion of the point of the instrument shows that it is within the cavity of the tunica vaginalis, the assistant should hold the empty bowl, and the surgeon, retaining the canula in his left hand, should withdraw the trocar with the right, and allow the liquid to escape. After the evacuation is completed, the nozzle of the syringe, charged with the injecting fluid, should be adapted to the canula, and the liquid injected by an assistant, whilst the surgeon, retaining the end of the canula in its position, takes especial care that the liquid is not thrown into the cellular tissue of the scrotum instead of the vaginal cavity. After creating sufficient pain to render the patient slightly faint and cause uneasiness in the lumbar region, the liquid may be allowed to escape, the canula withdrawn, and the patient placed in bed with the testicle supported.

After-Treatment.—As the object of this operation is to induce adhesion of the sides of the tunica vaginalis, care is required to guard against too much inflammation, and a moderate antiphlogistic treatment may therefore occasionally be demanded. After the lapse of about ten days, moderate compression by a bandage, or by adhesive strips, will prove useful by approximating the sides of the inflamed cavity and favoring adhesion. Should the lymph, which is sometimes effused into the adjacent parts, leave the testicle considerably enlarged after the operation, the induration may be made to yield to the use of iodine or mercurials.

II. CURE OF HYDROCELE BY THE SETON.

Operation.—Puncture the tumor with a seton-needle and strand of silk; allow the silk to remain until it excites sufficient inflammation; and then withdrawing it by a few threads at a time, so as to leave one or two to secure the continuance of the opening, pursue the treatment just referred to. Sometimes the trocar and canula are made to enter the tunica vaginalis from below, and pass out of the

scrotum above, when the trocar being withdrawn, a probe, armed with silk, will readily carry the seton through the canula; and the latter being withdrawn, the seton will be left in position.

III. TREATMENT BY INCISION.

Operation.—Puncture the tumor from above downwards with a sharp-pointed bistoury, and, introducing the forefinger or director into the cavity, enlarge the opening downwards. After which, charpie, lint, or balls of dough may be placed in the cavity to excite irritation, and left there until discharged by suppuration.

IV. TREATMENT BY EXCISION.

This is the same operation as the preceding, except in the removal of a portion of the vaginal tunic either with the scissors or knife.

Remarks.—The operation for the relief of hydrocele, though apparently simple, occasionally fails to evacuate the liquid, or does not accomplish a cure.

The first is usually the result of carelessness on the part of the operator, and may arise from an error of diagnosis, or from his not rendering the tumor sufficiently tense to cause the trocar to puncture all the tissues instead of passing between the scrotum and the tunica vaginalis; and such an accident is by no means rare, as I have more than once seen the puncture made, the trocar withdrawn, and yet no fluid escape. If the tunica vaginalis is thickened, or slightly ossified, or if the sac is not rendered tense by compression, or if the trocar is not sharp at its point, or if the canula is not well adapted to the shoulder of the trocar, the perforation of the sac may fail, and the tunica vaginalis be pushed back before the instrument, instead of being punctured. The evacuation of the fluid, and the consequent contraction of the scrotum, are also liable to displace the point of the canula, so that, on attempting the injection, the fluid passes with difficulty, and, instead of affecting the vaginal cavity, infiltrates the scrotum, and induces sloughing or gangrene. Every precaution should, therefore, be employed to prevent such mishaps in this apparently easy operation. In the selection of

a plan of treatment, I usually prefer a combination of the injection with the seton, leaving a single thread in the cavity for several days, in order to insure a vent for any liquid which may accumulate, and thus prevent the approximation of the walls of the cavity. By this method, I have never had occasion to repeat the operation, and when aided by the subsequent application of adhesive strips, as employed in orchitis, have usually obtained a speedy cure.

§ 2.—CASTRATION.

The removal of the testis, although a comparatively easy operation, is one that should not be performed without serious deliberation, and only resorted to when such degeneration is found as establishes the uselessness of the organ beyond a doubt, or the risk of further contamination of the system by its existence. In order to avoid the removal of the gland, ligature of the spermatic artery, or the excision of the vas deferens has been practiced by Maunoir and Morgan, of Europe, and Jameson, of Baltimore; but in the cases where these means would be advisable, it may be doubted whether castration would not be preferable, because it accomplishes the same object more effectually.

OPERATION OF CASTRATION.—The operation of castration consists in incising the scrotum so as to free the testicle, and in the division of the cord. The exposure of the gland may be effected either by a simple linear incision, or by an elliptical cut so as to permit the removal of a portion of the skin. The division of the cord may be accomplished either by inclosing all its structure in a ligature, and excising the portion below it, or by separating the vas deferens, ligating the cord, and then dividing it by a sweep of the knife. As the selection of either mode must be regulated by circumstances, I shall refer only to the following one, which is adapted to the majority of the cases which demand the operation, and especially to those where the tumor has attained some size, or where the skin is either diseased or superabundant.

OPERATION.—The patient being placed upon his back, and the parts shaved of hair, the surgeon should seize the tumor in his left hand, with the palm presenting anteriorly, and force it towards the front of the scrotum, or an assistant may hold it so as to render the skin tense. Then, commencing an elliptical incision through the

skin a little below the inguinal ring, let him continue it below the tumor, or to the inferior part of the scrotum, so as to insure the escape of pus, the two halves of the incision being made to include as much of the scrotum as it is desired to remove. Then seizing the margin of either half, dissect off its loose cellular tissue from around the tumor, until the latter can be turned out of the pouch (Plate LII. Fig. 10).

After isolating the cord from the surrounding parts, feel for the vas deferens, which may be told by its cartilaginous consistence, and with a few longitudinal touches of the scalpel, separate it from the cord. Pass a ligature around the remaining portion, draw it firmly, tie it in a double knot, allow the ends to remain, and then divide the entire cord below this ligature.

Dressing.—In order to insure a vent for the pus that will subsequently collect in the scrotum, introduce a small piece of lint or linen into the lower angle of the incision, unite the centre of the wound by a stitch, and close its upper angle by adhesive strips.

CHAPTER II.

STONE IN THE BLADDER.

Pathology.—The development of urinary calculi in the bladder of the male may be the result of various causes, though most frequently it is due to such derangement of the general system, and especially of the function of the kidney, as leads to the formation and deposit of sabulous matter in the bladder, till, by the continual increase and agglomeration of particles, it results in the production of a mass termed a Calculus. These calculi may vary in size from a bullet to that of the diameter of the pelvis, though most commonly they weigh from two to sixteen drachms, those which are heavier than this being rare, and those which are smaller being designated as "pebbles."

As all calculi differ in size, so they also differ in composition and hardness; those containing a large proportion of oxalic acid being the most resisting. The scientific treatment of these formations requires a minute investigation of all the functions of the body, as the permanency of the cure depends upon the correctness of

PLATE LIII.

INSTRUMENTS EMPLOYED IN LITHOTOMY.

Fig. 1. A strong round-bellied scalpel for the first incisions of the perineum. Schively's pattern.

Fig. 2. A sharp-pointed bistoury, to open the membranous portion of the urethra, and expose the groove of the staff, as it will do it better than the scalpel. In using it, the membranous portion of the urethra should be punctured as near to the prostate as possible, and then laid open from behind forwards. Schively's pattern.

Fig. 3. Dupuytren's double Lithotome cachè. 1. The beak adapted to the groove of the staff. 2, 3. The blades expanded laterally, but shutting up in the body of the lithotome. 4. The lever for expanding the blades. 5. A screw to regulate the expansion of the blades. Charrière's pattern.

Fig. 4. A side view of Physick's Cutting Gorget, the blade being detached at pleasure from the handle. 1. The handle. 2. The stem-beak. 3. The cutting edge. 4. The screw to fasten the blade to the beak and handle. Schively's pattern.

Figs. 5, 6, 7, 8 represent other blades, which may be adapted to the same handle, and selected in reference to the width of the perineum in each patient; they vary from one-fourth of an inch to one inch, increasing by fourths or eighths at the option of the operator. The size and angle of the blade and handle are similar to that of the common gorget. The length from the beak to the angle of the handle is four and a half inches, and the handle is four inches. As the blade can be readily detached, it may be perfectly and readily sharpened and made to cut directly up to the beak of the instrument.

Fig. 9. Barton's Stone Forceps with fenestra to diminish the expansion of the blades when holding the stone. Schively's pattern.

Figs. 10, 11. The ordinary Stone Forceps, of different sizes.

Figs. 12, 13. Different forms of the Scoop. Schively's pattern.

Fig. 14. Earle's Forceps, for crushing calculi, which are too large to be extracted whole. 1. The screw to close the handles. Schively's pattern.

Plate 53.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 4.

Fig. 5.

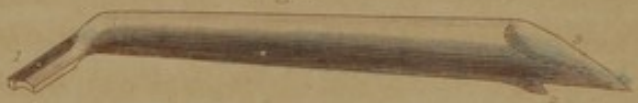


Fig. 6.

Fig. 7.

Fig. 8.

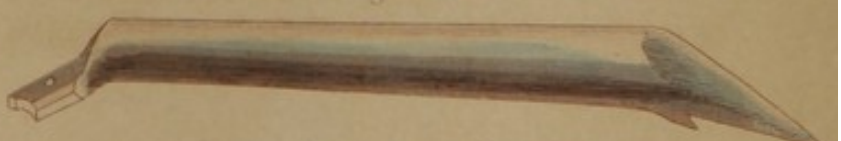
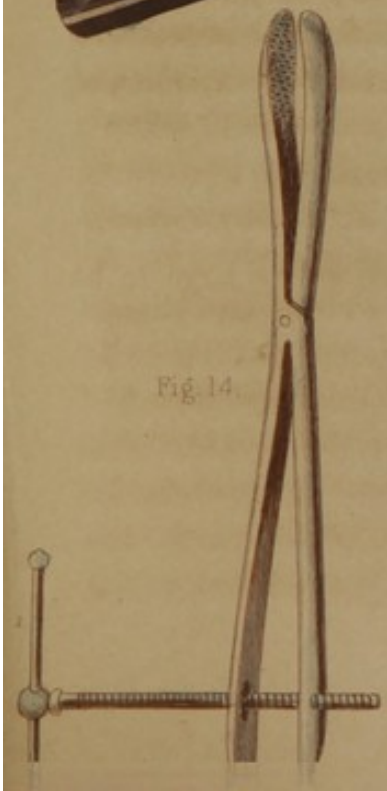


Fig. 14.



the surgeon's knowledge of the cause. Every possible means should therefore be resorted to, in order to learn all the peculiarities of the case, the microscopic and chemical characters of the stone being examined with the utmost accuracy. At present, however, I can only hint at this, and must refer those desirous of information on the more detailed pathology of the complaint, to the elaborate treatise of Dr. Gross, of Louisville, or to that of Civiale.*

Two operations have been suggested for the removal of calculi from the bladder, and the relief of the symptoms created by its presence, the one (Lithotomy) consisting in making an incision through the neck of the bladder by perforating the perineal structure; the other (Lithotripsy) being accomplished by instruments introduced into the viscus through the urethra, by means of which the stone is broken into particles of such a size as permits their being voided with the urine.

In selecting either one in preference to the other, the surgeon must be mainly guided by the peculiarities of the case. If the patient is in feeble health, with disordered digestion, with a diseased bladder, and thickened, muddy, or muco-purulent urine, lithotomy may be the best; but if the stone is soft and friable (as may be told by the sensation given to the sound), if the bladder is apparently healthy, and the general constitution not much impaired, lithotripsy should be selected, as being attended with less risk, and also as least likely to give rise to trouble in the execution of the function of the bladder and testicles, at a subsequent period.

The operation of incising the male perineum and extracting a calculus has always been regarded as one of the most important efforts of an operator, and the anatomical relation of the parts cannot, therefore, be too often referred to by those contemplating its execution.

SECTION I.

SURGICAL ANATOMY OF THE MALE PERINEUM.

The Perineum (περι around, and νεος a temple) is formed entirely of such soft tissues as fill up the inferior outlet of the pelvis, and has in the male no openings except those for the urethra and rectum.

In its general outline, the perineum may be limited to the space in-

* On the Medical and Prophylactic Treatment of Stone and Gravel, by Civiale, M.D. Translated from the French by Henry H. Smith, M.D. Phila., 1841.

cluded between the bones forming the inferior strait of the pelvis, though for the purposes of regional anatomy, it has sometimes been circumscribed yet more, by being referred to as "the isosceles triangular space formed by the bones of the arch of the pubis, and by a line drawn transversely from the tuberosity of one ischium to the other in advance of the anus."

The tissues entering into the composition of the perineum are the skin, superficial fascia, loose cellular tissue, loaded with fat, and varying very much according to the general condition of the patient, the perineal muscles, the triangular ligament or middle perineal fascia, and the deep or pelvic fascia.

In the middle of this region, as thus bounded, we find the triangular space can be readily subdivided into two equilateral triangles by the raphé, and this line is, therefore, the boundary of the symmetrical organs found on each side.

Of these parts, there may be noted the root of the corpus cavernosum, the erector penis muscle, the transversus perinei, and sometimes the transversus perinei alter, part of the levator ani, and muscle of Wilson, as well as the branches of the internal pudic vessels and nerves.

In the middle line of the perineum, we also find, in addition to the skin and fascia, the accelerator urina muscle, the sphincter ani, the bulb of the urethra, its membranous portion, the triangular ligament, the rectum, prostate gland, and orifice of the neck of the bladder.

The dimensions of the perineum in man have been carefully studied by surgical anatomists in order to decide how large a calculus can be extracted through this part. According to Dupuytren, the transverse diameter of the perineum varies from two to two and a half inches, whilst its depth, or antero-posterior diameter, is about four. The distance of the peritoneum from the skin on a level with the recto-vesical depression between it and the verge of the anus varied from two inches and eight lines to three inches and six lines, as examined upon twelve subjects, and from the mucous surface of the neck of the bladder to the raphé, ten lines in advance of the anus, it was from two inches to two inches and eight lines.*

The relative position of the prostate gland, and its capacity for dilatation, have also been accurately studied in consequence of its necessary division in the extraction of calculi through this region.

* Blandin, Anat. Topograph., p. 383.

According to Velpeau,* the prostate gland is situated about eight lines from the symphysis pubis, and its sides about an equal distance from the rami of the pelvis.

"The transverse incision on one side of the prostate, as ascertained by the measurement of the gland by Mr. H. Bell, in more than forty subjects, can only be about ten lines in length, give an entire opening of two inches and nine lines in circumference, and allow of the exit of a spheroidal body ten or eleven lines in diameter. The oblique incision downwards may be from eleven lines to an inch long, create an opening three inches and a line in circumference, and be large enough for a calculus one inch in diameter.

"When the prostate is incised on both sides, the transverse incisions being each nine or ten lines long, there will be an opening four inches five lines and a half in circumference, which will, therefore, permit the extraction of a calculus one inch and a half in diameter. Two perfectly oblique incisions form an isolated triangular flap, the base of which is one inch and three-fifths in extent, lays bare, when the flap is lowered in front, a triangular opening altogether a little less than four inches, and consequently less than the transverse opening. An oblique incision to the left side eleven lines, or an inch long, and another transverse one to the right ten lines long, permit the largest opening, and with the dilatation of the urethra, give an opening of four inches and eight lines, whilst it is one which can be easily expanded. This is the incision preferred by Mr. Senn."†

The membranous portion of the urethra is ten lines long, and is situated behind the triangular ligament, and in front of the prostate.

The bulb of the urethra is attached to the anterior face of the triangular ligament, is formed by a spongy or erectile tissue, which is nearly deficient in children, fully developed at puberty, and is longer than its width in old men.‡

The transversus perinei artery supplies the bulb of the urethra, and passes to it fourteen lines in advance of the anus. The branches of the venous vesical plexus, which surround the neck of the bladder, lie outside of the prostate in the thickness of its sheath.

* Anat. Chirurg., tome 2me, p. 236.

† Malgaigne, Op. Surg., Philad. edit., p. 497.

‡ Blandin, p. 386.

SECTION II.

OPERATION OF PERINEAL LITHOTOMY.

Perineal Lithotomy may be performed in three ways: in one, the incision opens the membranous portion of the urethra and the prostate on the left side of the perineum, and is called the lateral operation; in the second, both sides of the prostate gland are divided, constituting the bilateral operation; and in the third, it is divided in the line of the raphé, which is, therefore, termed the median operation.

§ 1.—PREPARATORY STEPS.

Before proceeding to employ any of the means that are proper, as preliminary measures, in the operation of lithotomy, it is essential that the presence of the stone be positively established.

I. DIAGNOSIS OF STONE IN THE BLADDER.

Various symptoms have been recorded by surgical writers as pathognomonic of the existence of a calculus; but, though useful as aids in diagnosis, they cannot be relied upon by themselves; sounding, or the direct contact of an instrument with the stone, being the only certain sign of its presence.

Sounding.—To prove the existence of a stone by sounding, the surgeon should select two steel sounds of different curves, and with smooth polished handles, warm and oil them, and then introducing first one and then the other into the bladder in the manner directed for catheterism, move its point about until he can cause it to touch the calculus, when the sensation which will be communicated to the fingers will prevent a mistake. The advantages of employing sounds with different curves will be found in the facility with which the smaller curve may be made to sweep the bas-fond of the bladder, when the greater convexity of a more curved instrument might enable it to pass over the stone without touching it. When a sound is in the bladder, its point should be gently turned from side to side as well as to the top and bottom of the viscus, lest the stone be encysted.

In order to obtain an accurate touch, the broad handle of the

sound should be perfectly smooth, and held between the thumb and forefinger, so as to obtain as great a surface of contact as possible. By attaching a flexible stethoscope to the handle of the sound by means of a little clamp, the sense of hearing may also be made to aid materially the diagnosis.

On the part of the patient, there are also certain circumstances which are favorable to the establishment of a diagnosis by these means. Thus the bladder, at the time of sounding, should hold sufficient water to keep its sides moderately distended. When, therefore, the patient has urinated a short time previous to the visit of the surgeon, a silver catheter should be first introduced, and about twelve ounces of tepid water slowly injected, so as to distend the bladder, and prevent its closing on the instrument. If, after sounding with the bladder in this condition, a stone cannot be felt, the fluid may be allowed to escape, or be voided by the patient, in order that the contraction of the bladder may bring the stone in contact with the instrument. Small calculi in patients with diseased prostate are also sometimes difficult to detect, unless the finger is introduced into the rectum; and the same manœuvre will often prove useful in other cases. A change in the position of a patient sometimes renders the presence of a stone apparent, by causing it to touch the sound; thus, after lying on the back, a position first on one side and then on the other, cautiously taken, will often cause the instrument to touch it; and in two instances Dr. Physick succeeded in thus detecting a stone where other means had failed, the patient being placed in one instance so nearly on his head that the fundus of the bladder became the most depending part.*

The record of cases in which patients have been cut, without the operator finding any stone, as well as the history of those whose bladders contained large calculi, the presence of which had not been detected during life, should lead every operator to use the utmost caution in sounding his patient. By a resort to anæsthetics, many of the former sources of difficulty can now be removed, so that one familiar with the changes of structure liable to be produced in the bladder by disease can hardly fail, with proper care and repeated examinations, to satisfy himself fully of the actual condition of the viscus.

In addition to the knowledge gained, by sounding, of the presence

* Dorsey's Surgery, vol. ii. p. 179.

of a stone, the operator should also learn the probable size, consistence, number, and position of the calculi, all of which will materially aid him in deciding upon the kind, as well as the steps of the operation, that may be required for its removal.

§ 2.—CONSTITUTIONAL TREATMENT.

The presence of the stone being in most instances the cause of much of the suffering and general constitutional disturbance seen at this period of the complaint, it might be supposed that its prompt removal would afford the best chances for a recovery; but experience has firmly established the fact that the greatest success attends such operators as have first carefully watched the preparation of their patients.

To accomplish the proper preparation of a patient for the operation of lithotomy requires a correct judgment and the combination of the highest medical with the best surgical experience, as the means must vary in different cases; but in every instance the patient should be placed in as healthy a condition as possible. He must therefore neither be too much depleted nor stimulated, whilst every secretion should be noted, in order to tell the proper condition of his whole system. As a general rule, it is beneficial to evacuate the bowels thoroughly, but gently, before operating; to obtain perfect rest; to have the mind free from anxiety, and to place the digestive and thoracic viscera in a good condition by means of alteratives, sedatives, and diaphoretics. No better means can be resorted to for the relief of the train of symptoms that have been termed a "fit of the stone" than the free use of alkaline and diluent drinks; the hip-bath; anodyne enemata; and the occasional inhalation of ether. I have in several instances afforded much relief simply by administering boluses of the following alkalies and diuretics:—

℞. Saponis Hispan.,
Carb. sodæ exsiccat., āā ʒj;
Ol juniperi gtt lx.

M. Et ft. mass dein in pil. xii dividend. S. One every four hours.

In cases of gravel, the same formula, by neutralizing the uric and lithic acid, has caused the evacuation of such an amount of sand as induced patients to think the stone was being dissolved.

§ 3.—LOCAL PREPARATORY MEANS.

The local preparatory measures required in lithotomy refer both to the part of the body to be operated on, and to the apartment selected for the performance of the operation.

The perineum of the patient about to be cut for stone should in all cases be perfectly cleansed and shaved, in order to avoid the irritation liable to be caused after the operation by the adhesion of unhealthy discharges to the hair of the part. The rectum should also be thoroughly emptied by a laxative enema, and then put at rest by the use of an anodyne, and the bladder kept nearly full, either by inducing the patient to retain his urine, or if this can not be done, or the secretion is deficient, by injecting tepid water as directed in sounding.

In selecting a room, it is important to have one that is well ventilated, and with a good light, falling either from above or from one side; to have a firm narrow table, and sufficient stands or tables for the reception of instruments, &c.

After selecting the table, it should be covered by a mattress and pillows, the end of the mattress being doubled under and tied or pinned firmly together, so as to elevate and support the hips. Over this should be placed a thick blanket, and over this a sheet, the end of which should hang down to the floor, in order to protect the clothes of the surgeon. The resort to a shallow box or pan of sawdust at the foot of the table, and placed just beneath the end of the sheet, will also aid in preserving the cleanliness of the apartment.

In addition to such instruments as may be required for the special mode of operating selected by the surgeon, there should also always be a large syringe and catheter, a pitcher of barley water to wash out such fragments of the calculus as may be created in extracting the stone, together with a little cup of sweet oil, sponges, basins, water, towels, and stimulants should the occasion require them.

Five assistants may be required to aid the operator. The first should hold the staff and scrotum of the patient, according to the directions furnished by the surgeon. Two others should place the patient's knee in their axilla whilst their forearms should be passed round his leg, so that by bearing their weight upon his pelvis they may steady it upon the table, and by keeping his thighs sepa-

PLATE LIV.

LATERAL OPERATION FOR LITHOTOMY.

Fig. 1. A view of the position of the patient, surgeon, and assistants, as far as they could be shown upon one figure, in the lateral operation for stone. 1, 2. Hands of first assistant holding the staff vertically, and holding up the scrotum. 3. Left forefinger of surgeon depressing the rectum in the deep incision in the perineum. 4, 4, 5, 5. The hands and arms of the assistants. Their arms are, however, represented as placed upon the thighs of the patient instead of nearly parallel with his legs, as they ought to be; but this position was incompatible with the view. 6. The appearance of the incision in a deep perineum, immediately after puncturing the membranous portion of the urethra. After Nature.

Fig. 2. Manner of holding and passing the knife in the groove of the staff when the bladder is opened by it instead of the gorget, its handle being gently depressed so as to keep its point in the groove of the staff as it enters the bladder. 1. The staff. 2. First position of the knife. 3. Its final position in the neck of the bladder. After Sir Charles Bell.

Fig. 3. The right forefinger passed into the bladder along the staff, so as to recognize the position of the stone before passing in the forceps. 1. The staff. 2. Hand of the surgeon. After Sir Charles Bell.

Fig. 4. An outline to show the manner of enlarging the wound by means of the probe-pointed bistoury. 1. The staff in position. 2. The forefinger of the surgeon introduced into the opening in the neck of the bladder with its palmar surface pressing against the back of 3, a probe-pointed bistoury in the act of enlarging the incision in the prostate gland.

After Sir Charles Bell.

Fig. 5. Outline representing the forceps as grasping one stone, whilst a second is represented below it. 1, 1. Improper line in which to attempt extraction, as it exposes the neck of the bladder to contusion against the arch of the pubis. 2. Forceps seizing the stone. 3, 4. Proper direction of the forceps in the last efforts for extraction of the calculus.

After Sir Charles Bell.

Fig. 6. A view of the mode of retaining the stone in the scoop during its extraction by this instrument. 1. The scoop. 2. Left forefinger of the surgeon. After Sir Charles Bell.

Plate 54.

Fig. 3.

Fig. 4.

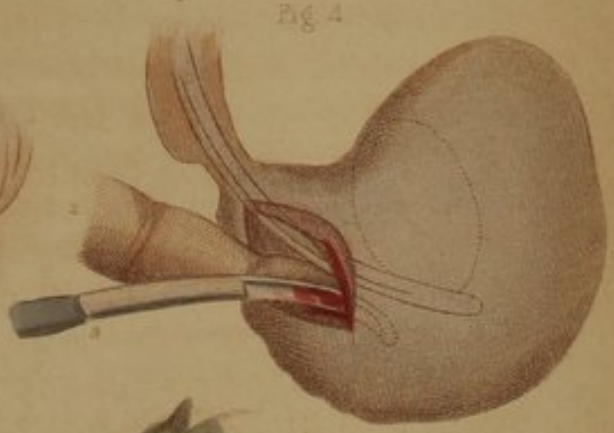


Fig. 1.

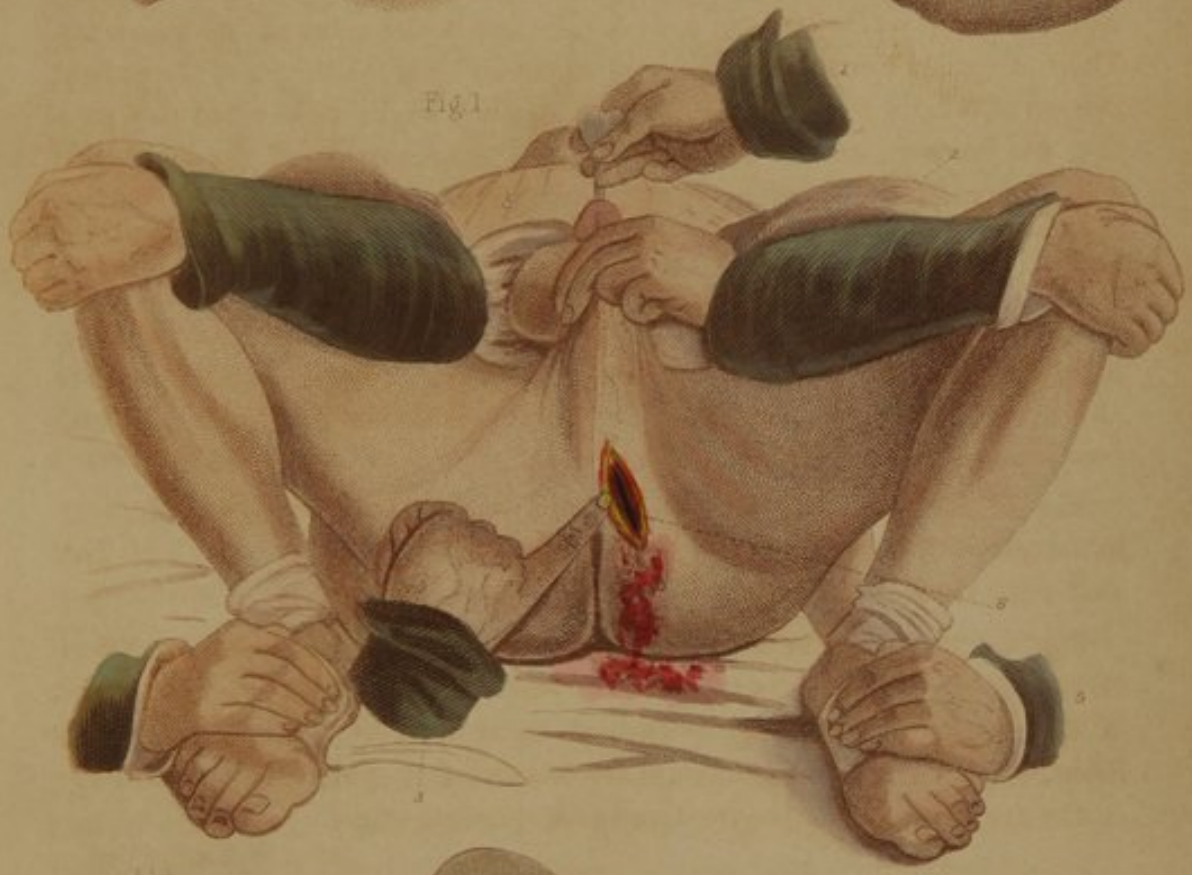


Fig. 2.

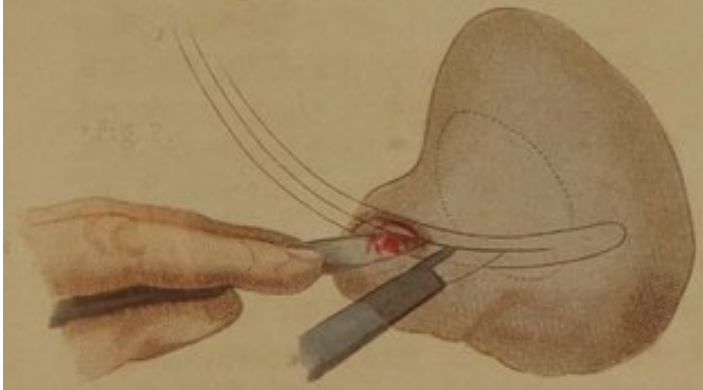


Fig. 6.

Fig. 5.

rated, render the perineum tense. The fourth should stand at the patient's head and shoulders, to administer the anæsthetic, watch its effects, and furnish drink or such other attentions as the circumstances may call for; the fifth should remain in the room to wait upon all.

SECTION III.

THE LATERAL OPERATION.

The division of the perineum upon the left side of the raphé, so as to open the bladder through the left half of the prostate gland, is an operation of considerable antiquity, and by many regarded as the best mode of operating where the stone is not excessively large. Although those selecting it have from time to time deemed it advantageous to modify the various instruments by which the division of the prostate was to be effected, there is but little difference in the other steps of the operation, and this account will therefore be limited to the operation as practiced by Cheselden and others in Europe, by Dr. Physick in the United States, and by such surgeons of the present day as prefer the use of the cutting gorget.

§ 1.—INSTRUMENTS THAT MAY BE WANTED DURING THE OPERATION.

In order to meet all the contingencies that may arise in the lateral method of lithotomy, the surgeon should prepare and place upon a tray the following articles: one large and deeply grooved staff, to pass into the bladder; one large round-bellied scalpel with which to incise the perineum; one sharp-pointed bistoury to open the membranous part of the urethra, if the scalpel is not sufficient; a gorget or knife to incise the prostate; forceps of different sizes, with and without fenestra; a scoop; Earle's crushing forceps, or Heurteloup's lithontriptor; a tenaculum; Physick's needle, in case of wound of the internal pudic artery, and ligatures, needles, and lint for arresting the hemorrhage, or plugging the wound, if requisite.

Introduction of the Staff.—The patient being etherized, and placed as before directed, the surgeon should oil and introduce a sound into the bladder to render the presence of the stone evident to his assistants, and, having done so, withdraw the sound and introduce the staff; or, the sounding may be practiced the day before the

operation, and verified simply by the staff at the time of the operation. The latter being then accurately adjusted in the median line of the body, the first assistant should hold it, whilst the patient's hands and feet are bandaged together, if the assistants are not men of experience, but with the employment of anæsthetics and with good assistants this is not necessary, though some deem it a safer practice. The patient being now in position, with the perineum fully exposed, the surgeon should feel for the ramus of the ischium, the bulb of the urethra, and the body of the staff, so as to recognize these points of reference, and, being satisfied with the position of the latter, direct the assistant how to hold it. On this point there is much difference of sentiment, such surgeons as prefer to be guided in their incisions solely by the staff liking it to bulge out in the perineum and incline well towards the left side; while others, relying upon their anatomical skill, prefer having its point kept accurately in the bladder, and its handle turned a little to the right groin, so as merely to present its groove towards the left side of the raphé. Of the two methods I prefer the latter, relying upon the staff chiefly in cases of error or deviations in incising a deep perineum.

§ 2.—LATERAL OPERATION WITH THE CUTTING GORGET.

The surgeon being conveniently seated on a moderately low stool or chair without a back, or else kneeling on one knee, should commence his operation by placing the first and second fingers of his left hand upon the perineum near the raphé, so as to steady the skin, and then holding the scalpel in his right hand like a pen, puncture the skin and fat by a perpendicular pressure, at a point near to the left side of the raphé, and immediately behind the scrotum, that is at one which corresponds with the lower side of the arch of the pubis, or is about one inch in advance of the sphincter ani muscle. Commencing at this point, let him now, by a steady pressure, continue the incision in a straight line to a spot corresponding nearly with the middle of the fibres of the sphincter ani muscle, and about half way between it and the tuber ischii, the incision being about three inches long in the adult, and boldly made, so as to divide the parts neatly, whilst it should be of sufficient depth, especially in its middle, to reach the membranous part of the urethra. The beginning and end of this first incision need not, however, be deeper than

the skin and fat, whilst the greater depth of its middle should be such as would make a conical wound, the apex of which should be towards the bladder (Plate LIV. Fig. 1). If the first incision is not deep enough in its centre, two or three touches of the scalpel may be made, so as to divide the transversalis muscle and triangular ligament and expose the membranous portion of the urethra. The left forefinger should now be thrust into the wound, with its radial edge turned downwards, the ulnar side of its pulp and the point of the nail being made to touch the staff, so that its back may present to the left descending ramus of the pubis. Then laying down the scalpel and taking up the sharp-pointed bistoury, pass it flatwise or with its back to the rectum, along the left forefinger as a director; carry its point to the bottom of the wound; puncture the membranous portion of the urethra so as to enter the groove of the staff, as may be told by the escape of a little urine and the contact of the instruments; and then cutting forwards, lay bare the staff by one stroke, from the prostate to the bulb: more urine will follow, and the staff will now be clearly felt and seen. Then promptly take the gorget, dip its point into oil, place its beak in the groove of the staff, stand up, take the handle of the staff from the assistant, balance the two together, the edge of the blade being inclined downwards and outwards, and then by a steady movement press the gorget along the staff into the bladder. As its cutting edge progresses, the handle of the instrument should be made to descend in front of the anus so as to keep the beak perpendicularly applied to the staff, and prevent its slipping, when a gush of urine will follow and show that the bladder has been opened. Then withdraw the gorget promptly, but leave in the staff; again pass in the left forefinger; touch the stone with it (Plate LIV. Fig. 3); direct the assistant to withdraw the staff; and taking the forceps, pass them into the bladder along the left forefinger, with the blades closed; touch the stone, and endeavor to seize it in the forceps, so that its longest diameter shall not be transverse to the wound. Then withdrawing the left forefinger, slide it along the forceps to the centre screw, and by a gentle lateral and up and down movement extract the calculus by such a moderate amount of force as may be necessary to dilate the wound, but not bruise it (Plate LIV. Fig. 5).

The calculus being removed, introduce the right forefinger and feel for others, or for fragments: then pass into the bladder through the wound a large catheter, adapt to its free end the nozzle of the syringe containing barley water, and wash out the clots of blood,

fragments, &c. that may be left behind, when it only remains to arrest any severe hemorrhage that may show itself, and to dress the wound in the manner hereafter stated.

Remarks on the Lateral Operation.—The section of the prostate gland, as accomplished by Physick's gorget (Plate LIII. Fig. 4), is one of great certainty and cleanness, creating a wound which is admirably adapted to healing, in consequence of the accuracy with which the two surfaces may be approximated. The advantages of the ordinary gorget have been variously estimated at different periods, some surgeons asserting that its operation was too mechanical, and its division of tissue a "stab in the dark;" whilst others have highly lauded it. In this country the cutting gorget has been the favorite instrument of Dr. Physick, who modified it so that its blade could be separated from the beak, and thus made to receive a perfect edge —a modification of great value, and one which really gave this instrument a new character, making it a perfectly firm and keen knife. The gorgets that have since been made in the United States have been mostly of this pattern, have been employed by Dr. Dudley, of Lexington, whose wonderful success is now everywhere known, and by Drs. Gibson, Randolph, and Rhea Barton, as well as by most of the lithotomists of Philadelphia.

An examination of the objections that have been urged against the use of the gorget show that the faults charged upon it are especially due to the English gorget, or that known as the gorget of Hawkins, as this cannot be sharpened close to the beak, and, in passing along the staff, is therefore apt to leave a portion of the prostate uncut at the sides of the staff, in consequence of which the gorget is liable to be thrown out of the staff, and towards the rectum. Many of the instances referred to by the opponents of the instrument are also only examples of the ignorance of the operators, as a good surgeon could hardly fail to lithotomize a patient with any instrument.

There are, however, many surgeons in the United States who do not use the gorget, preferring a beaked knife, of various shapes, most of which are apparently favorites, from having been designated by the name of the inventor. In many instances such knives are only poor modifications of a gorget, act in the same manner, but do not make so accurate an incision, and are liable to create an opening in the pelvic fascia by leading the operator to incise the prostate to too great an extent laterally. In a deep perineum, it is always difficult to judge of the position of the point of a knife, even when apparently

directed by the left forefinger; but with a staff held in the median line of the body, with its curve close under the pubis, and with the beak of a gorget well placed in it, it is impossible to extend an incision beyond the limits of the width of the blade. This subject is, however, one which has engaged powerful advocates on both sides, and I shall therefore dismiss it with the simple statement of individual preference for the gorget of Physick, though at the same time I should not hesitate to cut for stone with a staff and pocket bistoury, if nothing else could be obtained, nor doubt the possibility of a surgeon operating neatly and properly with any instrument when a correct anatomical knowledge of the structure concerned was made to direct it.

§ 3.—OPERATION WITH THE SINGLE LITHOTOME CACHÈ OF FRERE COSME.

This instrument, which resembles that of Dupuytren (Plate LIII., Fig. 3), has but one blade. It is introduced into the bladder by passing its beak into the staff when the latter has been exposed as in the preceding operation; carrying its point into the bladder and then opening the blade by pressure against the handle, incising the prostate and neck of the bladder whilst the instrument is being withdrawn in a perfectly horizontal direction. If the handle of the lithotome is too much elevated, the lower surface of the bladder will be exposed to injury; whilst, if it is much depressed, the incision will be too small. If the blade is directed outwards, the pudic artery may be wounded, and if too much downwards the rectum* may be opened.

Remarks.—In very many instances, I have operated in Paris upon the subject with this instrument, as well as with that of Dupuytren, in the manner usually directed by the French surgeons, but have always felt the uncertainty of the extent of the incision thus effected. The liability of the blade to spring; the difference in the resistance offered to its escape by different perineums; the liability to too great expansion, &c., have satisfied me that it cannot bear a comparison either with the gorget of Physick or with what has been termed the "beaked knife of Liston." Its chief recommendation appears to be the difficulty of wounding the rectum. Such an event would certainly be a strong recommendation of the instrument, if lithotomy were to be performed by every individual, but can not prove so to an accomplished surgeon—and none but good surgeons should attempt the operation.

* Malgaigne, Philad. edit., p. 505.

SECTION IV.

THE BILATERAL OPERATION.

In the bilateral operation of lithotomy, the bladder is opened by an incision through each half of the prostate gland, and a wound made, through which a calculus may be extracted, of somewhat larger dimensions than is possible by the lateral section. From having been revived and brought into notice, as well as modified by Dupuytren in 1824, it is often spoken of as his operation, though Celsus, it is well known, was also familiar with a similar method.

Operation of Dupuytren.*—Instruments.—The instruments employed by Dupuytren were: 1. A sound, which was lighter than the ordinary sound, sloped off at the end of its grooves, and expanded for two inches in length, at the point where it is most curved, so that it might the better distend the urethra. 2. A double-edged scalpel fixed in a handle, and sharp on each edge for about one-third of an inch from its point. 3. A double lithotome (Plate LIII. Fig. 3), the two blades of which opened in one handle, and were so acted on by two levers as to separate in a curved direction, and divide each side of the prostate in its oblique diameter.

Operation.—The patient being placed as before directed, and the position of the various points of reference accurately recognized (Plate LV. Figs. 1, 2), the staff should be introduced and held in a perfectly perpendicular direction, whilst the surgeon extends the integuments of the perineum with the fingers of his left hand, and makes a semicircular incision with the double-edged scalpel held in his right, commencing on the right side at a point half way between the tuberosity of the ischium and the anus, passing half an inch in front of the anus, and terminating on the left side of the perineum at a point corresponding with the starting-point on the right. (Plate LV. Fig. 3.) By continued, but rapid incisions, the superficial fascia, anterior point of the sphincter ani muscle, and the cellular tissue are divided, and the membranous part of the urethra laid bare, when the nail of the left index finger enables the surgeon to feel the groove in the staff, which may then be exposed, as before directed, by means of a

* Malgaigne's Operative Surgery, Philad. edit., p. 507.

bistoury. The forefinger, during all this period, should be made to depress the rectum in order to prevent its injury. After opening the urethra for one-third of an inch, use the left forefinger nail as a guide to the lithotome cachè, and introduce the instrument by holding it in the right hand with the thumb beneath and the two fingers above, presenting it to the staff, so that its convexity may look downwards. The contact of the two instruments being now recognized, the surgeon should take the handle of the sound in his left hand, and, elevating it so as to place its curve close under the symphysis pubis, slide the lithotome along its groove into the bladder. Then withdrawing the staff, turn the lithotome so as to present its concavity downwards, or towards the anus, and, grasping the lever, depress it to the handle of the instrument so as to unsheath the blades, withdrawing the instrument progressively downwards until it cuts its way out. (Plate LV. Fig. 4.)

The left index finger, being then introduced through the wound into the bladder, should examine the extent of the incisions, and if they are not sufficiently large, direct a probe-pointed bistoury so as to enlarge them. (Plate LIV. Fig. 4.) But if they are large enough, the forceps should be introduced, and the stone extracted as before directed.

The width of Dupuytren's incision, when widest, was not more than two inches, so that the incision did not pass the circumference of the prostate.

Operation of Dr. R. D. Mussey, of Cincinnati.—With a rather narrow scalpel, the superficial crescentic incision is made with its convexity anterior, so as to expose the staff at the membranous portion of the urethra. (Plate LV. Fig. 3.) A straight probe-pointed narrow bistoury being then passed along the groove of the staff, with its edge turned towards the left side until it enters the bladder, the point of the left index finger is slid along the back of the bistoury, and made to press it against the prostate so as to divide the latter sufficiently to admit the point of the finger into the bladder, when the staff should be withdrawn and the prostate further divided, if necessary. The finger being then rotated, the palmar surface of its point should be made to rest upon the right side of the prostatic portion of the urethra, the bistoury be turned upon the finger to the opposite side, and the right side of the prostate also divided as far as is necessary, the stone being afterwards extracted as usual.*

* Am. Journ. Med. Sciences, vol. xi., N. S., p. 265.

PLATE LV.

THE OPERATION OF LITHOTOMY AS PERFORMED BY THE BILATERAL SECTION, WITH THE LITHOTOME CACHÈ OF DUPUYTREN.

Fig. 1. Position of the patient with lines drawn on the perineum to show the points of reference and the direction of the incision. The subject being in the position of lithotomy, the testicles and penis have been turned up and the perineum divided into two equilateral triangles, the angles of which are made to touch the bones around the perineum. 1. Pubis. 2, 3. Tuber ischii. 4. Coccyx. 2, 3, 5. Line of external incision.

From Froriep, but after Dupuytren.

Fig. 2. Dissection of the same subject. The fascia superficialis has been turned up from the edge of the incision, so as to show the accelerator urinæ muscle, and the transversus perinei arteries. The sphincter ani is seen below, and the divided fibres of part of the levator ani are shown in the cut. 1. The skin. 2. Fascia superficialis. 3. Sphincter ani muscle. 4. Line of median incision through the anterior fibres of the levator ani muscle. 5. Accelerator urinæ muscle. 6. Perineal arteries. 7. Perineal fascia dissected up, and turned over the body of the penis. From Froriep, but after Dupuytren.

Fig. 3. External Incision in Bilateral Lithotomy. 1, 2. The hands of the first assistant holding the staff vertically, and elevating the scrotum. 3. The left forefinger of the surgeon depressing the rectum. 4. Right hand about terminating, 5, the incision. The external incision should be made from left to right, with its convexity forwards, so as to form an arc of about 100°.

After Bourgery and Jacob.

Fig. 4. Section of the prostate with the double lithotome cachè upon a subject which has been dissected, so as to show the incision, the anterior portions of the sphincter and levator ani muscles having been removed. 1. Accelerator urinæ muscle. 2, 3. Internal pudic artery and nerve. 4. Transverse perineal artery. 5. Hand of the surgeon. 6. Levers which regulate the blades of the lithotome. After Bourgery and Jacob.

Fig. 5. Lateral section of the prostate as made by the single lithotome cachè, a portion of the sphincter and levator ani and anterior end of the anus being removed in order to show the prostate gland. 1. Bulb of urethra. 2. Membranous portion of urethra. 3. Prostate gland. 4, 5. Lithotome in position. 6. Corpus cavernosum. 7. Symphysis pubis. 8. Vesicula seminalis. 9. Rectum. After Bourgery and Jacob.

Plate 55.

Fig. 1

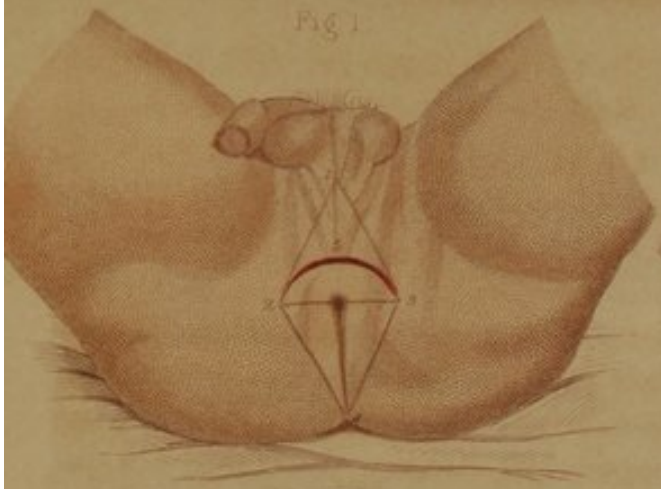


Fig. 2

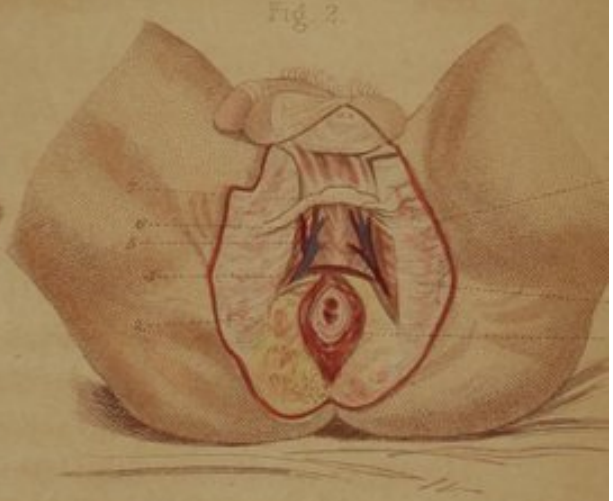


Fig. 3

Fig. 4

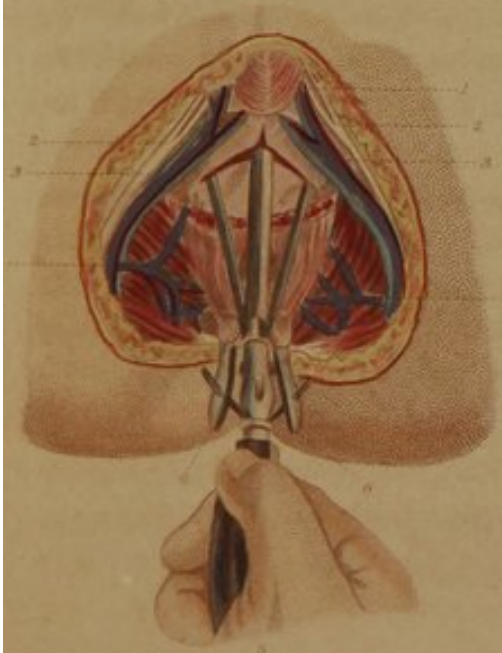


Fig. 5

Remarks.—Among American surgeons, the bilateral operation was first performed by Dr. Ashmead, of Philadelphia, in 1832, and by Dr. Ogier, of Charleston, in 1835, since which there have been many who have advocated and practiced it, among whom may be mentioned Drs. Stevens, Hoffman, and Post, of New York; May, of Washington; Pancoast, of Philadelphia; and Pope, of St. Louis; though most of them prefer the use either of a special instrument or of a probe-pointed bistoury to the lithotome of Dupuytren. My own experience, as gained upon the subject, corresponds entirely with this, as even with a lithotome, selected by the hands of Charrière, of Paris, I have found the blades to spring and yield to such an extent as to interfere with the accuracy of the section. The mode of operating, described by Dr. Mussey, is therefore, I think, preferable to that advised by Dupuytren.

The points of recommendation claimed for the bilateral operation are a more direct and free access to the bladder without injuring the vesical plexus of veins, as well as less risk of dividing important bloodvessels; but, on the other hand, the rectum is more exposed in the primary incisions, and perineal fistula, impotence, and a tendency to stricture near the prostatic portion of the urethra are said to be increased. Statistics alone can settle a question of this kind, though at present it is generally admitted that in cases of very large calculi, or in a case attended by anchylosis of the hip, as in that reported by my friend Dr. Pope, of St. Louis, or in analogous difficulties, the bilateral is preferable to the lateral section.

SECTION V.

THE MEDIAN OPERATION.

Lithotomy having at one period been the especial province of one family, or class of individuals, it is not surprising that various plans of accomplishing it should have been each highly lauded, and handed down as perfect from generation to generation. Among all these methods, that in which the perineum is incised in the median line, and the stone extracted by opening the urethra in the same direction, at first sight would appear to be the safest. But this operation, though very ancient, has, in truth, nothing to recommend it, and is only now referred to because some of its steps may occasionally be found useful in extracting such fragments of calculi as lodge and

become fixed in the urethra, or for the removal of such pebbles as are developed in the prostate gland. The operation of Giovanni di Romani, as published in 1520, and since repeatedly modified, is as follows:—

Operation of Vacca Berlinghieri.*—The patient being placed as before directed, an incision is to be made in the median line of the perineum from the origin of the scrotum to the anterior border of the anus, so as to divide the skin, superficial fascia, and anterior fibres of the sphincter ani muscle, and lay bare the groove of the staff in the membranous portion, without exposing the bulb. The knife, or probe-pointed bistoury, being then passed along the groove of the staff into the bladder, the neck was divided to the extent of four or five lines in a direction parallel with the median line.

SECTION VI.

OF THE SUPRA-PUBIC OPERATION.

As the process of peritoneum which lines the abdominal muscles is reflected from above the pubis to the superior and posterior portions of the bladder, there is a space left anteriorly through which it is possible to open the bladder without incising the peritoneum, and it is at this point that the extraction of calculi by the Supra-Pubic or Hypogastric operation has been occasionally practiced; though the majority of operators have preferred incising the perineum.

Operation of Sir Everard Home.†—An incision being made four inches long, between the pyramidales muscle in the direction of the linea alba, the tissues were divided down to the tendon, which was then pierced close to the pubes, and divided by a probe-pointed bistoury to the extent of three inches, a portion of the origin of the pyramidales being detached, so as to increase the size of the opening near the pubes. The forefinger being now passed into towards the pelvis, the fundus of the bladder was recognized, and a silver catheter open at both ends being carried into the urethra, its point could be felt pressing upon the fundus of the bladder. A stylet which had been concealed in the catheter, being then forced through the coats of the bladder, was followed by the end of the catheter, and the stilet being withdrawn, the puncture in the bladder

* Malgaigne, p. 503.

† Gibson's Surg., vol. ii. p. 259.

was enlarged sufficiently to admit two fingers, by means of the probe-pointed bistoury. The stone being now felt by one finger whilst the superior fundus of the bladder was held up by the other, a pair of forceps, with a net attached, was passed down into the bladder, and the stone directed into them and retained there by the finger till extracted. A slip of linen being then introduced into the bladder, one end was allowed to hang out of the wound, and the edges of the latter closed by adhesive plaster, a catheter being kept in the urethra in order to draw off the urine.

Remarks.—This operation, which was assigned to Franco, in 1561, and afterwards practiced by Rousset in 1581, has seldom been deemed advisable by surgeons, except for the removal of very large calculi, or in consequence of a diseased prostate.

In the United States, it was first performed by Dr. Wm. Gibson, of Philadelphia, but it has since been repeated by Drs. Carpenter, Van Valzah, and George McClellan, of Pennsylvania.* Its chief recommendation appears to be the safety arising from the absence of hemorrhage; but this is more than counterbalanced by the risks of peritonitis, urinary infiltration, and abscesses.

§ 1.—THE QUADRILATERAL OPERATION.

Vidal du Cassis having suggested the incision of the prostate in several directions, like the radii of a circle, so as to admit of the greater distension of the opening, his mode of operating has been designated as the quadrilateral operation. Except in the very rare instances of enormous calculi, such incisions must, however, be unnecessary, and, when required, could be easily added to any of the other plans of operating, though originally suggested in connection with the bilateral operation.

SECTION VII.

GENERAL REMARKS ON PERINEAL LITHOTOMY.

In the consideration of the different methods of performing perineal lithotomy, little has been said in reference to the mode of

* Gibson, vol. ii. p. 260. Gross, p. 500.

extracting the stone; in relation to the accidents likely to occur during the operation; or in respect to the dressing and after-treatment, all of which demand special consideration.

§ 1.—EXTRACTION OF THE STONE.

In extracting a calculus, after the bladder has been opened by either of the preceding methods, much care and skill are necessary, this part of the operation being, in many instances, the most difficult and tedious step of the proceeding. The wound may apparently be free, and the primary incisions rapidly and neatly made, with every appearance of a speedy termination to the operation; and yet the mere extraction of the stone through the wound will occupy more time than would suffice for several incisions. In order promptly to accomplish its removal, the operator should, therefore, first endeavor to learn its position and mode of presentation, and in this he may be materially assisted by recalling the shape of the bladder, its relations to surrounding parts, and the tendency of the stone to gravitate to the most depending point. Most calculi, especially when single, lie, at the posterior inferior part, or bas-fond of the bladder, in consequence of their weight, or because the contraction of the muscular coat forces them to occupy such a position as is most favorable to the escape of the urine by the urethra, presenting, therefore, their longest diameter longitudinally, and their flattened side downwards. In order to seize a stone thus placed, the curved forceps should be introduced, so that the convexity of their blades may correspond with the posterior angle of the wound, their handles being at the same time elevated sufficiently to place their points in the lowest portion of the bladder. (Plate LIV. Fig. 5.) When the thickness of the perineum permits it, the left index finger should also be made to depress the posterior angle of the wound, especially in the bladder, and serve as a guide for the forceps; but as, in a large deep adult perineum, this is sometimes impossible, the operator will be compelled to rely upon the knowledge gained in his previous examinations for the probable position of the calculus. After touching the stone with the points of the forceps, the rings of the latter should be seized between the thumb and fingers of each hand, the blades cautiously expanded, and then by a half turn to the left, made to scoop up or seize the calculus as it is forced into the grasp of the instrument

by its own weight, or by the contractions of the bladder. If, however, this should not be the case, the operator may gently expand and close the blades of the instrument, giving them at the same time a gentle lateral and up and down motion, so as to sweep the bladder by their smooth and external surfaces, until the stone is brought within their grasp. When seized, the left forefinger should be slipped along the blades, so as to feel if the short diameter of the stone is parallel with the transverse diameter of the wound, and being satisfied of this, the calculus, if large, may be extracted by pulling it gently but steadily towards the operator, it being at the same time moved laterally, as well as up and down, in order to favor the dilatation of the wound. The use of Barton's forceps (Plate LIII. Fig. 9) will materially facilitate the extraction of the stone, as the fenestra diminish the space occupied by the thickness of the instrument; but if the calculus is of the ordinary size, and the incisions sufficiently large, little difficulty will be experienced from the latter source. In many instances, the incision in the prostate has not been sufficiently large, or the inferior angle of the wound, or the opening in the skin is too narrow; and when this is so, much may be done by persevering and gradual dilatation of the part, or by enlarging the angle of the wound with the bistoury. When the size of the stone forbids all hope of its extraction entire, then it should be crushed by Earle's forceps (Plate LIII. Fig. 14), or by Heurteloup's lithontriptor, and extracted piecemeal, the fragments being removed by washing out the bladder with barley-water.

The Scoop is an instrument that may prove serviceable in cases where the size of the stone forbids the hope of introducing the additional thickness of the forceps, or in cases of numerous calculi, or in that of fragments of a calculus. Or, it may be resorted to for the removal of such calculous concretions as are occasionally found upon parts of the bladder, and which require to be peeled off. Whenever the attempt is made to remove a calculus by the scoop alone, the point of the forefinger of one hand should be placed against the stone to steady it in the hollow of the instrument (Plate LIV. Fig. 6).

After removing a calculus by any instrument, the finger should be again introduced into the bladder, and carefully passed around it in order to ascertain whether some particles have not been left. Should any be found, it will be better to wash them out by freely injecting barley-water than to attempt to seize them with forceps, or

to remove them with the scoop. The injection will also prove useful by removing clots from the part.

If the stone should be *encysted*, or adherent, the steps to be pursued will depend mainly upon the manner in which it is attached, and on the judgment of the operator. Sometimes the attachment is owing to folds of the bladder being introduced into asperities in the calculus, and these may be often overcome by passing the finger gently round, and hooking out the stone; or, a process from the stone may have entered a dilated ureter, or be placed in an abnormal pouch in the bladder. To relieve either of these latter attachments, it is usually necessary to exercise judicious traction upon the main portion of the stone; though the process of the mucous membrane may require to be ruptured with the finger, or, if it is a simple band, to be divided by the knife, in order to free it; but the necessity for the latter is very rare, and should never be resorted to until every other means have failed.

§ 2.—ACCIDENTS CONNECTED WITH LITHOTOMY.

An accident that occasionally complicates the operation of lithotomy, even in careful hands, is hemorrhage, though, under ordinary circumstances, it is not sufficiently severe to demand active treatment. A wound of the rectum may happen, but it can generally only be regarded as evidence of the incompetency of the operator.

Hemorrhage may arise from several points connected with the incisions in lithotomy: 1st, it may come from the perineal arteries; 2d, from the vesical plexus of veins; and, 3d, from the internal pudic; the latter being, however, much less frequently wounded than an inexperienced surgeon might suppose, as it lies too near the ascending ramus of the ischium to be in the way of any ordinary incision. When, however, the hemorrhage from any point is sufficient to demand treatment, it may be arrested either by the application of the ligature, or by pressure.

I. LIGATURE.

The ligature of the smaller perineal arteries does not differ in any respect from the ligature of other vessels, the open vessel being

seized with a tenaculum, and then tied with the silk ligature. But if by any accident the main trunk of the internal pudic artery be divided, the hemorrhage will be more troublesome, though it may be promptly controlled simply by compressing the artery with the finger against the ramus of the ischium until a ligature can be thrown around it. To accomplish the latter, few instruments will be found more serviceable than that resorted to by Dr. Physick under similar circumstances, and hence named Physick's forceps and needle (Plate II. Fig. 3). The needle being passed beneath the trunk of the artery, the ligature is carried around the vessel, and made to compress it by inclosing a portion of the flesh near the vessel.*

II. PLUGGING.

From the varicose condition of the vesical plexus, especially in old men, a general hemorrhage or oozing is sometimes seen from the wound, without its being possible for the surgeon to detect any point suitable for a ligature. Under these circumstances, compression is the only alternative, and may be readily accomplished by passing a large catheter into the bladder through the wound, and then packing the latter full of lint or charpie, the escape of the urine through the catheter preventing distension of the wound in the neck of the bladder, whilst the lint at its sides favors the formation of the clots which tend to close the vessels. After the lapse of three days, or when there is evidence of suppuration in the wound, this lint should be carefully withdrawn lest it interfere with the cicatrization.

III. WOUND OF THE RECTUM.

From want of attention to the entire evacuation of the bowel before the operation, or from the great dilatation of the prominent pouch or enlargement generally noted near the middle of the gut, or from the surgeon wandering from the staff in the prosecution of his incisions, the rectum has been perforated on its anterior surface, and the after-treatment of the case complicated with the production of a rectal fistula. Although such a fistula is a source of annoyance,

* Dorsey's Surgery, vol. ii. p. 190.

PLATE LVI.

INSTRUMENTS EMPLOYED IN THE OPERATIONS OF LITHOTOMY AND LITHOTRIPSY.

Fig. 1. The sound employed in detecting the presence of a stone in the bladder of the male. 1. Its smooth handle. 2. A curve of a medium size. Schively's pattern.

Fig. 2. Staff employed in operating for lithotomy on the female. Schively's pattern.

Figs. 3, 4, 5, 6. Staves of different sizes and curves, so as to be adapted to the urethra of different patients in the ordinary lateral operation for lithotomy. The handles should be broad and well serrated, so as to furnish a firm hold, and prevent the groove slipping or turning from the position in which it is wished to be held during the perineal incisions. Schively's pattern.

Fig. 7. Jacobson's instrument for crushing a calculus in the bladder. 1. The articulated loop which holds and crushes the stone when it is caught in the grasp of the instrument. 2. The screw which closes and expands the loop. Schively's pattern.

Fig. 8. Heurteloup's Lithontriptor. 1. The female blade. 2. The male blade. 3. The vice in which the screw works in crushing the stone. 4. The screw. Schively's pattern.

Fig. 9. A Litholabe for extracting fragments of a calculus or pebbles from the neck of the bladder. Schively's pattern.

Fig. 10. Leroy d'Etiolles's articulated scoop for the removal of fragments which lodge in the urethra. Schively's pattern.

Plate 56.

Fig. 1.

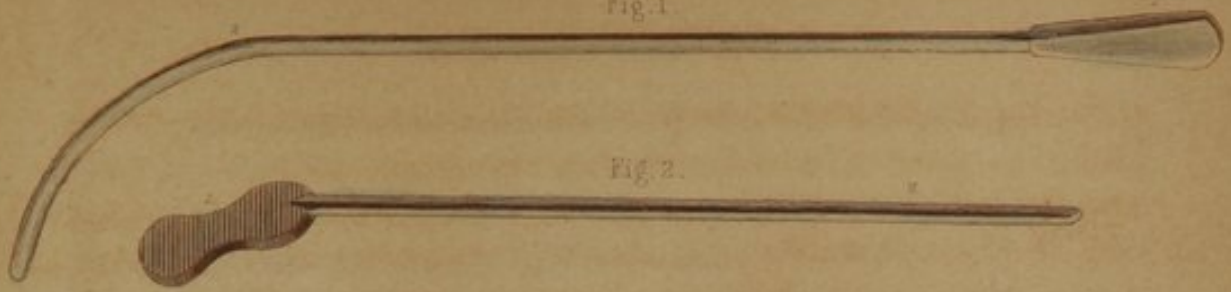


Fig. 2.

Fig. 3.

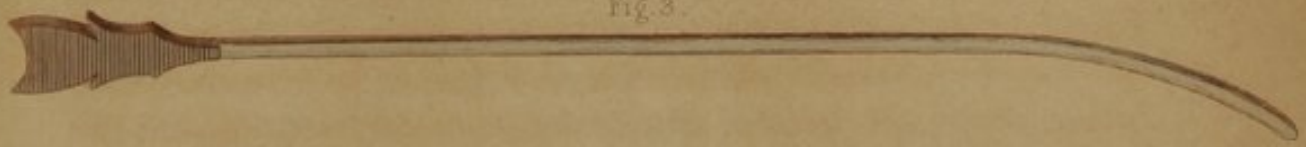


Fig. 4.

Fig. 5.

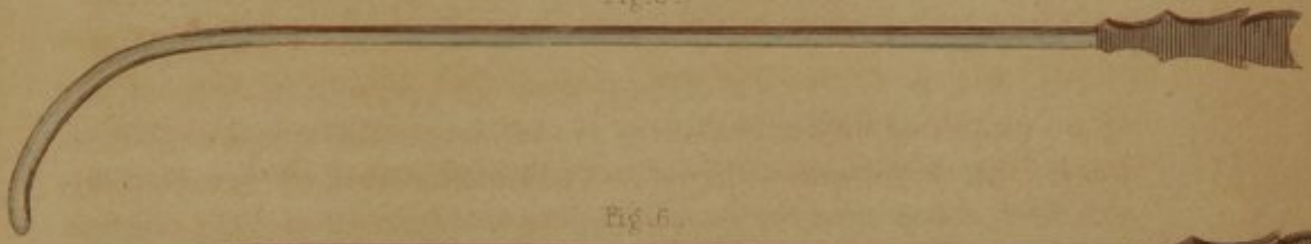


Fig. 6.

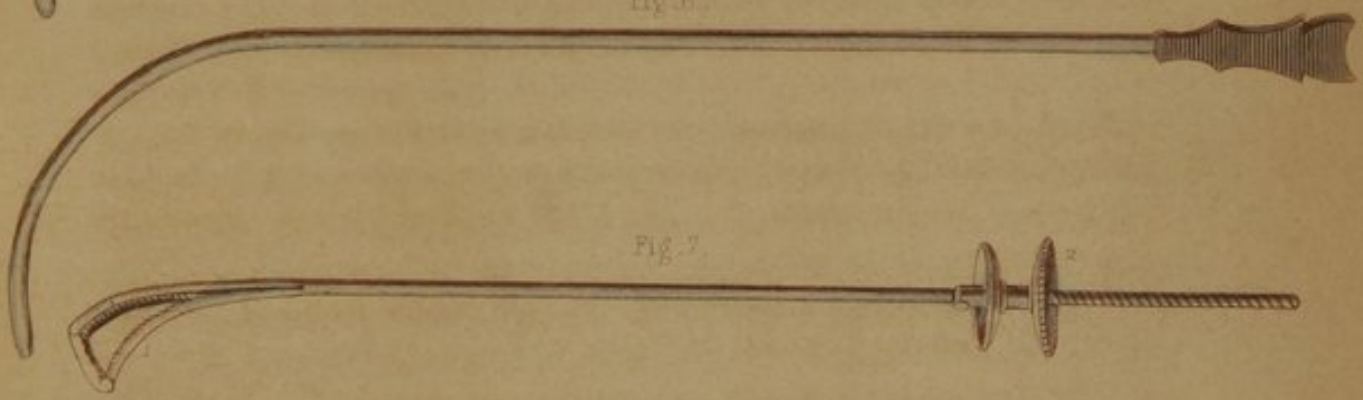
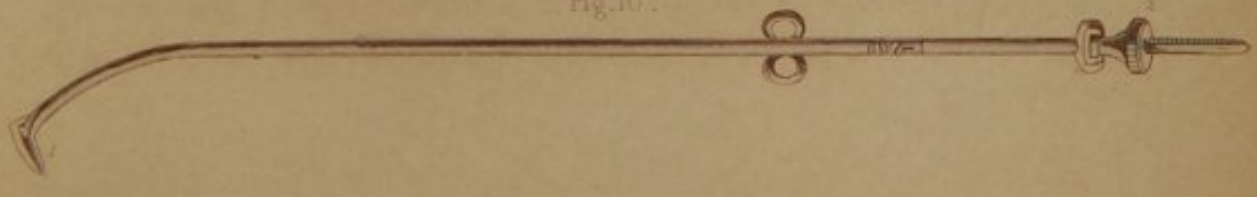


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.



adds an unnecessary risk to the chances of the patient, and is, I think, positive proof of the want of skill in the operator, its evils, in most instances, have been over-estimated, as it is usually readily amenable to treatment. In the simple case of a small puncture of the gut which is detected at the time or soon after the operation, the best mode of obviating it is to evacuate the contents of the bowel, give a large anodyne enema to keep the parts at perfect rest, and then, by means of the catheter passed into the bladder through the wound, prevent urinary infiltration of the surrounding structures. In more extended injuries, the entire division of the sphincter ani muscle, as in rectal fistula, together with the free use of anodynes, by allowing the gut to collapse, will favor the union of the incision. But even where a recto-vesical fistula has resulted, cauterization and perfect rest have often sufficed to heal it. In two instances, I have seen this accident occur in the operations of careless surgeons, who were evidently desirous rather of operating quickly than carefully, and in both, little or no treatment was requisite, the patients recovering without being aware of the occurrence.

SECTION VIII.

AFTER-TREATMENT OF THE OPERATION OF PERINEAL LITHOTOMY.

The importance of a judicious after-treatment in every operation has been perhaps sufficiently insisted on in the previous pages, yet the knowledge of a case in which an inexperienced operator, after succeeding in extracting a calculus by lithotomy, felt compelled to seek directions respecting the proper steps of the after-treatment, induces me to give to it in this operation such extra attention as my limits will permit, and to refer those desirous of further details, both on this and other points connected with stone, to the excellent volume recently published by a distinguished surgeon of the western country.*

* See "A Treatise on the Diseases, &c. of the Urinary Organs, by Samuel D. Gross, M. D., Louisville;" a work of great value, and indicative of the extended experience of this accomplished surgeon.

§ 1.—PUTTING TO BED.

After the completion of the operation, including the arrest of hemorrhage, the first point to decide upon will be the dressing. In most instances, nothing is required except rest, as the wound is intended to heal by granulation. According to some surgeons, certain advantages are to be obtained from tying the patient's knees together, and keeping him upon his left side, so as to favor the union of the edges of the wound and the escape of the urine without infiltration of the surrounding parts. Others, again, place a large catheter in the bladder by passing it through the wound, fastening it in position by a strip of adhesive plaster, which is attached to the perineum, so that the catheter, by leading the urine off to a saucer, may keep the patient dry. But the use of this catheter is liable to the serious objection of preventing union of the neck of the bladder by the first intention, as was the fortunate result in two of the operations of Dr. Physick;* and when it is retained in this way more than a few days, it is very apt to lead to the establishment of perineal fistula. For many years, and especially in the practice of the late Dr. Randolph, of Philadelphia, I have been accustomed to see patients removed directly from the operating table to the bed without any dressing—the bed being kept dry by the strict attentions of the nurse, and the removal of the clothes, placed beneath the wound as soon as they were wet. I would therefore urge the advantages of preparing the bed and patient as follows: Place a piece of oil-cloth upon a good elastic hair mattress at a point corresponding with the patient's hips; place over this the ordinary sheet; and place upon this transversely the end of another sheet folded in four lengthwise, so that as soon as one part is wet by the urine it may be drawn away and a dry part substituted. The position of the patient, "upon the left side, with the knees drawn up," has long been a standing rule, and so religiously observed by some that I have seen the great trochanter and crest of the ilium almost ready to come through the skin from the continued pressure, the patient being compelled to use large doses of opiates in order to obtain sleep. It is therefore with much satisfaction that I find an opposite practice sanctioned by the excellent authority of Dr. Gross, of Louisville, and the direction given to permit the patient to take, cautiously,

* Dorsey's Surgery, vol. ii. p. 191.

any easy position, experience having taught him that "it matters little what posture the patient assumes after he has been put to bed."*

§ 2.—TREATMENT OF THE WOUND.

The urine escaping from the wound by the lowest angle occasionally induces some little cutaneous irritation, which, if it become an annoyance, should be obviated by anointing the part with mild cerate. After two or four days, the lips of the wound usually become tumid, and present signs of inflammation. In most instances, this is only indicative of the efforts of nature to close the perineum, and should not, therefore, be interfered with unless excessive, when warm moist cloths, frequently changed, will suffice for its removal. If calculous matter forms around or in the wound, it should be washed away with a stream of water from a syringe, or loosened by the action of a weak solution of hydrochloric acid.

The bowels also should be kept at perfect rest by anodyne enemata until the fourth day after the operation, when the administration of a mild laxative, as castor-oil, or citrate of magnesia, will be serviceable. If on the escape of urine through the penis, the perineal wound does not heal, a catheter may be placed in the urethra, and the union of the wound facilitated by the use of caustic or by means of pressure.

§ 3.—CONSTITUTIONAL TREATMENT.

As a general rule, the constitutional treatment, after the operation for lithotomy, should be antiphlogistic, though strict attention should also be given to the previous habits of the patient. If the patient is an old man, good diet or even stimulants will often be demanded, and tardy healing of the wound will often be removed by such an increase of diet.

But among the most important of the steps connected with the constitutional after-treatment of lithotomy is the removal, if possible, of the calculous diathesis, as it is not sufficient for the cure of the patient that the surgeon should have removed the stone, unless he

* Opus citat., p. 465.

effects a change in the character of the urine. It is therefore advisable, in every case, to test the urine both before and after the operation, by litmus paper, the microscope, or similar means, until its peculiar characters are known, and then to obviate the unhealthy action of the kidneys by acids, alkalies, diet, or other appropriate means of treatment.

SECTION IX.

GENERAL ESTIMATE OF THE VALUE OF THE DIFFERENT METHODS OF OPERATING FOR LITHOTOMY.

After what has been said under the preceding sections of the special advantages of the different modes of operating, there is but little that is new to offer in a general estimate of the whole of them; and yet such a summary is not without its value. Apart from the peculiar predilection of certain surgeons for instruments of their own invention (which really afford nothing that can materially aid a good anatomist in the performance of lithotomy), there is, however, little that is settled on this point, and in examining the advantages derivable from the lateral, bilateral, or supra-pubic plans of operating, it is difficult to obtain anything like an accurate result when so much of the success of either must necessarily be due to the skill and judgment of the operator.

Statistics of the Lateral Operation. — The statistics of lithotomy, though presenting the results of a large number of cases, do not offer a perfectly reliable result, because in many instances nothing is said of the peculiarities of the case, the age of the patient, or other incidents which must exert a very important influence upon an opinion. Yet, as such statistics have a certain value, and are at present the only data upon which an inexperienced surgeon could form even an approach to an estimate of the risks to which a patient is exposed by the operation, they are presented as obtained from the sources mentioned, with the addition of the opinion of Dr. Gross that about one out of every five of those cut in lithotomy die after the operation.*

* Gross on Urinary Diseases, p. 470.

	CASES.	DEATHS.
Dudley, of Kentucky*	207	6
Pennsylvania Hospital, Philadelphia†	83	10
Gardner, of Kentucky†	15	1
Davis, of Ohio†	72	6
Eve, of Georgia†	2	1
Bush, of Kentucky†	5	0
Gibson, of Philadelphia‡	50	6
Mettauer, of Virginia§	73	2
Jno. C. Warren, of Boston§	30	2
Marsh, of Albany§	7	0
	544	34
Smith, of Bristol, England, reports for Great Britain	354	79

Mortality in Great Britain after the operation, 22⅓ per cent.

Mortality in United States, 6⅓ per cent.

Showing that the operation of lithotomy has been nearly four times as successful in the United States as in Great Britain.

STATISTICS OF THE BILATERAL OPERATION.—After examining the various tables, and separating these from the cases specially mentioned as operated on by the bilateral section, the following result has been obtained:—

	CASES.	DEATHS.	
Eve, of Georgia‖	16	0	specified.
Spencer, of Virginia‖	16	2	
Mussey, of Cincinnati¶	18	0	"
Hotel Dieu**	26	0	
Dupuytren**	70	6	
Warren, of Boston††	3	0	"
	149	8	

Or, a mortality of about 5⅓ per cent.

STATISTICS OF SUPRA-PUBIC LITHOTOMY.—A brief account of the cases operated on shows that this operation has obtained a sufficiently large success to justify its repetition where other means are not permissible. Out of twenty-five cases which I have collected from

* Trans. Am. Med. Assoc., vol. iv. p. 273, 1851.

† Ibid., p. 274.

‡ Gross on Urinary Diseases, p. 470.

§ Trans. Am. Med. Assoc., vol. i. p. 161.

‖ Ibid., vol. iv. p. 274, 1851.

¶ Ibid., vol. ii. p. 226, 1849.

** Velpeau, Op. Surg., by Mott, vol. iii. p. 918.

†† Gross on Urinary Diseases, p. 470.

various sources, twenty-one have been cured and four died, thus presenting a mortality of about sixteen per cent.

Great allowance must, however, be made for the results, as shown in all these tables. In several instances, the deaths have not been specified; in others, the surgeon has relied upon his recollection, and supposed that he has operated on about fifty cases with a moderate number of deaths, and in the statistics furnished under the head of the lateral operation, it is not always certain that the lateral method was the one employed. I have, however, examined the statements closely, and endeavored to obtain a correct result, and my conclusion is that the only point that can be depended on in the above tables is that out of 715 cases, 541 were cut by the lateral, 149 cases by the bilateral, and 25 cases by the hypogastric operation, thus showing a decided preference among surgeons in favor of the lateral operation.

CHAPTER III.

LITHOTRIPSY, OR CRUSHING OF STONE IN THE BLADDER.

The removal of a calculus from the bladder by the introduction of crushing instruments capable of reducing its particles to such a size as could pass out by the urethra, is an operation of great antiquity, having been spoken of by Ammonius about 110 B. C.,* though it appears to have been lost sight of, until again brought forward, through the efforts of Civiale, of Paris, about 1822. Like most other novel operations, the progress of lithotripsy was at first retarded by the great number of instruments supposed to be necessary for its performance. Enlightened by the experience of the distinguished European surgeons who seconded Civiale's efforts, and simplified the method very considerably, the operation has now been brought to such perfection that any surgeon can accomplish it, if a sufficiently dexterous manipulator; gentleness, a delicate sense of touch, and a light hand, aided by a good crushing instrument, being the points most essential to its performance at the present period.

Without entering into a history of the progress of the operation,

* Smith's Dict. Greek and Roman Antiquities, art. Chirurgie.

or spending time in the description of the multifarious instruments heretofore devised and employed, the present account will be limited to the operation as performed with the "lithontripteur" or "stone-crusher" of Heurteloup, this being the instrument now most frequently resorted to.

PRELIMINARY TREATMENT.—As the principal danger in the operation of lithotripsy arises from the production of inflammation, it is of the utmost importance that every means be employed to prevent it. The preliminary treatment will therefore often be the chief source of success, and it should be pursued according to the following plan: After giving attention to the condition of each organ, especial efforts should be made to remove the irritability of the bladder by the free use of the warm hip bath, by anodyne enemata, and especially by the use of alkalies, as they, by depositing on and equalizing the surface of a rough stone, often counteract one great source of irritation. When these constitutional remedies have induced a less irritable condition, a local preparatory treatment should be commenced, especially the frequent introduction of bougies, so as to dilate the urethra gradually, and accustom the parts to the passage of an instrument. By perseverance in the daily use of a bougie for about eight days, allowing it to remain in the bladder for a half hour or hour, and gradually augmenting its size, the urethra may be prepared to receive the largest lithontriptic instrument not only without pain, but without much irritation. The preparation of a narrow bed or table of a convenient height, some tepid water, a little oil, and a good instrument, complete the preliminary measures.

The selection of the lithontriptor is a matter of the greatest consequence, and, unless it is of the finest temper and finish, it should never be used. I have been accustomed to test these qualities by crushing a moderate-sized tamarind stone in the instrument before attempting to break a calculus. The danger from an imperfect instrument is, however, not in its breaking, so much as in its bending or spreading at the point, so as to prevent its retraction. In two instances in the hands of the late Dr. Geo. McClellan, of Philadelphia, the male blade of Heurteloup's instrument was broken short off in the bladder, and yet subsequently voided with the urine and sand; but when from want of temper the female blade is expanded, or either blade is twisted or bent, the withdrawal of the instrument may become impossible without a serious laceration of the neck of the bladder and urethra.

PLATE LVII.

OPERATIONS FOR THE REMOVAL OF STONE FROM THE BLADDER.

Fig. 1. Hypogastric Operation for lithotomy. An incision having been made in the linea alba and the bladder opened, the left forefinger of the surgeon is seen holding up the superior angle of the wound. Whilst an assistant separates the left side by a blunt hook, the right hand of the surgeon elevates the calculus from the bas-fond of the bladder by means of the scoop. 1. Left hand of the surgeon. 2. His right hand elevating the stone.

After Bourgery and Jacob.

Fig. 2. The scoop which thus supports the stone and prevents its again falling into the bladder being now held by an assistant, the surgeon seizes it in the forceps with both hands, and is seen in the act of extracting it. 1, 1. Hands of the surgeon. 2. Assistant holding the stone near the wound, so that the forceps can readily seize it. After Bourgery and Jacob.

Fig. 3. A View of the Operation of Lithotripsy. A section of the parts around the pelvis shows the position of the patient, and the manner in which the stone is seized and held by the lithontriptor of Heurteloup.

After Bourgery and Jacob.

Fig. 4. Another view of the same operation, showing the position of the fragments in the bladder and the mode of seizing them, after the stone has been crushed two or three times. After Bourgery and Jacob.

Fig. 5. Extraction of a fragment of a calculus from the prostatic portion of the urethra by means of the articulated scoop of Leroy d'Etiolles. The instrument is introduced as a straight sound, gradually passed behind the fragment, and then its end made to turn up at a right angle with its stem by means of a screw concealed in its shaft. 1. Handle of the instrument. 2. Its articulated point. 3. Fragment as held by it. 4. Prostate gland.

After Bourgery and Jacob.

Plate 57

Fig. 1

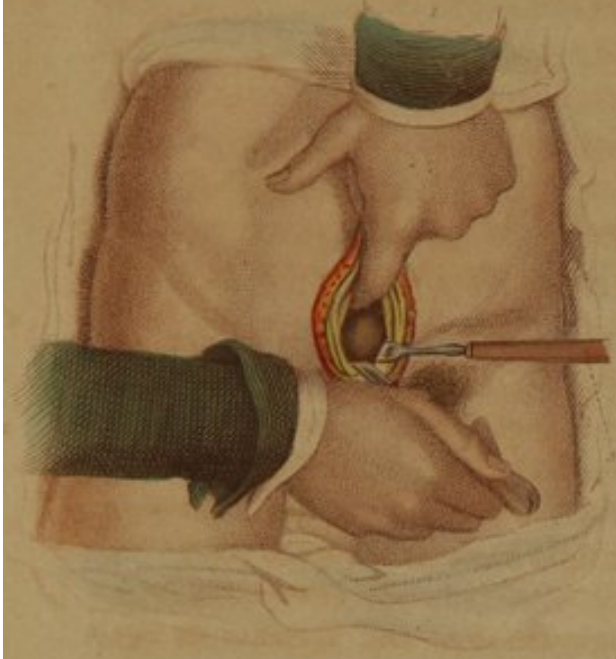


Fig. 2

Fig. 5

Fig. 3

Fig. 4

Having in former years aided in carrying out the plan of treatment directed by Dr. J. Randolph, of Philadelphia, who was eminently accomplished as an operator in this department of surgery, I have selected his method as that which may be advantageously followed; not that it presents anything peculiar, but because it is sanctioned by the experience of one of the earliest and most frequent operators in the United States.

Operation of Dr. Randolph, of Philadelphia.—The patient, after a careful preliminary treatment, being placed upon his back on a narrow table, covered with blankets, and with a pillow under the hips, the latter were brought to the end of the table, the head and shoulders slightly elevated, and the feet supported on chairs so that the knees were wide apart. When the urine had been retained, the lithontriptor was immediately passed into the bladder, but when it had escaped, a silver catheter was first passed, and tepid water injected until it was partially distended. The lithontriptor being then gently introduced into the bladder, its blades were cautiously expanded and carried from before backwards, or from right to left, or from behind forwards, or from left to right, according to the knowledge possessed by the surgeon of the position of the stone, when the manipulation of a few seconds usually enabled him to catch it (Plate LVII. Fig. 3), though sometimes it apparently fell into the grasp of the instrument as soon as the latter was expanded and before it was carried to any extent laterally. After seizing the stone, and moving it a little in the bladder so as to be sure that no portion of its mucous coat was included, the blades were closed by turning the screw with the hand, and the stone broken. Again a part was seized and broken, and if the patient did not complain, it was seized a third time (Plate LVII. Fig. 4), after which, the instrument was gently tapped and moved about in order to free it of the fragments, the blades perfectly closed and the whole withdrawn. The "sitting" often lasted only about five minutes, and was seldom over twenty, even when it caused the patient no pain.

After-Treatment.—The patient, if comfortable, was now kept on a light diet; but if in pain, received a hip-bath, and an enema of sixty drops of laudanum, or a dose of Dover's powder, and if, after the lapse of from three to five days, no constitutional or local irritation forbade it, the operation was repeated.

After crushing a stone, it has sometimes happened that a fragment in being voided lodges and becomes fixed in the urethra, and

this is usually the most troublesome part of the after-treatment. If seated near the neck of the bladder, the better plan is to push it back into the bladder by means of a sound; but when it is near the fossa navicularis, to dilate the orifice of the urethra, and remove it, if possible, with fine forceps. Should it, however, be further back, an effort may be made to draw it out by means of Leroy's scoop (Plate LVI. Fig. 10); or, if fast in the spongy portion of the urethra, by cutting down and extracting it through the opening. (Plate LI. Fig. 5.)

Remarks.—In operating for lithotripsy, much will depend on the manual skill of the operator, as well as on his accurate knowledge of the anatomy of the structure operated on. In order to obtain the first, the young surgeon will find it very useful to practice upon stones introduced into the bladder of a subject, or to place them in a moderately soft buckskin bag, lay the latter upon a pillow, and then with closed eyes endeavor to catch the stone without inclosing also a portion of the buckskin. But, although the operation of lithotripsy may thus be made to appear an apparently simple one, it is only so when practice has rendered the operator dexterous. In the hands of Civiale and Randolph, I have seen a patient continue in conversation with a smile upon his face during the whole sitting, whilst other operators have given rise to the most intense suffering by their heavy, clumsy, and thick-fisted manipulations. Since the introduction of anæsthetic agents, it has been thought that all pain from the operation could be avoided, and yet the dangers not increased, and such, I think, is truly the case, because, when the bladder is freely distended by the water previously injected, and the surgeon is a practiced operator, the use of the anæsthetic will not only prevent any suffering, but facilitate the operation by preventing straining. To such a surgeon the sense of touch, and that mental perception which enables him to see with his fingers exactly where the point of the instrument is in the bladder, will prevent any injury to the coats of the latter. But, under other circumstances, and in the hands of those who can only imagine what they are doing, the use of anæsthetics will be attended by much danger, as the cries of the patient will be the only proof that can be offered of the coats of the bladder being injured; in other words, anæsthetics will facilitate the operation of lithotripsy, in most instances, though it may also lead to most serious accidents. In the primary operations of young surgeons, it will certainly be safer for them to omit it.

CHAPTER IV.

OPERATIONS ON THE FEMALE GENITO-URINARY ORGANS.

THE operations required for the relief of the affections of these organs are comparatively limited in number; the removal of deformities and the evils resulting from injuries being those to which attention is chiefly directed.

SECTION I.

SURGICAL ANATOMY OF THE FEMALE PERINEUM.

The female perineum embraces a region that has been variously described by authors, some including in its boundaries most of the external organs of generation, and carrying it, as in the male, from the pubis to the coccyx, whilst others define it as the portion between the anus and vagina. For surgical purposes, the former is the most useful, though the changes produced in delivery are chiefly limited to the latter. Without entering upon all the details of this structure, it may suffice, at present, to allude briefly to such portions as are concerned in operations.

The surgical relations of the Vulva require no other reference than the mention of the fact that the cellulo-adipose tissue is here freely developed, and that cysts, abscesses, or wounds of the part should, therefore, be treated with reference to the liability of this structure to liquid infiltrations.

The Clitoris is formed chiefly of an erectile structure like the corpus cavernosum of the male arises by two branches from the ramus of the ischium and pubis, and has a small prepuce formed by the extension of the membrane covering the nymphæ. Occasionally the clitoris gives rise to such irritation as may demand its removal. As its vessels can be readily controlled, there is nothing in the operation requiring special attention.

Below the clitoris, and within the nymphæ, there is found a triangular smooth surface, about three-fourths of an inch long, called the

Vestibule. This surface terminates inferiorly, or posteriorly, in the orifice of the urethra, and is one of the points in which lithotomy is performed.

The female Urethra is from twelve to fifteen lines long, and pursues a direction which passes in a line from below upwards and from before backwards. Its vesical extremity is the largest, and its vulvular orifice the smallest, representing in this arrangement a cone, the base of which is towards the bladder; hence, small calculi escape readily, and simple dilatation of the orifice facilitates the passage of those of a large size. At the orifice may be found a marked rising, or tubercle, which is an approach to the bulb of the urethra as seen in man, and serves as a guide to the finger of the surgeon when introducing the female catheter. Near its commencement, the urethra is close to the vagina, but as it ascends it becomes separated from it by a triangular space corresponding with the vestibule, which is occupied by a very loose cellular tissue.

Below the urethra, is the orifice of the vagina, which, in virgins, is often closed by the membranous expansion known as the hymen. Most frequently, this membrane is thin, delicate, and readily lacerated, though sometimes it demands the use of the bistoury.

The Vesico-vaginal septum is sufficiently extended, reaching even as far as the boundaries of the anterior face of the vagina, and creating rather a vesico-uterine than a vesico-vaginal septum.

Between the vagina and the rectum, for a distance of fifteen lines above the anus, is a condensed cellulo-adipose structure, uniting the two canals, and constituting the recto-vaginal septum, and above this the peritoneum descends so as to form the recto-vaginal pouch. Below the recto-vaginal septum, or in the perineum proper of some anatomists, there is found the skin, anterior extremity of the sphincter ani muscle, the perineal fascia and the posterior portion of the sphincter vaginæ muscle, together with a cellular tissue which is remarkable for its laxity and the number of bloodvessels which run to it.

The muscles of the female perineum are very much the same as those found in the male, but they are usually less developed, with the occasional exception of the sphincter vaginæ. The levator ani is also separated in front by an interval which is occupied by the vagina and neck of the bladder.

The bloodvessels and nerves do not differ materially from the arrangement found in man.

In studying the layers of this region from before backwards, there may be noted: 1, the mucous membrane; 2, a vascular and cellular structure containing the roots of the clitoris, covered by the erector clitoridis muscle, and having the anterior extremities of the sphincter vaginæ muscle upon its sides; 3, the triangular ligament traversed by the urethra, and containing the transversalis perinei artery; 4, the dorsal veins of the clitoris and the plexus which surrounds the neck of the bladder; lastly, the inferior and anterior portion of the bladder, through which the incisions are made in lithotomy, as practiced in the female.

SECTION II.

OPERATIONS ON THE EXTERNAL ORGANS OF THE FEMALE.

Among the operations belonging to this section, will be found such as are demanded for the relief of the bladder as well as the external parts.

§ 1.—OCCLUSION OF THE VULVA.

Whether the closure of the lips of the vulva be the result of congenital defect, or the consequence of inflammation, it will generally require prompt attention in order to make a vent for the urine.

In the cases of young children, where the labia are partially adherent, it is only necessary to introduce a stiff probe at some point which is open, and lacerate the adhesions. But, if the adhesions are more complete than this, or more firmly united, a careful dissection should be practiced in the median line of the vulva, and reunion prevented by the introduction of lint, or by touching the surface with the nitrate of silver.

§ 2.—HYPERTROPHY OF THE NYMPHÆ AND CLITORIS.

Enlargement of these parts occasionally demands excision, and may be accomplished by seizing the portion with forceps, and excising it either with the scalpel or scissors. Should the hemorrhage not

PLATE LVIII.

INSTRUMENTS EMPLOYED IN OPERATIONS UPON THE VAGINA AND RECTUM.

Fig. 1. Lever Speculum of Dr. Marion Sims, for elevating the posterior face of the vagina. 1. Surface which is applied to the posterior face of the vagina. Schively's pattern.

Fig. 2. Sims's Smaller Speculum for elevating the anterior end of the vagina. Schively's pattern.

Fig. 3. Sims's Knife, for freshening the edges of a vesico-vaginal fistula. Schively's pattern.

Fig. 4. Sims's Needle, for inserting the sutures in a vesico-vaginal fistula. Schively's pattern.

Fig. 5. Sims's Crotchet, for sustaining the traction made in drawing upon the threads. Schively's pattern.

Fig. 6. Sims's Hook, for seizing the edge of the fistula, or the loop of a suture. Schively's pattern.

Fig. 7. A Small Blunt Hook to support the edge of the fistula when being transfixed by the needle. Schively's pattern.

Fig. 8. A Fork to sustain the traction made in tightening the wire ligatures. Schively's pattern.

Fig. 9. Forceps for seizing the wires and fastening the shot in closing the sutures. Schively's pattern.

Fig. 10. Sims's Female Self-Retaining Silver Catheter, as employed in vesico-vaginal fistula. Schively's pattern.

Fig. 11. Ordinary Female Catheter of Silver. " "

Fig. 12. Meigs's Shield for the vulva in incurable vesico-vaginal fistula. Schively's pattern.

Fig. 13. Bivalve Speculum Vaginæ. " "

Fig. 14. Univalve Speculum. 1. Handle. 2. Vaginal portion. Schively's pattern.

Fig. 15. Fenestrated Speculum, open on the side and applicable either to the vagina or rectum. 1. The fenestrum. Schively's pattern.

Fig. 16. Ordinary Rectum Speculum, for dilating the anus. " "

Fig. 17. Dewees's Glass Pessary for prolapsus uteri. " "

Fig. 18. Physick's, or Meigs's Ball Pessary—silver—gilt. " "

Fig. 19. Hodge's Curved Pessary " " " "

Fig. 20. Chase's Vaginal Syringe. 1. Shield to close the vulva and assist in retaining the injection. Schively's pattern.

Fig. 21. Double Canula for ligating uterine polypi. " "

Fig. 22. A Rectum Bougie. " "

Fig. 23. A "Porte Machè" for inserting lint in fistula in ano. Schively's pattern.

Fig. 24. Gibson's Stylet for puncturing the rectum in incomplete fistula. Schively's pattern.

Fig. 25. Spring to carry the ligature after the puncture is made. Schively's pattern.

Plate 58.

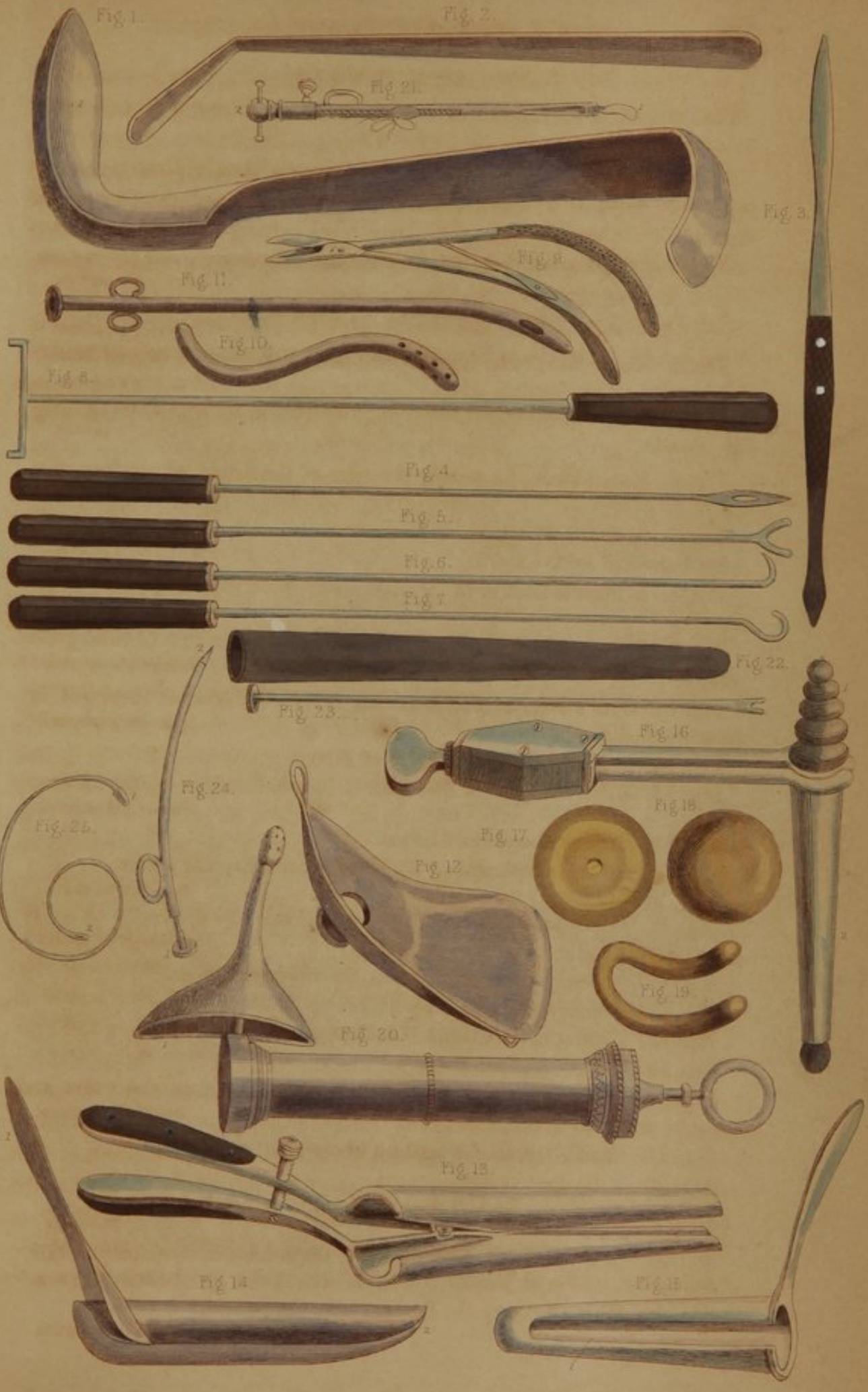


Fig. 1.
Fig. 2.
Fig. 21.
Fig. 3.
Fig. 9.
Fig. 11.
Fig. 10.
Fig. 8.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 22.
Fig. 23.
Fig. 16.
Fig. 24.
Fig. 25.
Fig. 18.
Fig. 17.
Fig. 12.
Fig. 19.
Fig. 20.
Fig. 13.
Fig. 14.
Fig. 15.

soon cease by the formation of the clot which will ensue on closing the thighs, or on more direct pressure when applied for a few hours, styptics may be resorted to.

Cysts and other tumors of the labia are to be removed in the same manner as would be proper in other parts, the wound being closed by a suture.

§ 3.—CATHETERISM.

In the introduction of the female catheter, the course and length of the urethra should be remembered, especially if a tumor or displaced womb exists at the same time.

OPERATION.—Place the patient either upon the side or back with the knees drawn up, and then, without uncovering her, pass the forefinger of the left hand, slightly flexed, to the posterior commissure of the vulva, separate the labia with the knuckle, pass the pulp of the finger to the anterior or superior margin of the orifice of the vagina, feel for the urethral tubercle, and, passing the catheter along this finger as a director, carry it gently upward and backwards so as to present its concavity under the arch of the pubis. As soon as the point enters the bladder, close the end of the instrument with the finger, and apply a small bowl to receive the urine. In withdrawing the catheter, the end should also be closed with the finger, to prevent the urine soiling the bed, the motions by which the instrument was introduced being reversed.

§ 4.—IMPERFORATE HYMEN.

Puncture the membrane with a bistoury or thumb-lancet, and make a crucial incision, to prevent union of the wound from the collapse of the membrane.

§ 5.—IMPERFORATION OF THE VAGINA.

The defects of the vagina, whether due to congenital causes or to the effects of inflammation, frequently require surgical treatment in order to restore the function of the canal. As such cases necessa-

rily differ, it is impossible to lay down any precise plan of proceeding, and the surgeon should, therefore, be mainly guided in his operation by his anatomical knowledge of the part, and by the results that are well known to follow upon the formation of cicatrices.

When the imperforation is perfect, an accurate diagnosis of the existence of a womb should first prove the necessity for the operation, as, until this can be settled, no operation ought to be attempted. But should the evidences of the presence of this organ be satisfactory, the dissection may be prosecuted by placing the woman in the position for lithotomy, introducing a catheter into the bladder, a finger or bougie into the rectum, and then cautiously incising the intermediate portions in the line of the natural curve of the vagina, until the uterus is reached, or until the depth of the incisions excites a fear of penetrating the peritoneum at the point of its reflection from the bladder. Subsequently, the parts should be prevented from adhering by the use of emollient dressings, and bougies. An instructive case of this operation has been reported by Dr. Charles D. Meigs, of Philadelphia,* as performed by Dr. Randolph upon a patient injured in labor, and who had retention of the menses in consequence.

Operation of Dr. J. Randolph, of Philadelphia.—The operator being seated in front of the patient, and the latter placed upon her back, with the knees drawn up, a strong metallic staff, slightly curved, was introduced into the bladder, and held by the assistant. Then, whilst the left index finger was kept in the rectum, the tissue between the urethra and rectum was dissected very nearly up to the substance of the womb itself by horizontal strokes of the bistoury. Not being able to find the os uteri, the operation was now suspended, a silver-gilt bougie, four inches long, and as thick as the thumb, directed to be constantly employed to preserve the newly-formed canal, and the patient sent home. Three months subsequently, after constantly wearing the bougie, the lady returned to the city suffering from uterine distension, when the vagina was found to be covered with a smooth surface resembling a mucous membrane, and a tumor could be distinctly felt through the upper end of the canal. On puncturing this with a trocar and canula, a viscid substance was evacuated, the patient relieved, and the menstrual fluid subsequently found to

* Pract. of Med., 2d edit. p. 383.

escape by the vagina. The latter, however, contracted until nothing was left but a sinuous opening sufficient for the menstrual fluid.

SECTION III.

LACERATION OF THE PERINEUM.

Laceration of the perineum, as the result of parturition, may result either in a slight or entire rupture of the recto-vaginal septum, and consequently demand different methods of treatment to effect its cure. Even a slight parturient laceration of the perineum proper causes, however, such a condition of the parts as is not favorable to immediate union, especially when the natural discharges from the womb are compelled by the position of the patient to pass over the wound. Union by the second intention is, therefore, that which most frequently accomplishes the cure, and though the close approximation of the edges of the fissure expedites the healing, and may seem at the first glance to result in direct union, close examination will often show that the appearance is deceptive, flatus or liquid matter sometimes escaping through parts which were thought to be solid. All sutures that are employed to approximate the edges of a laceration should therefore be retained in position as long as possible, in order to favor the union and prevent too early traction upon the newly-formed cicatrix.

Treatment of old Lacerations.—The interrupted or the quilled suture, with freshening of the edges of old injuries of the perineum, have been the means generally employed in the treatment of this injury; the modifications that have been at different periods suggested in the operation, being chiefly the result of the difficulties met with in particular cases.

Operation of Dieffenbach.—The parts having been well shaved and cleansed, the patient is to be placed in a good light, and in the position for lithotomy, when the edges of the fissure should be raised by forceps, and freshened by excising them with curved scissors, or a bistoury. The side of the rectum being now united by a fine stitch, a single point of the interrupted suture deeply introduced closed the middle of the fissure, when four stitches of the quilled suture applied at equal distances approximated the parts accurately. The loss of substance putting the united parts upon the stretch, he next made two lateral incisions, half an inch on each

PLATE LIX.

OPERATIONS UPON THE FEMALE GENITO-URINARY ORGANS.

Fig. 1. Operation of Celsus for closing a recent laceration of the perineum, as modified by Dieffenbach. After uniting the sides of the laceration by the application of the quilled suture, two lateral incisions are made so as to relieve the tenseness of the perineum. 1. Quilled suture. 2, 2. Lateral incisions of Dieffenbach. After Bourgery and Jacob.

Fig. 2. Roux's Operation for the cure of a Recto-Vaginal Fistula, which was situated behind the recto-vaginal septum. A quadrangular flap has been detached from the posterior parietes of the vagina, drawn forwards, and then attached to the freshened edges of the integuments, near the fourchette. 1, 1. Fingers of assistants. 2. The needle-holder.
After Bourgery and Jacob.

Fig. 3. Enlarged drawing of the same, showing the position of the sutures and the line of union. Two stitches of the interrupted suture are placed on each side as well as in front. After Bourgery and Jacob.

Fig. 4. Suture of a Longitudinal Recto-Vaginal Fistula. 1. The hand of an assistant dilating the vagina with a bivalve speculum, so as fully to expose the fistula. 2. The hand of the surgeon in the act of forming the suture after the edges of the fistula have been freshened either by caustic or the knife. After Bourgery and Jacob.

Fig. 5. Deyber's Operation for the cure of a Transverse Vesico-Vaginal Fistula. 1, 1. Fingers of the assistants exposing the parts. 2. The stylet, which, being introduced through the urethra, is about to pass the thread through the posterior lip of the fistula. 3. The forceps seizing it. The suture at the opposite angle is seen as applied, but it is not tied until all the threads are placed. After Bourgery and Jacob.

Plate 53

Fig 1

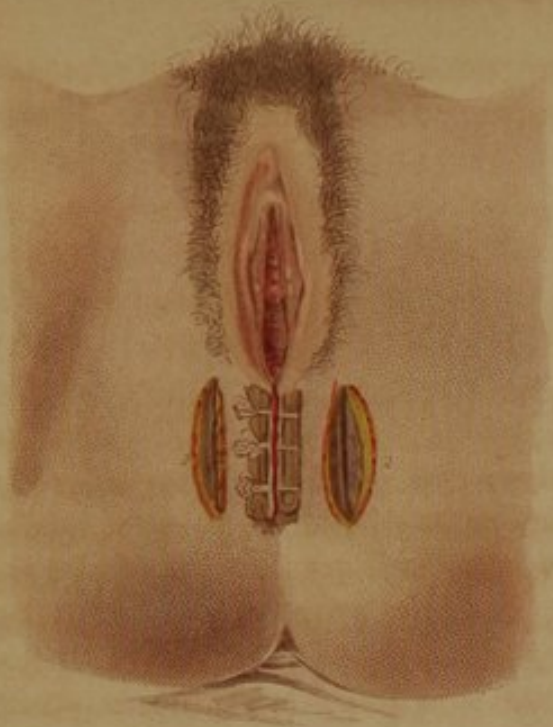


Fig 2

Fig 3

Fig 4

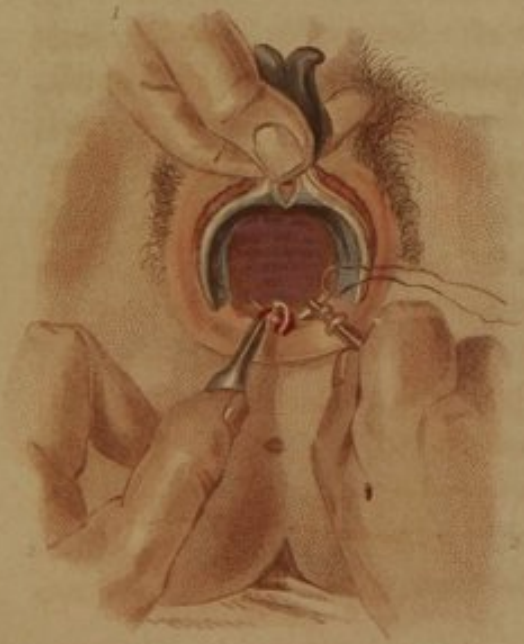


Fig 5

side of the posterior margin of the external labia (Plate LIX., Fig. 1), which soon relieved the tension of the line of the fissure, and by filling up with granulations prevented future traction on the cicatrix until it had become firm. The sutures being allowed to remain till loosened, care was taken to keep the bowels in a soluble condition by employing daily injections after the seventh day.

Operation of Dr. Mettauer, of Va.*—In this case a lady, thirty years of age, suffered a laceration of the perineum during parturition sixth months previously, from which there resulted "a complete disunion of the recto-vaginal wall from the verge of the anus three inches up the rectum, terminating superiorly in an obtuse angle; the rectum being contracted upon itself so as to render its several teguments a mere band of the width of five-eighths of an inch, whilst the retaining power of the sphincter ani was destroyed."

Operation.—The patient being placed in the position for lithotomy, with the knees held wide apart, denudation of the margin of the fissure to the extent of three-fourths of an inch was accomplished by the aid of hooks, scissors, and scalpels, according to circumstances. The bleeding being arrested, leaden ligatures were introduced in succession from within out, and from the angle to the verge of the fissure, at the distance of one-fourth of an inch apart, by means of curved needles threaded with silk, to the loop of which a leaden wire was attached. Physick's needle proved very useful in introducing these threads, and, as the leaden ligatures were successively tightened, by twisting them sufficiently to bring the abraded surfaces in contact, their ends were cut off. Twelve ligatures were required to close the breach, and these being subsequently tightened, the margins of the wound were cauterized with nitrate of silver. The patient was then kept perfectly quiet in bed, with the knees tied together, the bowels were not moved for four days, and then the matter did not escape through the fissure. The ligatures were removed in six weeks, and the union was perfect.

Plastic Operation of Dr. Horner, of Philadelphia.*—In this patient, the laceration was complete from the vulva to the anus, the parts were cicatrized over an inch deep, and but one fissure was apparent from near the os coccygis to the clitoris; there was a constant tendency to diarrhœa, and much of the fecal matter passed through the rima vulvæ.

* Am. Journ. of Med. Sciences, vol. xiii. p. 113, 1833.

† Ibid., vol. xx. p. 329, 1850.

Operation.—A previous operation by freshening the edges, and the use of sutures, having failed, the patient submitted to the following operation fifteen months after the first:—

After being thoroughly etherized, two flaps were made from the perineum adjacent to the vulva, one on the right and the other on the left side, twisted on their bases, crossed between the rectum and vulva, and fastened by sutures, so that the right flap formed the upper part of the rectum, and the free side of the left the lower part of the vagina; stitches of the interrupted along the rectum and along the vagina closing each of these cavities by the approximation of their raw surfaces. For ten days, there was no fecal discharge, but at this time the union, though not perfect, kept the septum in position, and ultimately benefited, though it did not cure the deficiency.

§ 1.—NARROWING OF THE VAGINA.

Contraction of the vagina is usually the result of a congenital defect, though it may ensue upon laceration of the perineum, and is usually limited to some portion of the canal. At first sight, the relief of this defect would appear to be a simple and certain operation, yet experience has proved that in most instances the efforts of the surgeon have been only partially successful. In most of the cases reported by surgical writers, the constriction has been overcome, or attempted to be overcome, by dilatation with bougies, sponge tents, or similar means, in the hope that, after once enlarging the canal, it would retain its proper size, especially in the married female. But the failures, or rather partial success, that has followed these means, all tend to show that this plan of treatment is not a judicious one. Like strictures in all other parts, constriction of the vagina requires more than a mere mechanical dilatation. There must be a change of action in the part, and when the contraction is the result of inflammation, the inodular structure must be removed or modified. When, therefore, the surgeon finds that such cases fail after being treated simply by the use of the bougie, let him try other means, and by repeated incisions, as in some of the plastic operations, gradually add, through the medium of the adjacent parts, to the new matter that may be required in the canal, or let him continue the operation of dilatation, and combine with it dissections of the walls of the vagina from the exterior cellular tissue.

CHAPTER V.

OPERATIONS FOR VAGINAL FISTULA.

From the relative position of the bladder, urethra, and rectum, to the vagina, it occasionally happens that sloughing or ulceration of the intermediate tissues produces a direct communication between these parts through which either urine or feces escape into the vagina. Such openings are usually designated as vaginal fistulæ, and may be either vesico-vaginal or recto-vaginal, according to the viscus into which they open.

SECTION I.

VESICO-VAGINAL FISTULA.

Pathology.—In vesico-vaginal fistula, there exists an opening of greater or less extent between some portion of the vagina and the urethra or bladder, or both, which varies under different circumstances. Most frequently this opening is the result of sloughing consequent either upon the long-continued pressure of these parts against the pubis by the child's head in parturition, or of the inflammation or laceration induced by the improper use of instruments, or from the presence of foreign bodies in the bladder or vagina.

When any of these causes impairs the vitality of the part, the portion affected is liable to separate or slough out, and leave an ulcerated opening with irregular edges, which, by the effusion of lymph in the efforts of nature to repair the loss, become thickened and indurated. From the loose character of the attachment of the mucous coat of the bladder, and the efforts at straining, a fold or two of the latter is also often forced into the vagina at the edges of the ulcer. Tedious labor and neglect of the condition of the bladder being the most common cause, the fistula will be found at some point either of the bas-fond or neck of the bladder, or at the posterior two-thirds of the urethra. When the result of labor, the

opening is most commonly transverse, the size of it being diminished by the os uteri being drawn downwards and forwards, so as to relax the anterior wall of the vagina. But when the fistula has been excited by the action of instruments, it is more frequently longitudinal.

The evils resulting from the existence of a vesico-vaginal fistula, as well as the difficulties of the cure, will depend in a great measure on the diameter and position of the opening, these evils and difficulties being greater in proportion to the proximity of the fistula to the bas-fond of the bladder, and least when it is in or near the anterior portion of the urethra.

The treatment of a vesico-vaginal fistula may be either palliative or curative, but the latter is so rare in a perfect degree that Velpeau and others have asserted that, "among all the cases related of cures, there were but a very small number that were entirely free from doubt,"* though the latter subsequently modified his statement by making it especially applicable to those in which the bas-fond of the bladder was involved.

§ 1.—PALLIATIVE TREATMENT.

Without spending time in referring to the treatment of these fistulæ by means of sponges and plugs introduced into the vagina, as they are but imperfect means of preserving cleanliness and preventing excoriation, I shall at once call attention to a simple contrivance and bandage, originally suggested, I think, by Dr. Charles D. Meigs, of Philadelphia. This instrument, which explains itself (Plate LVIII. Fig. 12), somewhat resembles an oyster-shell, fits accurately to the vulva, and is held in its place by the attachment of a T bandage, whilst a caoutchouc bottle, which is fastened to the opening at its lower end, receives the urinary secretion. In incurable cases, such a shield, made of silver and gilt, will be found of great service, and add much to the comfort of the patient. When a fistula is comparatively recent, the case may be much benefited by the frequent application of the nitrate of silver to the edges of the ulcer so as to favor the formation of granulation, or by the use of highly astringent injections into the vagina. In recent cases, and in those limited to the urethra, the use of the

* Velpeau's Op. Surg., by Mott, vol. iii. p. 858.

catheter, perseverance in such a position as will favor the escape of the urine through the upper half of the urethra, and the use of the nitrate of silver will often diminish very materially, if it does not entirely heal, the fistulous orifice.

§ 2.—OPERATIONS FOR VESICO-VAGINAL FISTULA.

The difficulties attending the union of this fistula by freshening its edges, and approximating them by various kinds of sutures, has led surgeons to suggest the use of different instruments, and to recommend various modes of operating. To recapitulate all these would be as tiresome as it would be useless, and this account will, therefore, be limited to a few which have been selected from among the cases reported by such surgeons in the United States as have paid special attention to the subject.

Operation of Dr. George Hayward, of Boston.*—At the close of a series of cases reported by this distinguished surgeon, the following account of the operation is given:—

Operation.—The patient being placed as for lithotomy, and thoroughly etherized, but not tied, a large-sized bougie made of whalebone and highly polished should be introduced through the urethra to the very fundus of the bladder, so as to depress it towards the vagina by elevating the end of the bougie towards the pubis. After bringing the edges of the fistula fully into view, the callous portion should then be excised either with the curved scissors or knife, or both, the edges being held by means of a double hook whilst the vaginal covering is dissected from the mucous coat of the bladder to the distance of two or three lines.

A short needle, with an eye near the point, and made to fit on a long handle, being then passed through the outer covering of one side of the fistula, should be seized by the forceps and withdrawn from the handle, then drawn through the lips of the wound, fitted again to the handle, and passed through the opposite side in the same manner. As many stitches as are necessary being thus taken, one thread of each should be cut off and the other left to show when the ligature has separated from the bladder. A large-sized female catheter being now secured in the bladder by a T bandage, the patient should be laid

* Cases of Vesico-vaginal Fistula, by George Hayward, M. D. Boston, 1851.

PLATE LX.

OPERATIONS ON THE FEMALE GENITO-URINARY ORGANS.

Fig. 1. Jobert's Operation for Elytroplasty, or closure of a vesico-vaginal fistula, by means of a flap taken from the integuments of the labium majus, and twisted upon its base round to the orifice of the fistula, where it is retained by sutures. After Bourgery and Jacob.

Fig. 2. Freshening the edges of a vesico-vaginal fistula whilst they are secured in 1, the forceps of Fabri. One blade of the forceps, being furnished with a plate of wood, is passed into the bladder through the urethra, and serves as a point of support for the other blade, which has a fenestrum capable of containing and approximating the lips of the fistula.

After Bourgery and Jacob.

Fig. 3. Velpeau's Operation of Anaplasty for the cure of a recto-vaginal fistula, the flap being taken from the side of the vulva and attached to the freshened edges of the fistula. After Bourgery and Jacob.

Fig. 4. Ligature of a large Uterine Polypus. The orifice of the vagina being kept open by the fingers of the assistants, the polypus has been seized with 1. Museux's hooks, and drawn down to the os externum by another assistant. The surgeon having then thrown a ligature around the pedicle of the tumor by means of the two ligature bearers 2, 3, has drawn the ligature 4 through the knot tier 5, and is about to strangulate it.

After Bourgery and Jacob.

Plate 50

Fig 1

Fig 2

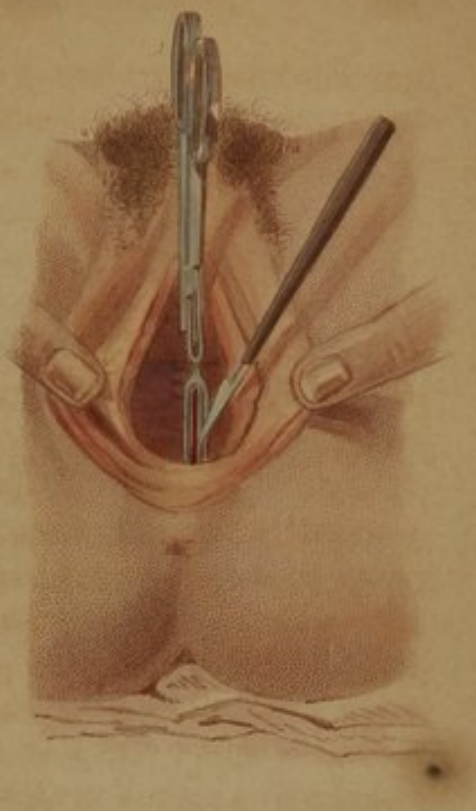
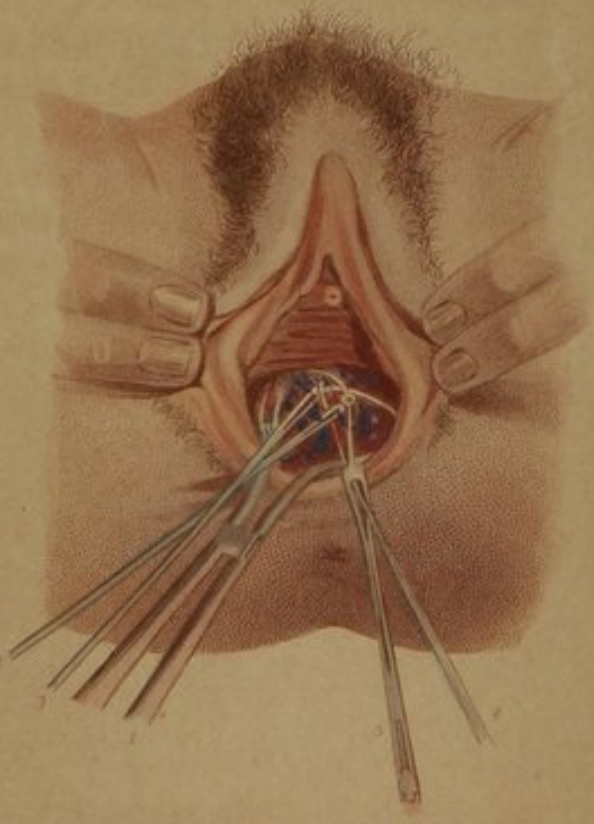


Fig 3

Fig 4



on her side with the shoulders raised so as to facilitate the escape of the urine, and the instrument removed every twenty-four hours, in order to prevent its clogging. After three days, it may be removed altogether, but the urine should be drawn off every three hours for ten or twelve days more, so as to prevent any strain on the bladder. The diet should consist entirely of liquid, mucilaginous food, until the ligatures separate; the bowels, which should be freely evacuated prior to the operation, be kept at rest for some days, and as little effort made by the patient to empty the bladder as is possible, till some weeks have elapsed.

Remarks.—Out of nine of the cases operated on in this manner by Dr. Hayward, three succeeded perfectly; five were relieved, and the others not benefited; and I have also performed a similar operation once with much relief to the patient.

Operation of Dr. John P. Mettauer, of Virginia.*—A fistula about the central part of the vesical triangle of the size of a Spanish dollar, and nearly circular, which had existed six months, and was the result of sloughing, was treated as follows:—

Operation.—After a preparatory constitutional treatment, the woman was placed and confined as in the operation for lithotomy, the vagina dilated by two broad spatulæ pressed against its opposite sides, and the edges of the fistula denuded by seizing them with delicate hooks, and trimming them with keen scissors, curved flatwise. A straight needle, thirteen lines long, was armed with a silk ligature, doubled so as to form a noose at one of its free ends fully six inches long, upon which the bent extremity of a leaden wire, of small size, was fastened, and then by forceps and a porte needle the first leaden suture was applied and loosely twisted so as not to pucker the edges of the fistula. Eight distinct sutures, being then formed and loosely twisted, were progressively tightened until the opening was perfectly closed, when the ends of the wires were brought out at the vulva, the soft parts being protected by investing them with oiled silk, after which a catheter was fastened in the bladder. The wires were tightened on the third, and again on the seventh day; the bowels were not moved until the eighth, and on the thirteenth day the sutures were removed, and "perfect union found to have taken place throughout the entire line of contact." The use of the catheter was, however, persevered in for four weeks for fear of vesical efforts, and

* Am. Journ. Med. Sciences, vol. xiv., N. S., p. 107.

the patient subsequently had two children without a return of the accident.

Operation of Dr. J. Marion Sims, of Ala.—Being dissatisfied with the success attending the repetition of the ordinary operations upon three cases in which he tried it, Dr. Sims, after devoting much time and study to perfecting instruments, and a mode of operating which could render this formerly intractable affection perfectly curable, has, in a well-written paper,* described very minutely his views of the subject. To his more extended account, I must refer the reader who desires further details than is compatible with my present limits, confident that the perusal of the original article will furnish him with such information as will prove practically useful.

Operation.—Having prepared the instruments figured in Plate LVIII., Figs. 1 to 10, and given every attention to the general condition of the patient, the operation should be conducted in the following manner:—

Position of the Patient.—In order to obtain a correct view of the vagina, place the patient upon her knees on a table two and a half by four feet, and have the nates elevated whilst the head and shoulders are depressed. The knees should also be separated six or eight inches, the thighs placed at about a right angle with the table, and the clothing so loosely arranged as not to compress the abdomen. An assistant on each side should then lay a hand in the fold between the glutei muscles and the thigh, the ends of the fingers reaching to the labia majora, and by simultaneously pulling the nates upwards and outwards open the os externum. The pelvic and abdominal viscera being thus made to gravitate towards the epigastrium, the presence of the atmosphere will suffice to distend the vagina to its utmost limits, thus freely exposing the os tincæ and fistula. To facilitate the view of the operator, the assistant on the right side of the patient should also elevate the perineum and recto-vaginal septum by means of the lever speculum (Plate LVIII. Fig. 1). A smaller speculum (Plate LVIII. Fig. 2) being used to press the urethra downwards against the symphysis pubis, when circumstances demand it. In most cases, a good northern light a clear day will suffice for the display of the canal, but if more is requisite, a looking-glass should be so arranged as to throw the rays

* Am. Journ. of Med. Sci., vol. xxiii. N. S. p. 59, 1852.

of the sun upon the part. The orifice of the fistula being now distinctly seen, the next step in the operation is to freshen its edges.

To Freshen the Edges of the Fistulous Opening.—A delicately curved tenaculum (Plate LVIII. Fig. 6) being inserted into the margin of the fistulæ, a sharp-pointed knife (Plate LVIII. Fig. 3) is made to shave off the edge of the opening to the extent of a quarter or third of an inch, so as to denude the part thoroughly on the vaginal surface, but without removing any of the lining membrane of the bladder, unless it project so much into the vagina as to obstruct the operation, which is rarely the case.

When the fistula is small, there is abundance of tissue, and there need be no fear about removing the parts freely, the success of the operation depending much upon the perfection of the freshened edges. During the scarification, there is always some hemorrhage, which may be readily removed by little probangs, one assistant attending solely to the preservation of the cleanliness of the orifice.

The Suture.—The object of all the sutures being to unite the freshened edges of the fistula, the interrupted, quilled, and twisted of ordinary wounds have been employed. From its peculiar method of action, Dr. Sims designates his as the "clamp suture." It is composed of fine annealed silver wire, about the size of a horse-hair, which is fastened to cross-bars, after the manner of the quilled suture. The bars may be silver or lead, either solid, or tubular, highly polished and without any asperities, particularly at their extremities. Acting as clamps, the embraced parts swell up and overlap them, while they produce sufficient ulceration of the vagina to permit their becoming imbedded and sometimes so hidden from view, that they will often remain until surrounded by granulations. This suture may be left untouched for six or ten days, or longer, and has never ulcerated out. If removed too soon, the cicatrix may yield, and judgment must, therefore, direct the proper period for the removal of the clamps.

Placing the Sutures and Closing the Fistula.—With a long needle (Plate LVIII. Fig. 4), armed with a silk thread, a puncture is made in the middle of the scarified edge of the fistula, about half an inch anterior to its border, the needle carried deeply into the vesical septum, but without transfixing it, brought out just at the edge of the mucous membrane of the bladder, carried across the opening, entered at the opposite side at a point corresponding with its anterior direction, and brought out on the vaginal surface about

half an inch beyond the scarified edge, but without touching the vesical mucous membrane, when the first thread is placed in position. The passage of the needle through the anterior edge is sufficiently easy, but the loose and yielding nature of the posterior margin renders some support necessary before it can be made to appear on the vaginal surface. To accomplish this, a blunt hook (Plate LVIII. Fig. 7) should be placed flatwise at the point of exit of the needle, so as to make a fixed point for it where it will readily pass, when the small tenaculum (Plate LVIII. Fig. 6) should be made to hook up and draw out the ligature from the side of the needle when the latter may be withdrawn, and the other ligatures passed in like manner. To prevent the cutting and pain which would ensue upon drawing the thread upon the posterior edge of the fistula, a crescent-shaped fork (Plate LVIII. Fig. 5) should be passed in, and made to serve as a pulley for the thread.

The three threads being thus placed, the most difficult part of the operation is finished, and it only remains to substitute the wires and apply the clamps, which is readily accomplished as follows:—

To apply the Wires and Clamps.—Take a piece of the wire, twelve or eighteen inches long, make a small crook at one end, and, fastening it to one end of the silk thread, draw the wire through the edges of the fistula, and bring its ends out of the vagina. Then do the same with the remaining wires, and making small oblong openings in the soft bars of lead at distances corresponding with that between the points of the suture, fasten the distal ends of the wires to one bar, either by twisting it round it, or by passing it through a perforated shot, and then bending it over the former. This being done, pull upon the proximal ends of the wires, or that nearest to the orifice of the vagina, and draw the bar up into the vagina above the fistula, or between its upper margin and the os tincæ, using a fork (Plate LVIII. Fig. 8) broad enough to serve as a pulley for all the wires whilst being drawn into position. Now pass the proximal ends of the wires through another bar, push it into the vagina till it is placed in front of, and parallel with the anterior edge of the fistula, and then using the fork to press up the clamp, draw firmly on the wires until the denuded edges of the fistula are so closely in contact that an ordinary probe would not pass between them, when the following simple contrivance will suffice to hold the clamps in position and fasten the wires. Slide a perforated shot over the free end of each wire, push it up to the clamp, and then firmly compress-

ing it on the wire by means of forceps (Plate LVIII. Fig. 9), the shot will be made to serve as a knot to the wire and prevent its being drawn through the clamp. The ends of the wires being then cut off about one-fourth or one-eighth of an inch from the shot, and bent over, they will be effectually prevented from slipping.

The whole operation, which usually occupies twenty or thirty minutes, or under any circumstances an hour, being now completed, the patient should be put to bed, and a self-retaining catheter (Plate LVIII. Fig. 10) applied to keep the bladder empty; an anodyne administered, the bowels kept at rest as long as possible, being usually ten or fifteen days after the operation, and the whole followed by a careful after-treatment. The sutures should be examined on the third or fourth day, again on the sixth or seventh, and if not doing mischief (exciting too much inflammation or ulceration), not removed until the ninth or tenth day.

Removal of the Clamps.—Clip off the flattened shot, and elevate the anterior clamp from its bed by a blunt hook, when the posterior clamp may be hooked up with the wires attached, pushed backwards into the vagina, disengaged entirely, and then lifted out with forceps. The patient should then remain in bed, and use the catheter for several days to prevent any strain upon the new cicatrix.

Remarks.—Although vesico-vaginal fistula cannot be regarded as a common complaint, it is unfortunately too often met with, and every means of affording relief will, therefore, be readily seized by a patient thus dreadfully afflicted. There is, however, a great difference in the utility of the means that have been proposed, and to estimate the value of each of these, is by no means easy, when so much must depend upon the position, size, and duration of the fistula, as well as upon the mechanical skill of the operator. The space for manipulation is necessarily small, and yet the neat and accurate apposition of the parts is essential to success; the selection of any one plan of treatment must, therefore, be left to individual judgment and delicacy of manipulation. In three cases, I have obtained relief from different methods of treatment. In a small fistula in the posterior edge of the urethra, cauterization closed the opening. In a larger orifice at the anterior end of the vesical triangle, the twisted suture and harelip pins induced the union of more than two-thirds of the original fistulous opening. In a third, who had an opening at the neck of the bladder, the interrupted suture, carefully applied, afforded but partial relief. The recent ap-

pearance of the paper of Dr. Sims prevented the entire performance of his operation in the latter case, owing to the want of his instruments, though I was enabled to test the value of the position of the patient, as recommended by him, and the facility with which the fistula could be exposed. To his operation I should, therefore, at present, give the preference, and as complete sets of his instruments can now be readily obtained, I hope to hear of its successful repetition by others. By supporting the edges during the adhesive process, preventing traction in the transverse line of the vagina, and readily keeping the bladder empty, this operation seems to present every prospect of success, and in the hands of its inventor has afforded relief to many sufferers. In the incurable cases, the vulva shield and bottle (Plate LVIII. Fig. 12) will be found to furnish much comfort, both mentally and physically. Plastic surgery has also been brought to bear upon the treatment of this complaint in the hands of Jobert, of France, and of Pancoast in the United States. For a full account of the latter, the reader is referred to his work upon operative Surgery.*

SECTION II.

RECTO-VAGINAL FISTULA.

Pathology.—In recto-vaginal fistulæ, a communication is established between the rectum and vagina by an opening which is in the anterior wall of the rectum, and the posterior of the vagina. This aperture may be of various sizes, and either congenital or the result of such injury as induces sloughing or the formation of an abscess. Congenital fistula of this kind, or an artificial anus opening into the vagina, is comparatively rare, though I have seen one within the last two years in the case of a child six months old, it being in this case complicated with a deficiency of the lower portion of the rectum, the gut opening into the vagina nearly a half inch above the os externum, and the anus being deficient. The occurrence of cholera infantum preventing any attempt at relief, the child returned to its home in the country, and has not since been heard of. Recto-vaginal fistulæ are mostly, however, the result of laceration or consequent on the improper use of instruments during delivery; they

* Operative Surgery, by Joseph Pancoast, M. D., Philad.

are also generally longitudinal, and give exit to fecal matter and flatus through the vagina as well as the rectum. Position and rest, coupled with a natural tendency in the orifice to close, are often sufficient to effect a cure, and yet it occasionally happens that considerable skill and attention will be required in order to heal them. As the various means referred to in the treatment of the vesico-vaginal fistula are equally and more readily applicable to this class also, the operative methods need not be so fully detailed as in the preceding class of fistula.

ROUX'S OPERATION FOR ENTERO-VAGINAL FISTULA.*—"In a case where the ilium terminated in the vagina, Roux opened the abnormal parietes, separated from the vagina the portion of the intestine that terminated in it, and tried to invaginate it into the inferior end, by means of a suture. The patient dying afterwards, the autopsy showed that, instead of invaginating the portion of the ilium in the inferior end of the large intestine, it had been inverted to its superior end."

VELPEAU'S OPERATION BY ANAPLASTY.—A lady, after undergoing an operation for the closure of a recto-vaginal fistula by means of the suture, was left with a perforation in the lower part of the recto-vaginal partition, above the front of the suture. To close this, a flap two inches long, and eight or ten lines at its base, was cut from the tissues about the left labium majus, and, a thread being affixed to its upper extremity, it was drawn from the vagina into the fistula in the rectum, so as to be fastened near the anus (Plate LX. Fig. 3). Two-thirds of its extent, however, mortified, and as it adhered only on one of its sides, the fistula was diminished but one-third of its size. Velpeau, however, thinks that in more tractable patients, and by taking every possible precaution not to weaken the vitality of the flap, such an operation will offer some prospect of success.†

OPERATION OF DR. JNO. RHEA BARTON, OF PHILADELPHIA.‡—A young lady, after suffering from an abscess, which was discharged, was left laboring under a fistula for four years, which resisted the ordinary treatment by tents, setons, and caustics. This fistula commenced about three-fourths of an inch within the right labium, and passed by a very irregular course up the pelvis, inclining to the rectum, into

* Malgaigne, Phil. edit., p. 529.

† Op. Surg., by Mott and Townsend, vol. i. p. 674.

‡ Am. Journ. Med. Sciences, vol. i. N. S. p. 305, 1840.

which it opened at about three and a half to four inches from its inferior aperture in the vagina, giving exit to fluids and flatus through the genitals.

As the sinus could not be included in a seton, and ulcerated through, or laid open without destroying the perineum, it became necessary to adapt an operation to the case.

Operation.—The sinus having been dilated for a few days by a tent, a seton was introduced into the fistula per vaginam, by means of an eyed probe, thence passed through its whole extent, till it entered the rectum by its orifice to that cavity, whence it was brought down to, and out at the anus, the two ends being loosely tied merely for security. After a few days, the loop was undone, and the end of the seton which passed out of the vagina passed through the eye of a probe which was previously bent at its other end. This probe being then inserted into the vaginal orifice of the fistula, was carried about an inch and a half up the sinus, and its point then directed towards the perineum, just exterior to the sphincter ani muscle, where a small but deep incision was made, the probe pushed through, and the end of the seton brought out and tied to the rectal end of the ligature, thus including in the loop the parts between the outer surface of the sphincter ani muscle and the rectum, the seton being subsequently twisted and drawn tighter and tighter, until it cut its way out, as in the ordinary operation for fistula in ano with the ligature. So soon as the new channel thus formed had attained a larger size than that entering the vagina, the discharges deserted the latter, and it healed up. It only then remained to treat the seton in the same manner as in fistula in ano till it ulcerated out, when the parts healed, and the lady recovered perfectly. Four years subsequently she was free from disease.

CHAPTER VI.

OPERATIONS PRACTICED ON THE DEEP-SEATED ORGANS OF THE FEMALE.

The deep-seated genito-urinary organs of the female consist of the uterus, ovaries, and bladder, upon each of which operations are sometimes demanded, as will be hereafter shown.

SECTION I.

LITHOTOMY AND LITHOTRIPSY IN THE FEMALE.

The great dilatability of the female urethra favoring the escape of pebbles of considerable size, the existence of urinary calculus is much more rare in the female than in the male, though it is occasionally seen. Before the revival of lithotripsy, the treatment of such cases was usually accomplished by opening the neck of the bladder at various points, as in the operation of lithotomy in man. Such an operation was, however, often followed by incontinence of urine and by other evils, which did not ensue in the case of males, and as all calculi can now be readily removed by crushing, I do not regard the operation of lithotomy in the female as justifiable, and shall, therefore, omit all description of it.

§ 1.—LITHOTRIPSY IN THE FEMALE.

Although a simple operation upon the male, the performance of lithotripsy in the female is even more readily accomplished, the urethra of the former being shorter and much more distensible, and the bladder so near to the vagina that the introduction of the forefinger into the latter will sometimes enable the operator to push the stone into the grasp of the instrument if he is otherwise unable to catch it. The position of the patient and the other details are very much the same as those described in a previous chapter, but there is less risk of trouble in the after-treatment, owing to the facility with which large fragments are voided by the female urethra. It may be incidentally mentioned that the operation does not require exposure of the patient's person.

SECTION II.

OPERATIONS UPON THE UTERUS.

The assistance rendered by the surgeon in the complaints of this organ may be made to include all the organic disorders to which it

is subject, or limited to those in which he merely aids the accoucheur. The present account will, therefore, be confined to such operations as are surgical in their character, as those performed for the relief of obstructions of the os uteri, of polypus, prolapsus, excision of the neck, and extirpation of the entire womb.

§ 1.—PUNCTURE OF THE UTERUS.

Puncture of the neck of the uterus is an operation that may be required by various circumstances, but is mainly demanded in cases where, from mechanical causes, such a degree of inflammation has been excited as has led to the closure of the os uteri. Occasionally the obliteration of the mouth of the uterus is congenital, but, in some instances, it is simply closed by an adventitious membrane. The restoration of its patulous condition, or the formation of a new orifice, must therefore be regulated by the peculiarity of each case.

Puncture of the uterus may be accomplished by means of a sound, pushed steadily into its cavity if the obstruction is slight and the orifice otherwise normal; but, in more difficult cases, the use of the speculum, with a guarded bistoury (Plate LXI. Figs. 3, 4, 5), or the trocar and canula, will be requisite. Under any circumstances, when the perforation is made, care should be taken to preserve the continuance of the opening by the use of bougies or sponge tents.

§ 2.—POLYPUS OF THE UTERUS.

Polypi of the womb, like those found elsewhere, present us with a peculiar class of tumors, whose characteristics are mainly dependent on the mucous membrane to which they are attached, and the specific peculiarities of which have been already described.* When developed in the womb, polypi may be removed by very much the same means as were detailed as applicable to them when seated in the nostril, the chief difference being due to the structure of the part. The strangulation of polypi by the ligature being the most frequent mode of removing them from the womb will be taken as illustrating the character of the operations demanded for their cure.

* See Operations on the Nostril.

I. LIGATURE.

By means of the double canula, a loop of a wire ligature may be drawn tight enough to strangulate the tumor in the following manner:—

Operation.—Place the patient on the back with the knees drawn up; introduce the speculum so as fully to dilate the vagina; and, recognizing the position of the os uteri, pass the canula (Plate LVIII. Fig. 21) and loop of the ligature over the polypus to the mouth of the uterus by means of a probe, so as to place the loop as high up as possible. Then, whilst an assistant retains the loop in position by means of the probe, draw upon the wire so as to strangulate the tumor and leave it to slough off, tightening the ligature, from day to day, by means of the screw of the instrument.

Another mode of strangulating uterine polypi is shown in Plate LX. Fig. 4.

SECTION III.

EXTIRPATION OF THE OVARY, OR OVARIOTOMY.

When the ovary has been the seat of such changes as have induced a degeneration of structure, and especially of those resulting in the formation of a cyst or other tumor, it has been proposed, within the last century, to remove the entire mass by means of an incision through the abdominal parietes. Such an operation is not as difficult as it is dangerous from its subsequent effects, and the prognosis should, therefore, be well considered before the operation is attempted.

Ovariotomy may be accomplished by an incision into the abdominal parietes, of sufficient extent to permit the escape of the mass. As the diagnosis is not easy, and the size of the tumor varies considerably under different circumstances, two operations have been described, and have been designated as the great and lesser operation, the distinction being chiefly owing to the length of the external wound.

In the minor, or exploratory operation, or that proposed by Mr. Wm. Hunter, the incision should be about two inches long, and the

ovarium tapped, or the condition of the part, and especially the extent of the adhesions learned by introducing the finger through the small wound. The major operation lays open the abdomen from the umbilicus, or even beyond it, to within an inch and a half or two inches of the pubis, so as to make the cut from eighteen to twenty-four inches long. The minor operation is palliative, or intended to assist the diagnosis, whilst the major is for the removal of the mass.

§ 1.—THE MAJOR OPERATION.

OPERATION OF DR. MCDOWELL, OF KENTUCKY.*—In December, 1809, a patient, with an enlarged ovarium, was operated on as follows: Being placed on a table of the ordinary height, and all the dress removed that could impede the operation, an incision was made in the abdomen, parallel with the line of the rectus abdominis muscle, but about three inches from it on the left side, and extended from the margin of the ribs to the pubis.† On opening the abdomen, its parietes were found to be a good deal contused from the tumor having rested on the pommel of a saddle, on which the patient had travelled. The tumor after being fully exposed, being found to be too large to be removed entire, a strong ligature was placed around the Fallopian tube near to the uterus, and the tumor cut open (Plate LXI. Fig. 1), when it was proved to consist of the ovarium and fimbriated extremity of the Fallopian tube. About fifteen pounds of a dirty, gelatinous-looking substance being evacuated, the Fallopian tube was divided, and the sac, which weighed seven pounds and a half, extracted.

As soon as the external incision was made, the intestines fell out on the table, and could not be replaced during the operation, which lasted twenty-five minutes. The patient was, therefore, placed on her left side so as to permit the blood to escape, after which the intestines were replaced, and the wound closed by the interrupted suture, the ligature around the Fallopian tube being left out of its lower angle. Between every two stitches there was placed a strip of adhesive plaster, which aided the union, and after applying the usual dressings, the patient was put to bed, kept on a strict regimen,

* Eclect. Repert. and Analyt. Review, vol. vii. p. 242, 1817.

† Ibid., vol. ix. p. 547.

and in twenty-five days returned to her home, which was sixty miles off.

Operation of Dr. Washington L. Atlee, of Philadelphia.*

Preparatory Measures.—The diagnosis being carefully established, the bowels and bladder should be evacuated, the room warmed to the temperature of 80° Fahr., the finger-nails of the operator and his assistants trimmed close, and the following instruments placed upon a tray, to wit: two good and large scalpels for the abdominal incision; one probe-pointed bistoury; one director; one tenaculum; two dissecting-forceps; one pair of dressing-forceps; together with ligatures, sponges, towels, brandy, &c., a narrow table, being also well covered, and placed in a good light, with two chairs to receive the patient's feet.

Operation.—The patient, clothed in an ordinary nightgown, rolled up around the waist, being placed upon her back upon the table with her hips near the end, and covered by a sheet, applied like a diaper, her feet are to be supported by two chairs, her limbs covered with another sheet, and her head and shoulders moderately raised. The surgeon should then place himself upon the patient's right side, and, commencing an incision immediately below the umbilicus, carry it boldly through the skin and subcutaneous tissues to the sheath of the recti muscles, extending the incision in the median line to within one inch of the symphysis pubis. A small incision being then made through the linea alba, the peritoneum is to be cautiously cut and opened to the extent of the external wound by means of the probe-pointed bistoury.

The hand being now introduced into the abdominal cavity, the connections of the tumor should be examined, and an effort made to tilt it out, when, if the abdominal opening is too small, the incision may be continued below to the pubis, and above to three inches beyond the umbilicus, passing around the latter on its left side. The tumor being then turned out on the side opposite to its pedicle, the latter was found, in the case operated on by Dr. Atlee, to consist of a broad ligamentous sheath five or six inches broad, extending from the left hypochondrium into the pelvis; had the sigmoid flexure of the colon incorporated in it; was highly vascular, one vein as large as a goosequill, extending along its attachments, and sending out ramifications which were much gorged with blood. This pedicle consisted of a double fold of peritoneum,

* Am. Journ. Med. Sciences, vol. viii. N. S. p. 51.

PLATE LXI.

OPERATIONS ON THE FEMALE GENITO-URINARY ORGANS.

Fig. 1. McDowell's Operation for Ovariotomy. An incision has been made through the linea alba, the abdomen opened, and a ligature passed around the pedicle of the tumor, near to its uterine extremity. The hands of the assistants are seen retaining the tumor in position, whilst the surgeon, grasping the section of the broad ligament of the uterus, is about to divide it with the scalpel, beyond the ligature, so as to avoid unnecessary hemorrhage. 1, 1. Hands of the assistants. 2, 2. Those of the operator.

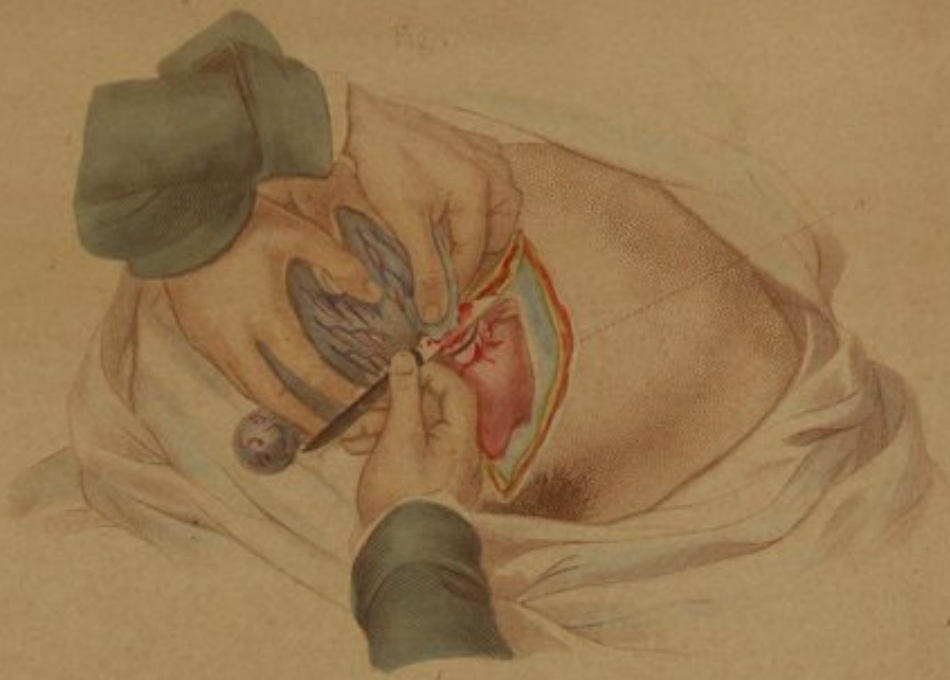
After Bourgery and Jacob.

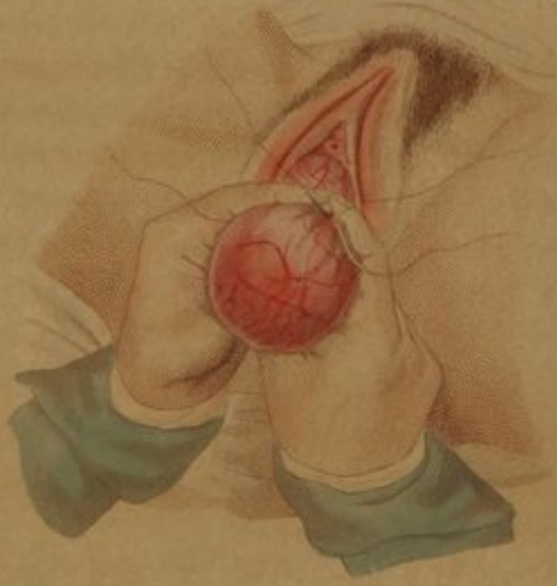
Fig. 2. Extirpation of the Uterus by means of the Ligature, in a case of procidentia uteri. The uterus and the vagina having been prolapsed beyond the vulva, and the viscera which had been invaginated in the utero-vaginal pouch having been reduced, an assistant kneels below the operator, and seizes the vagina and uterus between his thumbs and fingers 1, 1, in order to prevent their escape, whilst the surgeon passes a needle, with a double ligature, vertically through the vagina, ties the right half, and is about to tie that on the left, the ends of which are seen pendent.

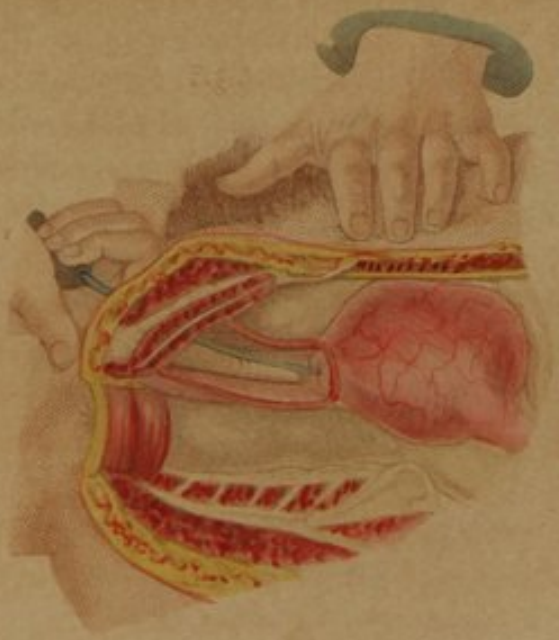
After Bourgery and Jacob.

Figs. 3, 4. Uterotomy, or incision of the neck of the uterus, either by a straight or curved bistoury, in order to enlarge the os uteri and facilitate the extraction of a polypus. After Bourgery and Jacob.

Fig. 5. Section of the abdominal parietes, in order to show the operation of puncturing the os uteri, when it is requisite to evacuate the menstrual secretion. 1. Left hand of the surgeon, as placed upon the hypogastrium, in order to steady the uterus. 2. Right hand of the surgeon, holding the trocar, and directing its point upon the right forefinger, which is curved so as to carry it to the position of the os uteri. After Bourgery and Jacob.







arose from the broad ligament of the uterus, had a triangular form, and its lower edge, which ran from the uterus to the left side of the pelvis, was several inches long, whilst the upper, which ran from the tumor to the uplifted sigmoid flexure, was one inch long. The Fallopian tube, which was also very much elongated, and somewhat attenuated, was stretched up to the top of the tumor.

A surgeon's needle, armed with a single strand of saddlers' silk, being waxed, was now passed so as to include an inch of the lower border of the pedicle, and firmly tied, after which this part of the pedicle was divided near the tumor, exposing some of the large veins upon its surface, which broke as soon as they were deprived of their peritoneal coat, and gave rise to most of the hemorrhage that was seen. A second ligature of double stranded silk was then introduced about an inch above the first, made to embrace several veins, and being then firmly tied, the remainder of the pedicle was tied with another ligature, and then severed, when the whole tumor was removed. The blood which flowed into the pelvis did not exceed six ounces, and was carefully removed by soft and warm sponges. The ends of the pedicle being then examined, and no oozing noticed, the four ligatures were brought out at the lower end of the wound, and the latter closed by nine harelip sutures and intervening adhesive strips, covered by patent lint and a soft compress, and the whole secured by a broad towel, which extended from the thorax to the trochanters. The operation occupied about an hour; peritonitis supervened, and death ensued on the fifth day.

Statistics of the Operation.—The formation of tables showing the results of the operation of Ovariotomy has, fortunately for the profession, been so well attended to, that the question of its success up to the present period, is readily settled. Through the industry of Dr. Washington L. Atlee, of Philadelphia, as well as of Dr. Thomas Safford Lee, who has pursued a similar course of inquiry in Great Britain, the profession have been for some time familiar with the result of most of the cases operated on, and an accurate idea may now be formed of the mortality which has ensued upon the operation.

From the tables of Dr. Atlee,* it appears that—

* A Table of all the Known Operations of Ovariotomy from 1701 to 1851, comprising 222 Cases, including their Synoptical History and Analysis, by Washington L. Atlee, M. D., Philadelphia, and published in the *Transactions Am. Med. Association*, vol. iv. p. 286, as well as in pamphlet form.

"Of the 222 cases thus collected, 52 were of the minor section, 153 of the major, and 17 unknown.

"Of the 52 minor operations, 39 recovered and 13 died, or 1 in every 4, or 25 cases in 100.

"Of the 153 major operations, 95 recovered and 58 died, or 1 in every $2\frac{37}{58}$, or 29.41 cases in 100.

"Of the whole 222 cases, 146 recovered and 76 died, or 1 in every $2\frac{35}{38}$, or 33.78 in 100.

"Of 222 cases, the operation was not completed in 57, or 1 in every $3\frac{17}{19}$, and there was no tumor in 6."

After carefully analyzing his cases, Dr. Atlee gives, as the mortality of the operation, "1 in every $3\frac{21}{38}$, or 29.74 cases in 100."

Remarks.—The operation of ovariotomy is one which, at the present time, has excited much discussion, and must yet be regarded as *sub judice*, the statistics not having as yet satisfied many in the profession of the propriety of its performance. The frequency with which the operation has lately been repeated, and the valuable tables above referred to, have, however, induced many to admit that, though great difficulties are to be anticipated in the diagnosis as well as in the after-treatment, sufficient success has been obtained to justify a calm consideration of the question. From the usual spirit of conservatism exhibited by the profession (a conservatism which is highly laudable as well as advantageous to the public interest), much criticism has been exercised in relation to the accounts of the operations already furnished, and those who continue to operate, and to advocate the means of treatment, being in the position of those who propose and practice an innovation upon old-established rules, must anticipate opposition, strict investigation, and possibly unjust condemnation, as well as to be subject to such charges as are dictated by prejudice, and constantly renewed through envy. Such a result is no novelty, but has been seen heretofore in numerous instances, of which it may suffice to mention the cases of the discoverer of vaccination, of the attempt to introduce etherization, as well as other novel points of practice with which all are familiar. Instead, therefore, of anticipating any general approbation, the few surgeons who dare to advocate the propriety of this operation must be content to stand forward and bear the criticisms of its opponents, consoling themselves with the principle, that "the honest physician knows no other interest than the life and health of his patient."*

* Hufeland.

The candid inquirer after truth may readily, it seems to me, obtain a clear view of this question, by laying aside all preconceived opinions, and examining it under the following or similar heads :—

1. Are such tumors proper subjects for an operation?

2. Is their removal attended by any extraordinary difficulty or danger during or after the operation?

I. ARE OVARIAN TUMORS PROPER SUBJECTS FOR AN OPERATION?

In investigating the merits of ovariotomy, this question stands prominently forward, and must mainly regulate an opinion of the value of the operation.

To show the views of a few experienced surgeons, I cite the following opinions :—

VELPEAU* says, "the diseases which require ovariotomy are, if left to the resources of nature, almost always fatal; but though incurable, they do not generally cause death until after a long-protracted period, which lasts, as a medium, five or six years." Under certain conditions, such as the medium size and mobility of the tumor, he deems them proper subjects for the operation.

CHURCHILL† thinks "there are cases in which this operation would be justifiable on the grounds that the disease is incurable by medical means; that the patient will ultimately die from constitutional disturbance, after suffering more or less inconvenience, and that tapping in ovarian dropsy is attended with great danger."

COLOMBAT,‡ who seems to be least decided in his views, says, "without wishing to proscribe the operation, it ought not to be resorted to except as an extreme resource."

CHELIUS§ thinks, "unless the disease causes great annoyance, no operation is allowable, but puncture only affords a short relief, as the fluid re-collects so much the quicker the oftener it is evacuated."

BLUNDELL‖ says, "we may be justified in operating, provided it be the wish of the patient;" but he also¶ says, "all the operations

* Velpeau, Op. Surgery, by Mott and Townsend, vol. iii. pp. 538, 539.

† Notes on Ovariotomy, quoted from Meigs's Colombat, p. 418.

‡ Diseases of Females, Meigs's translation, p. 432.

§ Chelius's Surgery, by South, vol. iii. p. 212.

‖ Diseases of Women, p. 118, [quoted from Churchill, Philad. edit. p. 304.]

¶ Churchill, p. 305.

upon the ovaries are worthy of consideration; for, if one can be made to cure an unhappy individual, who would otherwise fall a victim to disease, it will be an invaluable good to the fairest and least offending part of our species."

From an examination of these opinions, and they are certainly those of great professional worth, and might be readily augmented, did my present space permit, we are, I think, justified in concluding that the majority of ovarian tumors cannot be controlled by medicine; that their natural course is to terminate fatally in about five years; that tapping them is attended with considerable danger; and that, when they create great distress to the patient, and the latter is fully informed of the possibility of failure or the chance of death, such tumors are proper subjects for an operation.

II. IS THE REMOVAL OF THE OVARIAN TUMOR ATTENDED BY ANY EXTRAORDINARY DIFFICULTY OR DANGER DURING OR AFTER THE OPERATION?

In attempting to decide this portion of the question, little more than a general opinion can be given, as individual cases will often be found in this disease, as in others, in which peculiar difficulties must be overcome. As a general rule, the dangers attending the removal of ovarian tumors are mainly due to an error of diagnosis, and yet, though many such instances are on record, they are few compared with the great number of cases in which the diagnosis was correct, and the operation successful.

Thus, "out of 81 cases collected by Mr. B. Phillips in 1844, in which ovariotomy was attempted, no tumor was found in 5, and in 6 others it was not ovarian;" and "in 15 of the 81 cases it was impossible to remove the tumor after the abdomen was opened, owing to the adhesions."*

In the elaborate tables of Dr. Atlee,† it is also shown that there was no tumor present in 6 cases out of 222 operated on. In 83 cases, there were adhesions, but of these 49 recovered. In 57 cases, the operation was left unfinished; in 27 of which other important diseases coexisted, 13 of which were diseases of the uterus, and in

* Druitt's Op. Surgery, Philad. edit. p. 422, 1848.

† Table of all the Known Operations of Ovariotomy from 1701 to 1851, Philadelphia, 1851.

5 of the cases, complicated with other diseases, the operation was left unfinished.

But, on the other hand, it appears that, out of 211 cases, 146 have been successfully operated on, a statement which strongly tells for the other side of the question, and positively establishes the fact that the difficulties that may be met with can in very many instances be overcome.

The following table shows the American surgeons who have performed the operation, and the results in their hands.

STATEMENT OF THE CASES OPERATED ON BY AMERICAN SURGEONS,* WITH THE RESULTS.

SURGEON.	CASES.	CURES.	DEATHS.
E. McDowell, Kentucky	7	5	3
Nathan Smith, Yale College	3	3	0
Alban G. Smith, Kentucky	3	3	0
Jos. Gallup, Vermont	1	0	1
D. L. Rogers, New York	1	1	0
Jno. C. Warren, Boston	1	1	1
R. D. Mussey, Cincinnati	4	3	1
Jno. L. Atlee, Penna.	2	1	1
W. L. Atlee, Phila.	16	10	6†
Webster, Boston	8	1	0
Bellinger, Charleston	2	2	0
Bayless, Kentucky	1	1	0
S. G. Parkman, Boston	1	0	1
H. Miller, Louisville	1	1	0
J. Deane, Mass.	2	1	1
J. P. Buckner, Ohio	4	3	1
D. Meeker, Indiana	1	0	1
Wm. H. Van Buren, N. York	1	1	0
J. H. Bigelow, Boston	1	1	0
Alden Marsh, Albany	1	1	0
David Prince, St. Louis	1	1	0
A. H. Grimshaw, Delaware	1	0	1
E. R. Peaslee, Maine	1	1	0
	57	40	17

In No. 17 of the *British and Foreign Medico-Chirurgical Review*,

* These accounts have been condensed from the Bibliographical Index, p. lxxx., as collected by myself from various journals, as well as from the tables of Dr. Atlee, before referred to.

† Reported to 1851.

January, 1852, the question of the merits and demerits of ovariotomy have been ably discussed. In this paper, the writer contends that it is necessary to correct the prevalent notion that a person may live for years with an ovarian tumor, as more than half the cases quoted by Mr. Safford Lee (63 out of 123) died in two years, and 90 out of 123 within four years. He, therefore, thinks it more correct to say that ovarian diseases, like other organic affections, tend to run their course in a space of three years; that these years are emphatically years requiring patience, resignation, and sweet temper to render them even tolerable to the sufferer.* Tapping, he contends, is also more fatal than is generally thought.

That the dangers arising from the operation are great, will be admitted, and so they are in ligating the large arteries, and in many other operations; but that these dangers may be overcome, is evident from the success which has attended its performance. According to the tables of Dr. Atlee, the rate of mortality for the operation is twenty-six and a half per cent., or a rate which places this operation on as good or even a better footing, than some of the other capital operations, and, in my opinion, justifies its repetition by a skillful surgeon in the case of a tumor of medium size, which is comparatively movable, uncomplicated with other disease, and in a patient whose sufferings render her anxious for the operation. Since the discovery of etherization, several objections to the operation have been removed; thus, it has ceased to be painful, the intestines remain quiescent, and do not protrude at the wound, whilst the latter can be accurately closed, and the risks of peritonitis thereby diminished. Experience has also reduced the accidents likely to arise during the operation in the after-treatment. The points most essential to success appear to be the extreme care exercised in the diagnosis, the selection of proper cases, the preservation of a high temperature in the chamber whilst the patient is uncovered, perfect quiescence through etherization, and a neat and close application of the dressing. Such adjuvants materially change the character of any operation, and when combined with a skillful after-treatment, must do much to diminish even the mortality which has hitherto followed ovariotomy. A few years must, however, enable any one to add materially to the statistics now collected, and will, I think, place upon a firm basis the merits of an operation which I

* Opus citat., p. 231.

admit is now viewed with distrust by many. But until this period arrives, it is to be hoped that prejudice will not be allowed to check the formation of a candid opinion of a means of treatment, which, if established beyond all cavil, is capable of adding materially to the comfort of a large and interesting class of the community.

SECTION IV.

ON THE CÆSARIAN OPERATION.

The term "Cæsarian operation" has, from a very early period, been assigned to that in which the parietes of the womb were incised through the walls of the abdomen in order to permit the removal of the child in this manner when the pelvis was too small or deformed to allow of its delivery per vias naturales. Few of the operations proposed for the benefit of mankind present the surgeon with as many scruples in regard to the course to be pursued as this; and he may well hesitate before deciding upon a course which, though it may offer a prospect of saving the life of the infant, exposes the mother to almost certain death. As the preservation of the life of the child is also by no means certain, the surgeon, when thus called upon, should endeavor to weigh correctly the value of each life to society, and if satisfied of the greater value of that of the mother, remove the child piecemeal through the vagina. In Paris, as stated by Velpeau,* every woman died on whom it was performed during forty years, and in Great Britain, there had been no well-attested cure, as reported by Mr. S. Cooper. Out of 424 others reported by other surgeons, as occurring elsewhere, 210 died, making the chances of success about one out of two, supposing all the accounts to be accurate, but yet presenting a fearful odds when it is remembered that the delivery may be accomplished without risking the life of the mother more than in an ordinary accouchement. In the United States, the operation has been performed in a few instances with nearly similar want of success, though it was attended by a most fortunate termination in the patient operated on by Dr. Wm. Gibson of Philadelphia,† and on whom it was performed twice, thus proving successful in two different pregnancies.

* Op. Surg., loc. cit.

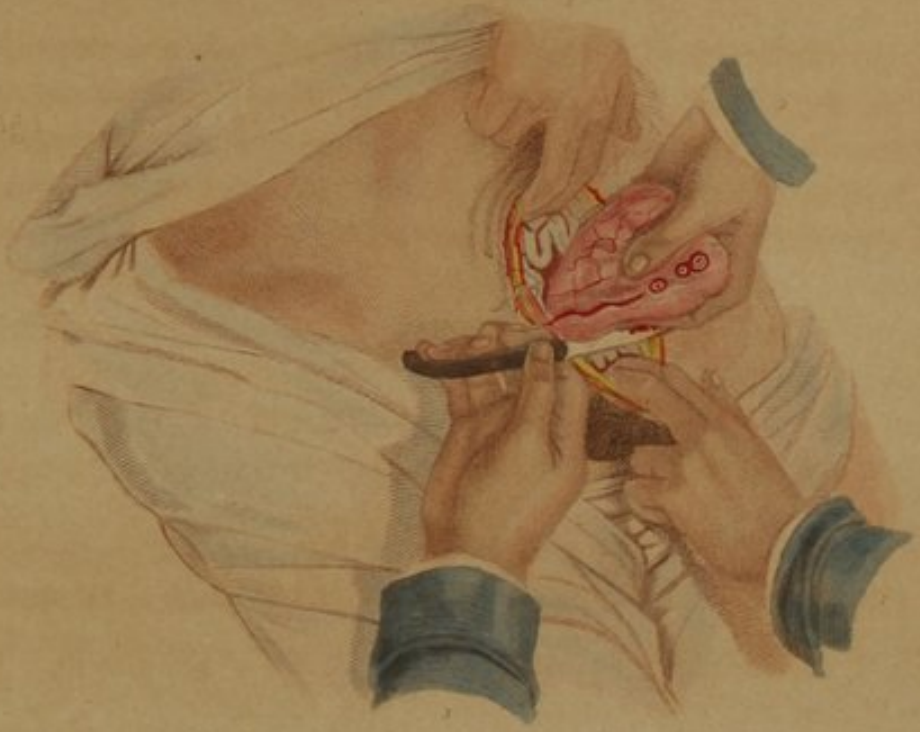
† Am. Journ. Med. Sciences, vol. xvi. 1835, and vol. xxii. 1838.

PLATE LXII.

OPERATIONS UPON THE UTERUS THROUGH THE ABDOMEN.

Fig. 1. Langenbeck's Operation for Extirpation of the Uterus. An incision having been made through the linea alba, the hands, 1, 1, of two assistants elongate the angles of the wound, and retain the intestines in the abdomen whilst the surgeon, after applying a ligature to the broad ligaments of each side, seizes the womb with 2, his left hand, and is about to extirpate it above the vagina with the knife 3, in his right hand. After Bourgery and Jacob.

Fig. 2. A View of the Median Cæsarian Operation. The incision having been carried from just below the umbilicus to a little above the pubis, the abdominal parietes and the peritoneum have been divided in the line of the linea alba—the uterus opened; and whilst 1, the left hand of the surgeon, separates the right lip of the abdominal wound, the right hand, 2, has seized the head of the fœtus, which presented in this instance, and is about to deliver the child. After Bourgery and Jacob.



PREPARATORY MEASURES.—The operation having been decided on, there should be prepared one or two good large scalpels, one sharp and one probe-pointed bistoury, dissecting-forceps, dressing-forceps, director, scissors, harelip pins, ligatures, a syringe, catheter, brandy, ammonia, sponges, adhesive strips, spread cerate, compresses, and bandages. The abdomen should also be entirely free from hair, and the rectum and bladder thoroughly evacuated also. The arrangement of the bed or table, as directed in lithotripsy, will usually be useful in this operation.

OPERATION.—The patient being etherized so as to tranquilize the bowels, two assistants should compress the abdomen with their hands, so as to steady the uterus and prevent its variation from the abdominal parietes. The surgeon then, with a large scalpel, should incise the integuments in the line of the linea alba from just below the umbilicus to within about one inch of the pubis, not passing too near the latter, in consequence of the position of the bladder, and passing on the left of the umbilicus, if he extends the incision upwards, in order to avoid the anastomosis between the epigastric and umbilical veins. The abdominal parietes being thus divided, the peritoneum should be punctured, the left forefinger introduced as a director, and the membrane slit up with the probe-pointed bistoury to the extent of the outer incision. The uterus, being now fully exposed, should be cautiously incised, layer by layer, until the membranes around the fœtus are exposed, when an assistant should rupture them, if possible, per vaginam, but if not, the sides of the abdomen should be closely pressed against the womb, and the liquor amnii discharged through the wound. Two assistants should now hook up the uterus with their fingers at the angles of the wound, in order to prevent its variation from the wound, and the surgeon then extracts the child according to its position (Plate LXII. Fig. 2). The membranes and placenta being subsequently removed per vaginam, or through the wound, according to circumstances.

The parts being now thoroughly cleansed, and any clots that may have collected washed out through the vagina, by means of the syringe and catheter, the bleeding vessels may be ligated, if the uterine contraction is not sufficient to arrest the flow of blood. A strip of linen should then be placed in the pubic angle of the abdominal wound, and the sides of the latter united by the harelip suture and strips, the uterine contractions diminishing and closing the opening in that organ. Spread cerate, a compress, and a body-

bandage complete the dressing, when opiates may be administered, and an appropriate after-treatment directed, in order to combat peritoneal inflammation.

SECTION V.

EXCISION OF THE NECK OF THE WOMB.

The existence of cancer, which was supposed to be limited to the neck of the uterus, has, within the last century, led some surgeons to excise or amputate the diseased portion, which may be accomplished by the following operation :—

Operation.—Place the patient upon her back, introduce a speculum, seize the neck of the womb with Museux's forceps, or other long tumor-forceps, or hooks, pull it down to the orifice of the vagina, and cut it off by a circular sweep of a bistoury, or with the scissors, arresting the profuse hemorrhage which generally follows by the actual cautery or the tampon.

Remarks.—Excision of the neck of the uterus is an operation which few experienced surgeons at the present day would willingly perform, whilst it is one to which I only refer in order to guard the inexperienced against it, by expressing the results of my personal observation as obtained during several months' close examination of the cases operated on by Lisfranc and others in Paris. So thoroughly convinced am I of the impropriety of the operation that nothing could tempt me to perform it.

As an operation, excision of the neck of the uterus is a trifling matter; but the risks of the patient may be found in the difficulty of establishing a positive diagnosis of cancer, in the impossibility of eradicating such a disease by an operation, and in the danger of the patient dying from hemorrhage within twenty-four hours, which I have seen in two instances in Paris, under the hands of Lisfranc. Appropriate constitutional treatment, with local medication, is also capable of retarding the disease, and in no instance has it led to so rapid a death as the operation. As performed by Lisfranc, in the cases that fell under my observation, amputation of the neck of the womb was not only useless torture, but in several instances evidently accelerated the death of the unhappy individuals who were submitted to it.

SECTION VI.

EXTIRPATION OF THE WOMB.

Extirpation of the uterus is an operation that can only be thought of under extraordinary circumstances, and never attempted until all other means of relief have failed, and extirpation is deemed likely to offer a chance for life. As a remedy for cancer of the uterus, it offers certainly a better prospect of success than that presented by excision of the neck; but no judicious surgeon would advise either except as a dernier resort.

In the United States, extirpation of the womb has been successfully accomplished by Dr. Essellman, of Tennessee, and by Dr. Eve, of Georgia.

Complete Extirpation of the Uterus by Ligature after Chronic Inversion of the Organ, by John M. Essellman, M. D., of Nashville.—A lady, thirty-two years of age, had labored under inversion of the uterus for several years, in consequence of the manipulation of an old woman. Various symptoms inducing the belief in the existence of a polypus, a ligature of saddlers' silk, well waxed, was applied around the tumor and tied tight, causing great pain and prostration for the first four or five hours, her pulse sinking to a mere thread. Reaction ensuing, she rested well the first night; and the ligature was tightened each morning for eighteen days, at which time the tumor came away, proving, to the surprise of all who saw it, to be the uterus instead of a polypus.* The patient did not leave her bed for months after the operation, "but was finally restored to perfect health."

Operation of Dr. Paul F. Eve, of Georgia.†—A negro woman, twenty-eight years of age, married, but never pregnant, had been laboring for a long period under a malignant tumor of the uterus, to cure which, she consented to excision of part, or the whole of the womb.

Operation.—The bowels and bladder having been thoroughly evacuated, the patient was put fully under the influence of chloroform, the tumor drawn down to the os externum by forceps, and

* Am. Journ. Med. Sciences, vol. vii. N. S. p. 254, 1844.

† Ibid. vol. xx. N. S. p. 399, 1850.

then the mass carefully excised from above downwards, or in an antero-posterior direction by the knife, it being suspected at the time that the uterus was involved. One artery bled quite vigorously, but it was tied, and the hemorrhage arrested by a solution of sulphate of zinc. There was no protrusion of the bowels, or any severe symptoms; a rigid diet and the horizontal position were maintained for ten days, and the opening into the peritoneum was closed by agglutination and adhesion.

The uterus, with the Fallopian tubes and broad and round ligaments, could be distinctly seen in the mass, and the preparation is now in the hands of Dr. Charles D. Meigs, Professor of Obstetrics in Jefferson College, Philadelphia.

CHAPTER VII.

OPERATIONS PRACTICED ON THE RECTUM.

The operations performed on this portion of the body are such as are demanded for the relief of congenital defects, for the cure of a disordered condition of the rectal veins, and those owing to the development of abscesses in the neighborhood of the gut.

SECTION I.

SURGICAL ANATOMY OF THE RECTUM.

Arising at the inferior and left side of the fifth lumbar vertebra, the rectum descends obliquely downwards to the centre of the sacrum, and following thence the middle line of the bones, it terminates near the point of the coccyx, in the anus. Although nearly cylindrical in its entire length, the rectum yet presents a considerable dilatation or pouch near its lower end.

The rectum has the same number of coats as the other intestines, but its inferior third is not covered by the peritoneum. In man it corresponds with the position of the bas-fond of the bladder, vesiculæ seminales, prostate gland, and membranous portion of the urethra, to all of which it is very loosely attached by its anterior face; but

in the female, it adheres directly and closely to the posterior face of the vagina.*

The peritoneum stops about two inches from the end of the rectum in woman, but it is from two to three inches above the anus in man.†

The muscular coat of the rectum, like that of the other intestines, is composed of circular and longitudinal fibres; but when the latter reach the lower margin of the anus, they do not terminate, but turn under it between the internal and external sphincters, and then ascend in contact with the mucous coat, or the submucous cellular tissue, into which they are finally inserted. This connection exerts considerable influence on the mucous coat in hemorrhoids, as well as in prolapsus ani.

The mucous coat at the lower end of the rectum is thrown into longitudinal folds (columns), at the lower end of which are numerous small pouches of from two to four lines in depth, which point upwards, and are occasionally the seat of a disease (encysted rectum) which is characterized by intense itching.‡

The arteries of the rectum are known as the hemorrhoidal, and are sufficiently large and numerous, about an inch and a half from the anus, to cause troublesome hemorrhage. When diseased, the hemorrhage from them is also apt to be profuse, even when they are divided near the anus.

The hemorrhoidal veins are very numerous, and form, at the lower part of the gut between the mucous and muscular coat, the hemorrhoidal plexus, which anastomoses freely with the adjacent veins, all of which are without valves. The thinness of the mucous coat over these veins gives to internal hemorrhoids the very smooth, shining, and bluish or purple tint which is characteristic of this complaint.

On the exterior face of the rectum, the hemorrhoidal plexus is applied to the internal sphincter muscle, and branches of it pass through the muscle in so many directions, that its fibres are sometimes, and especially in bad cases of hemorrhoids, so intermixed with enlarged veins as to appear like an erectile tissue.§

The orifice of the rectum (anus) is closed by a sphincter muscle, which is under the control of the will; the contraction of which

* Dict. de Méd., tome 27me, p. 271.

† Malgaigne.

‡ Horner's Anat., vol. ii. p. 47, 9th edit., 1851.

§ Dict. de Méd., tome 27me, p. 274.

has an effect in producing the folds or wrinkles found in the skin about the anus, whilst its relaxation permits, in certain diseased conditions, the eversion of the mucous coat, together with the blood-vessels and nerves. Even in the ordinary evacuation of the bowel, the loose adhesion of the mucous to the adjacent tissues permits the formation of a circular pad which is formed of the inverted portion of the gut, and favors the escape of the fecal contents by forcing the matter to free itself from the surface of the bowel, whilst the skin of the part is thus protected from contact with the discharges, when of the ordinary solidity. Certain diseased conditions change this action, as will be again referred to under the operations for fissure and prolapsus ani.

SECTION II.

OPERATIONS ON THE RECTUM.

The affections of the rectum requiring operative treatment are so numerous, and its structure so important as to have engaged a large portion of the time of many surgeons, and were they at present to receive the detailed consideration that their frequency deserves, would occupy the remainder of my space. A condensed description must, therefore, suffice.

The aid of the surgeon may be required in this region for the removal of foreign bodies; for encysted rectum; fissure of the anus; imperforate anus; prolapsus ani; fistula in ano; hemorrhoids; stricture of the rectum; and extirpation of the lower portion of the bowel for cancer.

§ 1.—REMOVAL OF FOREIGN BODIES.

The removal of foreign substances from the bowels may be accomplished by the finger, handle of a teaspoon, scoop, forceps, or other similar instrument, according to the circumstances of the case. In the removal of articles which have sharp points or cutting edges, it will be found advantageous to dilate the anus by means of a speculum ani, so as to protect the mucous coat, unless the size of the object should forbid it. In a case reported by Dr. Ruschenberger,

of the U. S. Navy,* where a glass goblet, three and a half inches high, with a brim two and five-eighths inches, and a base one and seven-eighths inch, was introduced into the rectum of a Chinaman, the whole was removed by Dr. Parker, of Canton, by crushing it with strong forceps, protecting the parts with folds of cloth, and removing the smaller fragments with a teaspoon; and a similar treatment would be requisite for the removal of all fragile articles.

§ 2.—ENCYSTED RECTUM.

In 1792, Dr. Physick, of Philadelphia, called the attention of the profession to a condition of the rectum in patients who had been previously thought to labor under neuralgia of the anus, or a series of symptoms which some regarded as an imaginary complaint, and which had then been generally overlooked by surgical writers.† This condition is characterized by the following symptoms: "Sometimes the patient experiences little or no uneasiness between the stools; at others, he has a sensation of discomfort, as if a worm or insect were in the canal, or it produces an intense itching which is often sufficient to prevent sleep; and there is occasional pain after a stool, though this is uncomplicated with spasm of the sphincters. The touch shows no tumor or other disease of the gut; no pus is present, except when the disease is complicated; but an examination made by passing a hooked probe a short distance within the anus, and withdrawing it, will demonstrate the existence of a little pouch or pocket, which is so exquisitely sensitive to the point of the probe as to cause acute suffering."

These pouches having since been minutely studied by Dr. Horner, of the University of Pennsylvania, and their anatomical relations strictly defined,‡ are now usually regarded as a normal portion of the gut, which only demands interference when it becomes the subject of diseased action. To relieve the symptoms above detailed, Dr. Physick proposed the excision of the pouch affected.

OPERATION OF DR. PHYSICK, OF PHILADELPHIA.—Bend the point of a probe backwards on itself for about half an inch, so as to form a hook, pass it into the anus, and by a movement backwards and

* Am. Journ. of Med. Sci., vol. xvii. N. S. p. 410, 1849.

† Am. Encyclop. of Med. and Surg., Article Anus, by Reynell Coates, M. D.

‡ Special Anat. and Histol., vol. ii. p. 147, 9th ed.

forwards, and with the point close to the side of the gut, draw down the membranous portion or wall of the sac, and snip it off with the scissors, so as to lay the pouch completely open. As these pouches are liable to be reproduced, a repetition of the operation may be called for. Injections of cold water, and attention to the fecal evacuation will subsequently facilitate the cure.

§ 3.—FISSURE OF THE ANUS.

Fissure of the anus is the name applied to designate a long, narrow, linear ulceration of the verge of the anus, which sometimes extends from the sphincter ani to the folds of the skin on the margin of the anus, and is invariably attended by spasm of the sphincters, a characteristic sign which has been much insisted on since the time of Boyer. This disease being usually well described in works on surgery, it is only necessary at present to designate the treatment. When something more than a palliative treatment by anodynes, and similar means of producing relaxation of the sphincters, is demanded, a cure may be accomplished by frequently cauterizing the surface, until the ulcer healed, or by paralyzing the external sphincter by a transverse division of its fibres. This may be accomplished either by dividing the muscle from the inside of the gut outwards, or by a subcutaneous incision, or by lacerating the ulcerated edges by dilating the anus, either by introducing the fingers or tents, or an anal speculum.

Operation of Boyer.—Place the patient on the side, introduce the left forefinger, well greased, into the gut, and pass a very narrow probe-pointed bistoury flatwise along the finger as a director. The cutting edge of the bistoury being then directed to the right or left side, according to the direction of the fissure, cut through the mucous membrane, sphincters, cellular tissue, and integuments at a single cut.* In the subcutaneous incision, pass the point of a very narrow, sharp-pointed bistoury beneath the mucous coat near the fissure, and divide the fibres of the muscle by cutting outwards. Then turn the bistoury flatwise, and withdraw it at the point of entrance.

* Am. Encyclop. of Med. and Surg., loc. citat.

§ 4.—IMPERFORATE ANUS.

OPERATION.—Puncture the membrane or the integument at the proper point, for the anus, either with a trocar, abscess lancet, or bistoury, and dilate the opening by means of a tent. Should contraction of the orifice supervene, as is frequently the case, make a crucial incision in the part, or dissect out a portion of the integuments.

§ 5.—PROLAPSUS ANI.

By prolapsus ani is usually understood such an eversion of the rectum as is not replaced by the natural action of the levator muscle. Whether this eversion is limited to the mucous coat, or formed of the other portions of the bowel, it has been usual to designate the complaint under the same name, though the inversion of any other than the mucous coat should be regarded as an intussusception, and treated accordingly.

PATHOLOGY.—In the natural condition of the bowel, the efforts at defecation create a disposition to partial eversion of the mucous coat in order to facilitate the escape of the fecal matter, as is daily seen in the defecation of the horse. In man, however, such a protrusion is rarely noticed, except when infiltration of the submucous cellular tissue, and a relaxed condition of the sphincter ani favors its production. But when once the mucous coat is fully everted, spasmodic contraction of the sphincter ani and the interruption of the circulation may so favor the congestion and infiltration of the part as to induce pain and the other symptoms of inflammation. For the relief of these evils, when simpler means have failed, various operations have been suggested, all having for their object either the diminution of the protruded coat itself, of the folds of the skin about the anus, or of the sphincter ani muscle, these operations being always, however, preceded by an appropriate local and general treatment. One of the simplest and most effectual means of affording relief in prolapsus ani is the immediate restoration of the gut.

I. TO RESTORE THE PROLAPSED PORTION.

The restoration of a prolapse of the rectum may be accomplished as follows:—

PLATE LXIII.

OPERATIONS PRACTICED ON THE RECTUM.

Fig. 1. Removal of hemorrhoids by means of the ligature. On the right side is seen the double canula and wire ligature of Physick, and on the left the application of the double silk ligature. 1, 2. Two ends of the ligature passed through the piles, and intended to strangulate one-half of the tumor. 3, 4. The other ends of the ligature about to surround the opposite half. 5. The wire ligature as applied by Dr. Physick. After Nature.

Fig. 2. Horner's Operation, for the removal of hemorrhoids. The patient being placed on the side to be operated on, the hand of one assistant draws up the buttock of the opposite side. A ligature being then passed through the largest pile and tied in a loop, the thread is held by another asssistant, or by the surgeon. A short tenaculum transfixing the base of the pile now draws the tumor off from the buttock, whilst the surgeon makes an incision around the external side of its base, so as to free it from its connection with the skin. The loop of a wire ligature being then thrown around the pile, so that one side of the loop lies in the incision, whilst the other is applied on the mucous surface of the tumor, the latter is perfectly strangulated without the integuments being involved in the ligature. 1, 2. Hands of assistant. 3. Ligature passed through the tumor to prevent its retraction within the rectum. 4. Tenaculum raising it from the side of the anus. 5. Double canula and wire ligature. After Nature.

Fig. 3. Operation for Imperforate Anus, and extirpation of a small flap. 1. Forceps. 2. Scissors. After Bernard and Huette.

Fig. 4. Dupuytren's Operation for Prolapsus Ani. 1. Forceps. 2. Scissors excising a fold of the skin at the verge of the anus. After Bernard and Huette.

Fig. 5. Ricord's Operation for Prolapsus Ani. 1, 2. Ligatures passed through the mucous coat so as to elevate the portion to be excised. 3. Curved scissors. After Bernard and Huette.

Plate 63

Fig. 1

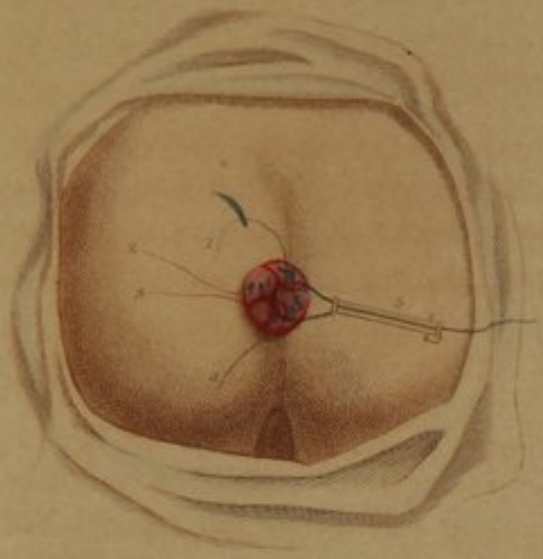
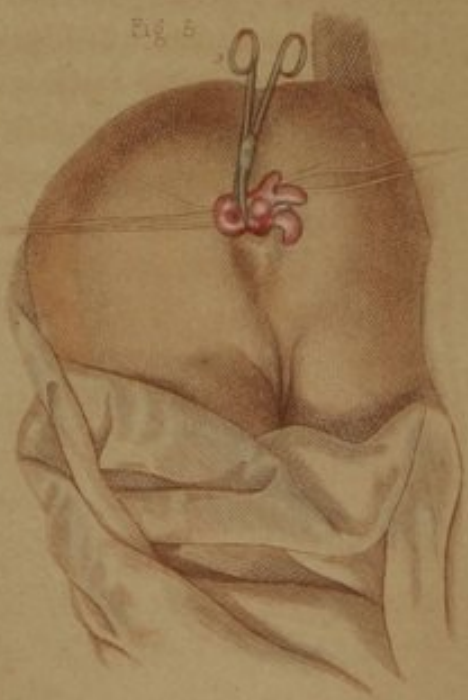


Fig. 2

Fig. 3

Fig. 4

Fig. 5



Place the patient on the side, with the knees drawn up and the shoulders flexed, so as to relax the abdominal muscles, or, if the parts are sensitive, etherize him thoroughly so as to prevent any resistance, and wash the tumor. Then, with the first and second fingers well oiled, press the centre of the prolapsed bowel within the sphincter ani muscle, retain it there with one finger whilst another portion of the bowel is similarly inverted, and continue this manipulation until the entire tumor is replaced, when a compress applied with a T bandage will often suffice to retain it. If the submucous cellular tissue and sphincter muscle have been much relaxed, the introduction of an ivory or wax stem, or about two inches of a rectum bougie, will prove useful by supporting the upper folds of the gut until the proper tone of the part is acquired. But if these means fail, a diminution of the bulk of the part, or of the anal orifice may be demanded so as to create a cicatrix that will induce sufficient contraction of the cellular tissue to reduce the size of the opening.

II. OPERATION OF DUPUYTREN.

With the patient in the position just recommended for the restoration of the bowel, pick up with a pair of Liston's forceps one of the radiated folds of skin on the verge of the anus, and cut it off by means of scissors curved on the sides, prolonging the cut about one-fourth of an inch into the mucous coat of the gut.

After this one, two or more similar folds may be excised, and the wounds left to cicatrize.

Velpeau,* instead of this, prefers union by the second intention, and introduces a little lint into each wound, in order to insure suppuration and favor the subsequent contraction of the cicatrix. The cure, in either plan, being dependent on the contraction of the parts thus induced, the surgeon should be cautious in regard to the amount excised lest he produce such a diminution of the anus as will interfere with the subsequent efforts at defecation.

III. EXCISION OF A PORTION OF THE SPHINCTER ANI.

Operation of Robert.—Remove, either by scissors or the scalpel, a transverse portion of the sphincter ani muscle, and unite the wound by a twisted suture.

* Mott's Op. Surgery, vol. iii. p. 1106.

IV. CAUTERIZATION.

Operation of Cheselden.—Apply caustic lengthwise upon one or more points of the mucous coat, favor the suppuration, and await the cicatrization. The French surgeons sometimes prefer the actual cautery similarly applied.

V. EXCISION OR AMPUTATION OF THE TUMOR.

In very bad irreducible cases, the adhesions of the adjacent portions of the tumor prevent its reduction; suppuration and sometimes hemorrhage ensue, and the aged patient is exhausted by the discharge and suffering. Under these circumstances, the removal of the tumor by excision, or ligature, has been practiced, and may possibly, though rarely, be again demanded.

Operation of Ricord.—Pass a needle and ligature through the mucous coat alone, near the base of the tumor, so as to retain it in position, and excise it by a circular cut either with the scissors or bistoury, arresting the hemorrhage by ligating each vessel as cut. Then removing the retaining ligature, guard against secondary hemorrhage, and obviate excessive contraction by the use of bougies.

Remarks.—In the operations just quoted, but little difficulty will be found in their performance, but much judgment will be requisite in deciding upon their necessity. In young patients, such operations will seldom be required, as these cases usually yield to an appropriate treatment, without surgical aid. If the prolapsus is so marked and obstinate as to require the adoption of any operation, that of Cheselden should be first tried, and then, if requisite, resort had to the operation of Dupuytren. In excising the folds as there directed, four generally suffice, one being in front, another behind, and two others laterally, as directed by him; the amount included in the forceps, and excised, being regulated by the degree of relaxation of the anus.

SECTION III.

HEMORRHOIDS, OR PILES.

PATHOLOGY.—Hemorrhoids (αιμα blood, and ρεω to flow) consist of tumors seated at or near the verge of the anus, which are sometimes liable to bleed at each effort at defecation. Although this complaint has been so long known to the profession, there is yet a diversity of sentiment in regard to its pathology. By some, hemorrhoids are regarded as a varicose condition of the anal veins (Jobert), or as tumors resulting from a laceration of the veins and the effusion of blood into the adjacent submucous or subcutaneous cellular tissue (Ribes), or as preternatural cysts, which are sometimes distended with blood and very much swelled, whilst at others they are more empty and flaccid. These different views, as thus expressed by distinguished surgeons, can only be reconciled on the supposition that a condition of parts similar to each of those described may accompany every case of hemorrhoids at some period of its course. On this supposition, and with a knowledge of the minute anatomy of the anus and rectum, it appears to me an easy matter to harmonize these varied conditions, and explain the pathology of the complaint. The mucous membrane, at the verge of the anus, being continuous with the skin, and having beneath it a fine anastomosis of veins without valves, which veins are seated in a cellular tissue, and directly continuous with those of the mesentery, it is certainly possible to create precisely such a condition of parts as has been described by Ribes, and yet refer the whole complaint to a varicose condition of the veins of the anus, and especially of the hemorrhoidal plexus, as stated by Jobert. Thus, constipation, straining, and all the usual causes of hemorrhoids would first induce fulness of these vessels, then serous or lymphy infiltration of cellular tissue in which the distended veins would freely anastomose, whilst the rupture of the veins would readily lead to effusion of blood, and the formation of a cyst covered by mucous membrane or skin, according as the vessel was above or on the line of the external sphincter ani. If, then, absorption of the more liquid parts of such a cyst were to ensue, it would certainly create a semi-solid or mulberry-like tumor, such as is described by Ribes, whilst the inflammation and ulceration of either the mucous or cutaneous surface of the tumor might give rise to a hemorrhage, the amount of which would depend on the

size of the vein opening into it. If, then, I wished to define the pathological characters of an external pile, I should say it is a tumor covered by the skin or mucous membrane on the verge of the anus, which tumor is due either to a laceration of the hemorrhoidal veins, and the escape of blood into the subcutaneous cellular substance, or to a varicose condition of the vessels. The first tumor, when excised, will not bleed, but simply give vent to a clot, or perhaps present the appearance of the semi-erectile tissue, before referred to.

An internal blind pile being, on the contrary, a varicose enlargement of one or more branches of the same veins higher up the rectum, would consequently be a tumor covered by the mucous coat of the part, which mucous covering would be liable to become elongated by infiltration of its submucous cellular tissue; whilst if it inflamed, ulcerated, and opened the vein, it would give rise to a hemorrhage, which would of course be most marked when the efforts at defecation created a congestion of the veins. Such a tumor will, therefore, require to be treated with an especial regard to this inflammation, as well as with reference to the hemorrhage likely to follow the opening of veins without valves, or of small arteries so situated as not to be readily seen.

§ 1.—TREATMENT OF HEMORRHOIDS.

The principal plans of treatment proposed by surgeons for the cure of hemorrhoids consist in the ligature and in excision.

I. THE LIGATURE.

The hemorrhoidal tumor may be strangulated either by threads passed through its base, and then tied so as to surround it, or by encircling the tumor with a wire ligature, drawn tight by means of a double canula (Physick), or by the simple loop of silk thrown over it, so as to constrict its base. (Plate LXIII. Fig. 1.)

II. EXCISION.

The removal of hemorrhoidal tumors by excision may be effected by seizing them in toothed forceps, and removing them with scissors

curved on the side (Dupuytren), or by passing a ligature through the tumor, and excising it with a bistoury.

Remarks.—The objection to the use of the wire ligature, as above directed, is the extreme pain induced by the constriction of the nerves of the skin, as well as the suffering and delay consequent upon the sloughing of the tumor; whilst excision, especially of internal piles, by removing the mucous coat, exposes the patient to dangerous hemorrhage. The following plan obviates all these objections, and effects a speedy, safe, and permanent cure:—

Operation of Dr. Wm. E. Horner, of Philad.*—Calm the irritability of the rectum by cold water injections, employing them several days before the operation. Then, at the time of the operation, empty the rectum, direct the patient to force out the tumors by straining in a squatting position, and place him in bed on the side corresponding to the tumors after they are protruded.

Then passing a large needle and strong silk ligature transversely through the upper part of the largest tumor, and removing the needle, form a loop by tying together the ends of the ligature, and direct it to be held by an assistant, so as to prevent the retraction of the hemorrhoids within the rectum. (Plate LXIII. Fig. 2.) A strong awl, or slightly curved tenaculum, being next made to transfix the base of the same tumor in a line transverse to the ligature, the assistant should hold this with his other hand so as to pry or elevate the mucous coat from the subjacent parts, when the surgeon should make a semicircular incision around the base of the tumor of a sufficient depth to detach the anal plexus of veins from the sphincter muscle, cutting rather into the skin than upon the mucous lining of the anus, and keeping sufficiently close to the margin of the anus to prevent a fold of integument being left upon its edge, as this is apt to swell, inflame, and become exceedingly painful. The awl and ligature being then passed through the loop of a wire ligature, the latter should be carried around the base of the tumor, so as to occupy the line of the incision on one side, and the mucous covering of the tumor on the other. The wire should now be drawn perfectly tight, or until the tumor becomes dark brown or black, when its end should be fastened upon the canula, and the venous plexus will be perfectly constricted through the mucous coat of the rectum on the inner face of the tumor, and through the cell-

* Am. Journ. Med. Sciences, vol. iv., N. S., p. 358.

PLATE LXIV.

OPERATIONS FOR FISTULA IN ANO.

Fig. 1. A Section of the Rectum and Anus, in order to show the relations of the parts in a Blind Fistula. 1. Rectal orifice of the fistula. 2. Its position in the fat about the anus. 3. The gut. 4. The anus. 5. The structure immediately around the anus. After Bernard and Huette.

Fig. 2. A similar Section to show the relations of an Incomplete Fistula. 1. Orifice of the fistula in the buttock. 2. Its termination. 3. Rectum. 4. Anus. 5. Surrounding parts. After Bernard and Huette.

Fig. 3. Section showing the relations of a Complete Fistula. 1. Rectal orifice. 2. External opening. 3. Rectum. 4. Anus. 5. Surrounding structures. After Bernard and Huette.

Fig. 4. Operation for Fistula in Ano by the Knife. The patient being placed upon the affected side, the parts can thus be laid open without exposing the surgeon to the chance of injuring his own finger, as has often happened by the sudden motion of the patient when placed upon his hands and knees. 1. Hand of assistant supporting the buttock. 2. Left forefinger of surgeon passed into the rectum to touch the point of the bistoury. 3. His right hand introducing the bistoury through the anal orifice of the fistula, in order to divide the parts from above downwards, as he withdraws both hands. 4. Fistulous opening. After Nature.

Fig. 5. Section to show the Operation of Probing a Fistula. 1. Rectal orifice of fistula. 2. Its anal orifice. 3. Rectum. 4. Probe passed along the fistula until its point touches the forefinger in the rectum. After Bernard and Huette.

Fig. 6. Division of a superficial Anal Fistula by the Bistoury, as passed along a Director. 1. Rectal orifice of fistula. 2. Its anal opening. 3. The gut. 4, 5. The director. 6. The bistoury passing along it. 7. Portion of the integuments near the anus, which is to be laid open. The drawing represents the patient in the position of Fig. 4. After Bernard and Huette.

Fig. 7. Operation for Fistula in Ano by means of the Ligature. 1. Rectal orifice. 2. Anal opening. 3. Rectum. 4, 4. Ligature *in situ*. 5. Tissue to be divided. After Bernard and Huette.

Plate 64.

Fig. 1

Fig. 2

Fig. 3.

Fig. 4.

Fig. 5.

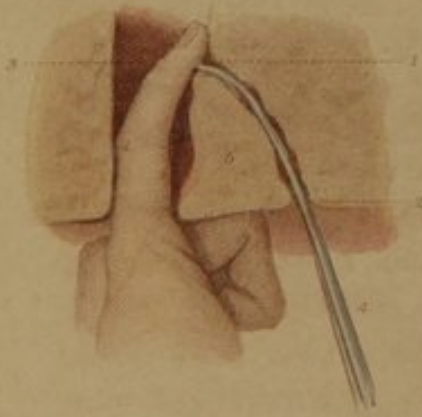


Fig. 6.

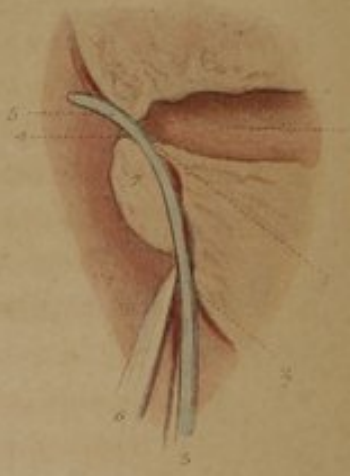


Fig. 7.

ular coat of the gut on its outer side. If the hemorrhoid remains large and very tumid, after being constricted, the surgeon may puncture it with a lancet or bistoury, and permit its blood to escape, after which a piece of cerate should be temporarily placed between the tumor and the incision, to guard against adhesions, and an anodyne enema given, the thread ligature being left in the tumor for six or eight hours, when it may be used to elevate it, whilst it is snipped off with a pair of scissors, the wire loop being thus freed from its position without creating any loss of blood.

Remarks.—The dangers that have been incurred from the excision of piles, and the suffering consequent on the ordinary method of applying the ligature, are facts that every experienced surgeon must have frequently noted. When, therefore, it is necessary to select a mode of operating, I would recommend a trial of that proposed by Dr. Horner, as it is one that I have repeatedly performed, and the success of which I have now seen in nearly thirty cases. In but one of these has it been necessary to repeat the operation, whilst many, and some even of the very worst hemorrhoids that I have ever encountered, have been cured in about two weeks; some patients being able to sit up in bed in seven days.

SECTION IV.

FISTULA IN ANO.

Pathology.—When, from any cause, an abscess is developed about the anus, it may discharge itself by one or more small orifices, either externally upon the buttock, internally into the gut, or by both surfaces. From the constant action of the sphincter and levator ani muscles, the approximation of the sides of this abscess and their union is prevented, the parietes of the cavity become callous, the orifice becomes small, contracted, and indurated, and the condition known as fistula in ano is induced. To facilitate the adhesion of these parts, by exciting proper inflammatory action, and bring the sides of the cavity of the abscess in contact, so that they may be kept at perfect rest, is the object of the operations performed for the relief of this complaint. Two principal means are resorted to: 1. The ligature. 2. Incision.

§ 1.—THE LIGATURE.

The application of a ligature to a fistula, so as to induce the division of the sphincter muscle by ulceration and the formation of healthy granulations, may be effected in various ways; but by the use of the following instruments of Dr. Wm. Gibson, it is rendered a simple and not very painful operation.

OPERATION OF DR. GIBSON, OF PHILADELPHIA.*—A silver canula, five inches long, and an eighth of an inch wide, slightly curved, so as to convey a watch-spring ten inches long, with a bulb at one end and an eye at the other, and with a steel stylet (Plate LVIII. Figs. 24, 25) being first prepared, the surgeon should gently probe the course of the fistula, and if it is incomplete, pass in the canula, with its stylet retracted, passing the left forefinger into the rectum, and pressing the point of the canula against the side of the gut, where it is supported by the finger, push forward the stylet, puncture the wall of the rectum, withdraw the stylet, and pass the canula through the opening thus made, until it touches the finger in the rectum. Then passing the watch-spring, armed with a ligature, into the canula, carry the spring into the cavity of the gut, and bring one end out of the anus, when the canula and watch-spring being removed, the other end of the ligature will be left coming out of the fistulous orifice. (Plate LXIV. Fig. 7.) The two ends being now loosely tied, the patient may walk about until the ligature ulcerates out and escapes, as during this time the formation of granulations will generally have removed the complaint.

§ 2.—OPERATION BY THE KNIFE.

Empty the bowels, and place the patient upon the side next to the fistula; pass the left index finger into the rectum; pass the bistoury into the fistula; bring its point to touch the finger, and, withdrawing the two, lay open the gut and the cavity of the abscess by dividing the levator ani longitudinally, and the sphincters transversely. Then keep the anal orifice of the fistula moderately open by introducing

* Pract. of Surg., vol. ii. p. 164.

charpie or lint until it heals from its upper end by the formation of new granulations. (Plate LXIV. Fig. 4).

Remarks.—Among the variety of methods of operating for fistula in ano, recommended by surgeons at various periods, there is no difference in the indications to be accomplished, though individual peculiarity has suggested a variety of instruments. Of all these but one demands special notice, and that is the sheathed bistoury of Wheatley and Dr. Physick. This instrument resembles the ordinary sharp-pointed bistoury, but has a sheath attached upon the blade, which covers its cutting edge as well as its point, but may be shifted at pleasure. This sheath saves the patient the pain likely to be created by passing the sharp edge and point against the sides of the fistula in introducing the instrument, a matter of some moment where etherization is not practiced. The position of the patient upon the side, with the limb of the sound side flexed, and that of the affected side extended (Plate LXIV. Fig. 4), as pursued by the French surgeons, are also better than the position upon the hands and knees, or leaning over a table or bed. In the latter position, the pain caused by the incision is apt to force the patient away from the surgeon, in consequence of which the forefinger of the operator is liable to injury. Such a position is also incompatible with etherization, which, in an operation upon an inflamed and sensitive part, is essential to the comfort of the patient. Where time is not an object, or in scrofulous patients, the ligature is best adapted to the cure; but incision is the most prompt and least troublesome.

When the surrounding parts and the edges of a fistula are indurated, the French surgeons are accustomed to pare them off, and leave the wide wound thus made to heal by granulations. But in the majority of cases, such a proceeding only increases the suffering of the patient, and delays the cure. In very callous cases, a slight paring of the edges of the incision may expedite the treatment; but in most instances, nature is capable of removing the induration.

OPERATIVE SURGERY.

PART V.

OPERATIONS ON THE EXTREMITIES.

PART V.

OPERATIONS ON THE EXTREMITIES.

CHAPTER I.

GENERAL OPERATIONS ON THE EXTREMITIES.

THE upper and lower extremities being composed of several tissues which are analogous to those found in other regions of the body are liable to many similar complaints, and sometimes require operations which are the same in principle as some of those that have been already described; thus, the removal of tumors, the relief of deformities arising from the cicatrices of burns, the ligature of arteries, or the resection of bones, is very much the same in all parts of the body, and must be regulated by the same general rules, as they differ only in accordance with the anatomical relations of the region in which they are performed. It will consequently be unnecessary, in this part of the volume, to do more than describe such modifications of these operations as are required by the position and functions of the extremities, and the reader is therefore referred to the preceding pages for any operative directions not specially required in connection with this region. Two classes of operations are performed upon the extremities; one includes all those of a general kind which are performed upon the superficial tissues, whilst the other has reference to such as are deeper seated.

The class of operations of a general character which may be assigned to the first of these limits embraces such as are required for the relief of diseases of the nails and skin, of the superficial nerves, of the veins, and of the tendons.

SECTION I.

OF INVERTED TOE NAIL.

Pathology.—The suffering caused by the inflammation or ulceration of the skin, at the external side of the nail of the great toe, has been such as frequently to attract the attention of surgeons to its pathology and mode of treatment. Authors have, however, differed considerably in their views of the cause of the complaint, some asserting it to be due to a deviation or ingrowing of the nail itself, whence the name of "Inverted Toe Nail;" and others contending that it was owing to the uprising of the flesh in consequence of the pressure of the boot. As in many other vexed questions, both opinions are perhaps correct, or rather the trouble is often due to both causes. But whether the original source is in the flesh or in the nail, the latter soon becomes the cause of its continuance.

To relieve the trouble created by this complaint, it was proposed by Dionis to elevate the nail by scraping it thin, and packing fine lint beneath its edge; by Dessault to recurve the nail, and elevate its point by means of a curved piece of tin; by Dupuytren to slit it up in the middle, and turn out each half, whilst Larrey suggested the same process, combined with excision of the matrix and the application of the actual cautery or caustic. The latter I have found to be the most effectual, and it may be readily accomplished in the following manner:—

§ 1.—REMOVAL OF THE NAIL AND ITS MATRIX.

Operation.—Place the patient in a perfect state of anæsthesia by the use of ether, and then with a small sharp spatula or scalpel handle passed around the root of the nail and inserted beneath the fold of the skin at its base to the extent of one-fifth of the length of the nail, free the latter entirely from its matrix. Slit the nail down the middle from before backwards; evert each half; cauterize the matrix thoroughly with anhydrous potassa; apply over the surface a pledget of dry lint; allow it to remain until suppuration is induced, and then favor the cicatrization by appropriate treatment.

SECTION II.

CURE OF PARONYCHIA, OR WHITLOW.

PATHOLOGY.—Four kinds of whitlow have been described by authors: to wit, that where pus is found immediately beneath the cuticle, at the root of the nail after trivial inflammation; that in which it is seated in the cellular substance at the end of the finger; that in which the disease is in the sheath of the tendons; and that arising from inflammation of the periosteum.

To relieve the sufferings of the patient, and check the progress of the disease in the first two varieties, Dr. Perkins has proposed the free application of caustic;* and such a treatment may answer for the mild forms. But in the more severe kind (third and fourth varieties) nothing but an early and free incision will prove effectual, and in the cases involving the periosteum prevent the necrosis of the phalanx which is so apt to ensue when the disease is not promptly arrested.

OPERATION OF INCISION.—Etherize the patient, place the finger well supported upon a table, and with a sharp-pointed straight bistoury puncture the soft parts at the upper end of the affected phalanx, and then by a rapid motion slit them down to the lower end of the same phalanx, making the incision in the middle of the finger so as to avoid serious injury to the tendon or the division of the digital arteries or nerves, which course along its sides. The case should then be subsequently treated as an ordinary abscess.

SECTION III.

ENLARGED BURSA.

PATHOLOGY.—The enlargement of the bursæ mucosæ, which are seated in the course of the tendons near certain joints, is generally the result of an acute or more frequently subacute inflammation consequent upon over-action of the tendon, or upon long-continued pressure on the part. The increased secretion of bursal synovia thus induced leads to the formation of a tumor in the course of the tendon, which

* Am. Med. Record., vol. ii. p. 490, 1819.

is more or less elastic, and caused by the bursal sac being distended with the natural secretion of the part. When seated at the wrist, the term ganglion is generally employed to designate it, though this is equally applicable to the swellings found near other joints.

The principles of the treatment are the evacuation of the contents of the bursa, and the production of such action in its cavity as will prevent the reaccumulation of the fluid. These principles have been carried out in various ways; sometimes the cyst has been ruptured by a blow, and the liquid, after being effused into the surrounding cellular tissue, left to be absorbed by nature; or the tumor has been treated as an abscess by laying it open with a bistoury, or by introducing a seton, or by a subcutaneous puncture; or by exciting adhesive inflammation in it by injections of iodine; or the sac has been entirely removed by dissecting it out. The close proximity of the joint must necessarily be an objection to any means of treatment that is liable to excite severe inflammation, and the least dangerous methods should therefore be first tried.

§ 1.—SUBCUTANEOUS PUNCTURE.

OPERATION.—Puncture the tumor by a tenotome or cataract needle, so that the opening in the cyst and that in the skin shall not correspond; squeeze its contents into the adjoining cellular tissue, and leave it to be absorbed, whilst pressure is employed to prevent its reaccumulation.

§ 2.—PUNCTURE AND INJECTION OF IODINE.

OPERATION.—Puncture the cyst directly through the skin with a narrow bistoury, or, if the tumor is large, by a trocar and canula. Evacuate its contents, and then with a syringe throw in a small portion of tincture of iodine, regulating the subsequent inflammation by appropriate treatment.

§ 3.—INCISION.

OPERATION OF DR. GEO. HAYWARD, OF BOSTON.*—In enlarged bursæ over the patella, or housemaid's knee, Dr. Hayward operates as follows:—

* Am. Journ. Med. Sciences, vol. iv. N. S. p. 513.

Puncture the tumor, and evacuate its contents, and if it fills again, as is usually the case, lay it open by a free incision, inserting a piece of lint between the lips of the wound, so as to bring on the proper degree of inflammation, and regulate this by poultices and appropriate treatment.

Dr. Hayward has never found it necessary to excise the cyst.

SECTION IV.

PAINFUL CONDITION OF THE NERVES.

The nerves of the extremities are sometimes pricked in bleeding, or so accidentally injured as to induce a neuralgic condition, to relieve which an operation is demanded. This operation is varied, and may consist either in a simple transverse division of the main trunk, or in the excision of a portion of it. For the neuralgia and other evils resulting from the injury of a cutaneous filament in venesection, little more is requisite than a simple incision across the nerve so as to divide it entirely; but in other cases it may be requisite to lay bare the main trunk of the nerve by a regular dissection of its course, and to excise a small portion in order to prevent the reunion of the divided parts, and the restoration of the function of the part. For several interesting papers on affections of the nerves, the reader is referred to the operations of Dr. Warren, of Boston, as quoted in the Bibliographical Index.*

SECTION V.

VARICOSE VEINS.

PATHOLOGY.—The morbid enlargement or dilatation of any of the veins of the body has long been regarded as constituting a varix, and, to relieve this, surgeons have suggested various operations. The failure of many of these plans to effect a cure, as well as the serious loss of life that has in some instances ensued upon their performance, should induce a close examination of the anatomical relations of these vessels, as well as the pathological changes noted in

* Part I. p. xxxiv.

them. My present limits will, however, simply permit a reference to the coats of these veins, without entering upon their surgical anatomy.

The veins of the extremities, in which the varicose condition is most often seen, are, like the arteries, composed of three coats—a cellular, muscular, and serous or arachnoid one—these coats being generally much thinner in these vessels than in the arteries, the tenuity of the veins being so great as to permit the circulation of the blood to be distinctly seen through them, in consequence of which they are more liable to expansion or rupture upon the application of force. All the superficial veins of the extremities communicate with the deep veins by numerous anastomoses.

In an elaborate paper upon the Pathology of Varices, by Dr. Jno. Watson, of New York,* may be found many excellent observations connected with their condition. Speaking of the stages in the progress of varices, Dr. Watson refers to the first as being characterized by a simple dilatation of the vessel, which leads to interstitial development or hypertrophy; the second, by an increase in their length, which leads to the formation of folds and serpentine convolutions, these being most common where the vessel is under least restraint; the third, by an increase in the thickness of their elastic or muscular coat; and the last, by a change in the inner coat, which becomes so thickened as to resemble delicate muscular tissue.

Terminations.—Varicose veins may, under favorable circumstances, contract upon themselves, and diminish in calibre so as to contain less blood than is natural to them. Or the inner membrane may inflame, throw out coagulated lymph, and thus close its channel, or it may run on to suppuration, as in suppurative phlebitis, or the disease may terminate in death by loss of blood.

Operations upon the veins, by inducing inflammation, may cause death from phlebitis; or the recession of the blood from the varicose vessels into the course of the general circulation, in persons of a plethoric habit, may induce pleurisy and pneumonia; whilst, under the most favorable circumstances, the most that can be obtained is a temporary relief, the return of the circulation through the anastomosis, between the deep and superficial vessels, often redeveloping similar evils to those which it had been attempted to

* Am. Journ. of Med. Sciences, vol. v. N. S. p. 36.

relieve. From considerable observation of many of the plans of operating heretofore employed and recommended, I am induced to think that the patient's life is often exposed without obtaining any permanent good, and I shall therefore omit all mention of the operative proceedings usually described as applicable to this complaint. Those desirous of full information on these plans are referred to the excellent and extended paper of Dr. Watson, to whom I am indebted for much additional information, and to a confirmation of views obtained in Paris in 1840.* Coinciding in the correctness of his opinions as to the danger resulting from incisions, and similar means of treatment, the following plan, as pursued by him, is the only one to which I will refer.

Treatment of Varicose Veins, by Dr. Jno. Watson, of New York.†—The patient, having the limb bandaged, and having been kept in bed for twenty-four hours, several small pieces of a common wax bougie should be applied over the course of the varices, some being placed longitudinally, and others transversely along the veins, and secured in their position by a roller. Over this apply the starch bandage,‡ and allow it to remain undisturbed as long as it causes no inconvenience, and does not become deranged.

Remarks.—After the references already made to the treatment of this complaint, the reader must be aware that I deem little more requisite in the way of an operation upon varices, than such pressure as can be obtained by pursuing the judicious plan advised by Dr. Watson. It or the laced stocking, or both, are capable of accomplishing quite as much in the treatment of varices of the limbs as either caustic, excision, incision, perforation, or any of the numerous other plans usually referred to.

SECTION VI.

TENOTOMY, OR DIVISION OF THE TENDONS.

Under the heading of "contracted tendons," surgeons have sometimes placed a class of deformities which are due to a contraction of the muscle, instead of the tendon, to which it belongs; but in the

* Philada. Med. Exam., vol. ii. p. 821, 1839.

† Loc. citat., p. 57.

‡ Smith's Operative Surgery, p. 282, 3d edit.

cases of burns or ulcers, an actual loss of the substance of the tendon sometimes ensues upon the injury. From muscular contraction, the tendons in the neighborhood of different joints are, however, sometimes rendered so prominent and distinct, that they appear to be contracted, as they can be felt like tense bands or cords immediately beneath the skin, interfere with the motion of the part, and retain the limb in a deformed position. To obviate this, the division of the tendon has been practiced with considerable success, especially when seconded by such mechanical contrivances as may restore and preserve the limb in its ordinary position. This division of a tendon may be readily accomplished in any case by means of a tenotome (Plate XXXV. Fig. 13), which should be passed beneath the skin, and made to act on the tendon as directed in torticollis.*

As an operation, the division of a tendon is sufficiently simple; but, unless the consequences are well understood, much evil may result from its performance, or from the too early application of mechanical means to remedy the contraction. In studying the result of the operation, it should therefore be recollected that when a tendon has been divided without contact with the air, as is accomplished in its subcutaneous section, or in its laceration, the following changes may be anticipated: 1. A slight effusion of blood at the seat of injury between the divided ends. 2. The exudation of soft gelatinous plastic matter. 3. Its conversion into a sort of lamellated or fibrous tissue, which in its early condition is susceptible of a certain amount of elongation.

Perfect rest for a day or two is therefore essential to success in operating for tenotomy, the mechanical means being gradually applied and persevered in until the elongation of the part is sufficient. In deformities of the foot (club-foot), and of the hand, or in false anchylosis, the operation of tenotomy may prove serviceable, care being taken, by reference to the surgical relations of the part, to prevent injury to the adjacent nerves and bloodvessels. For the mechanical treatment of these complaints, the reader is referred to my volume on minor surgery.†

* Part III. p. 286.

† P. 435, edit. 1850.

CHAPTER II.

LIGATURE OF THE ARTERIES OF THE EXTREMITIES.

THE arteries of the upper extremity may be ligated at any point from the shoulder to the fingers, and are to be operated on by the same rules as have been already stated in the chapter on Aneurisms in general.* The present account will, therefore, be limited to the operative steps required in the special application of the ligature to the arteries of this member, the anatomical relations of each vessel being given in connection with the operation practiced upon it.

SECTION I.

LIGATURE OF THE AXILLARY ARTERY IN THE AXILLA.

ANATOMY.—The region of the axilla has been differently described by authors; the French surgeons including in it nearly all the parts found between the arm and clavicle, and others, among whom is Dr. E. Geddings, of Charleston,† limiting it to the triangular depression included between the upper part of the arm, shoulder, and side of the chest, which is formed by the edge of the pectoralis major in front, the latissimus dorsi, and teres major muscles behind, as they tend to their insertion into the humerus, and by the ribs covered by the serratus magnus at the sides. As the parts about the clavicle have been already referred to,‡ I shall adopt the latter limits.

The depth of the axilla depends very much upon the position of the arm and the obesity of the patient. When the arm is elevated perpendicularly, the head of the humerus is forced down, and nearly effaces it, or sometimes renders it convex, and when the patient is

* Part III. p. 317.

† Amer. Cyclop. of Med. and Surg., vol. i. p. 559.

‡ Part III. p. 345.

PLATE LXV.

LIGATURE OF THE ARTERIES OF THE ARM.

Fig. 1. A View of the Anatomical Relations of the parts about the Axilla and upper portion of the Arm. 1. Brachial artery. 2. Director beneath it. 3. Median nerve. 4. Internal cutaneous nerve. 5. Ulnar nerve. 6. Brachial vein. 7. Axillary lymphatics. 8. Branches of axillary artery. 9. Pectoralis minor muscle. 10. Pectoralis major. 11. Anterior margin of axilla drawn back by a hook. 12. Cut edge of brachial fascia. 13. Biceps muscle. 14. Coraco-brachialis. 15. Lymphatic.

After Bernard and Huette.

Fig. 2. Ligature of the Axillary Artery in the Axilla. 1, 2. Incision in the skin and fat. 3. That in the fascia. 4. Axillary artery raised on a director. 5. Axillary vein drawn back by a blunt hook forceps. 6. The median nerve. 7. Internal cutaneous nerve. After Bernard and Huette.

Fig. 3. Anatomical Relations of the Brachial Artery. 1. Brachial artery. 2. Radial artery. 3. Coraco-brachialis muscle. 4. Biceps muscle. 5. Median nerve. 6. Brachial vein. 7. Profunda minor artery. 8. Ulnar nerve. 9. Fascia formed over artery at the elbow by expansion from biceps tendon. 10. Median basilic vein. 11. Cephalic vein.

After Bernard and Huette.

Fig. 4. Anatomical Relation of the superficial parts about the bend of the Arm. 1, 3. Cephalic vein. 2. Median cephalic. 4. Median vein. 5. Median basilic vein. 6. Brachial artery. 7. Biceps tendon. 8. Median nerve. 9. Ulnar nerve. 10. Radial nerve. 11. Branch of external cutaneous nerve. 12. Main trunk external cutaneous. 13. Branch of median nerve. 14. Branch of internal cutaneous. 15. Its main trunk.

After Bernard and Huette.

Fig. 5. Anatomical Relations of parts about the Wrist. 1. Posterior annular ligament. 2. Tendon extensor primi internodii. 3. Tendon extensor secundi internodii. 4. Radialis indicis artery.

After Bernard and Huette.

Fig. 6. Ligature of Radialis Indicis Artery. 1. The skin. 2. The fascia. 3. The artery with the ligature beneath it.

After Bernard and Huette.

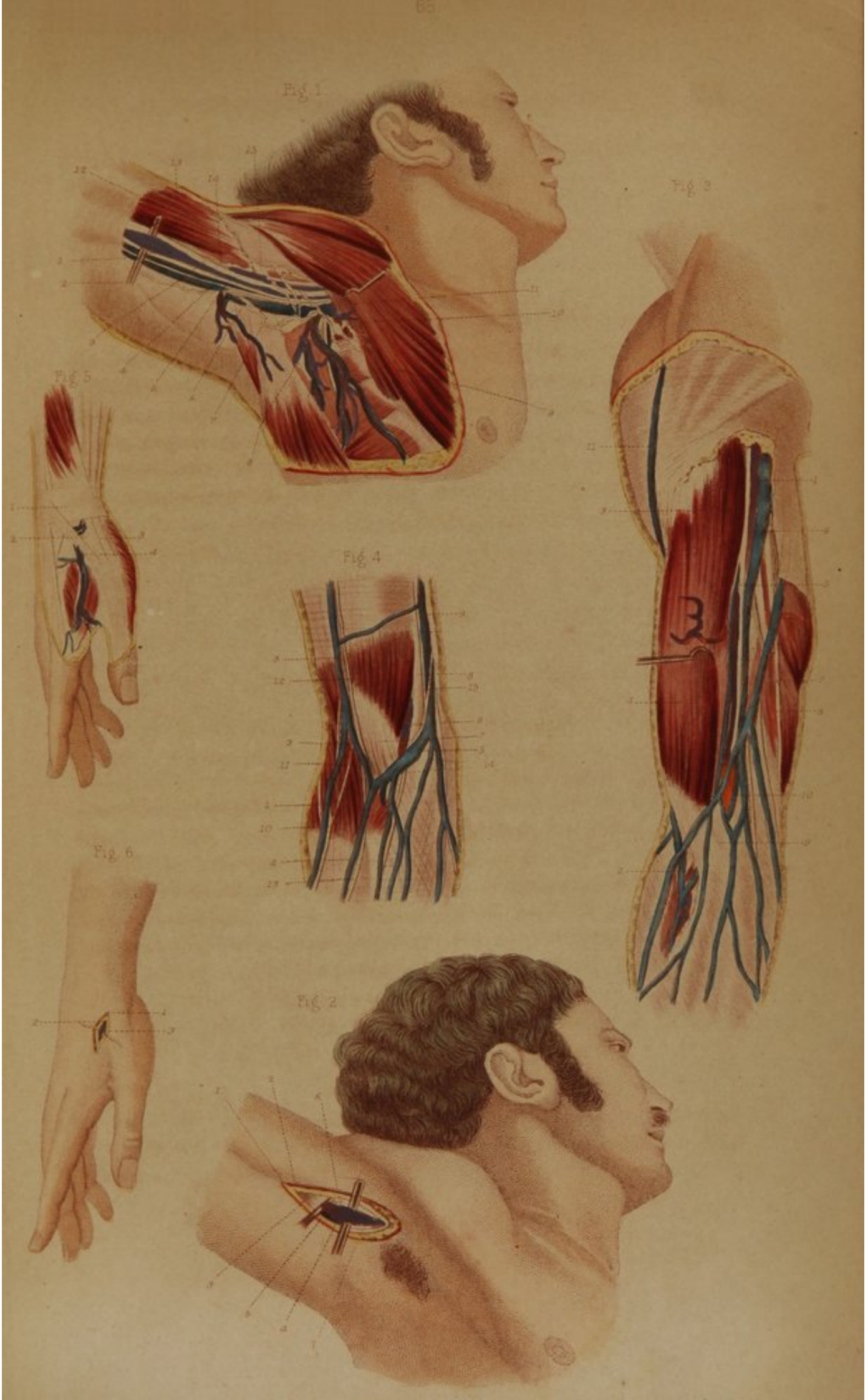


Fig. 1
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fat, a deposit of adipose matter so fills up this space as barely to leave a depression.

In the region thus bounded by the pectoralis major muscle in front, and the latissimus behind, and which, in the adult, contains a luxuriant growth of hair, are to be found the axillary artery and vein, with their branches, as well as the nerves of the brachial plexus, together with the lymphatic glands; all these parts being united together by a loose cellular tissue, and surrounded by fat.

The vessels and nerves of the axilla are so arranged as to form a plaited cord or thong, the vein being generally anterior and internally, whilst the artery which was between the vein and the nerves near the clavicle is here so interlaced by the latter as to be difficult of access. The whole bundle of vessels and nerves traverses the axilla diagonally from above downwards, and from within outwards. The lymphatic ganglia occupy the course of the vessels, and are abundantly developed. (Plate LXV. Fig. 1.)

Operation of Lisfranc.—The patient being placed upon the back, and the arm forcibly extended, the distance between the latissimus and pectoralis major should be divided by imaginary lines into three equal parts, and a longitudinal incision three inches long made through the skin and cellular tissue in a line corresponding with the union of the anterior and middle third of the axilla. (Plate LXV. Fig. 2.) The fascia, being then seized in the forceps, should be nicked and slit up on a director in the same direction, or, if this does not expose the parts sufficiently, it may also be divided to a slight extent transversely. The nerves and vessels being now reached, the arm should be lowered, and the cellular tissue around the vessels lacerated by the point of the director sufficiently to distinguish each part. The vein being then pushed to one side, seek on the anterior side of the axilla for the median nerve, underneath which is found the artery, which may now be secured by passing the aneurism-needle from behind forwards, care being taken to avoid the axillary vein.

Operation of Malgaigne.*—By a similar incision in the skin, or by one, three-fourths of an inch from the anterior border of the axilla (as advised by Manec), the fascia is exposed, opened as before, and the internal border of the coraco-brachialis muscle sought for as the first indication. Division of the sheath of this muscle, on a level with its internal border, leads directly to the median nerve,

* Méd. Opératoire.

which is the second indication; and inside and beneath it is the artery, which should be ligated as before directed.

Remarks.—Ligature of the axillary artery in the axilla may be demanded in case of an aneurism or wound of the brachial artery high up; the primary hemorrhage in the case of wounds being restrained by pressure of the subclavian upon the first rib, whilst, if the wounded vessel can be drawn out at the lower part of the wound, the ligature may be more readily applied than it can be higher up where it is surrounded by nerves. In aneurism, the same rule holds good, and the difficulty of ligating the vessel high in the axilla, without injuring either the nerves or the vein, has therefore generally prevented its being attempted. As the application of the ligature in the axilla does not make so unfavorable a wound for suppuration as the operation below the clavicle, I should prefer ligating the vessel at this point when permissible. Occasionally, fainting from loss of blood will deprive the operator of the aid to be obtained from noting the pulsation of the vessel in its full force, whilst the interlacing of the numerous nerves will add to his embarrassment; but it should be remembered that usually the median nerve is next to the coraco-brachialis muscle, that inside of it is the internal cutaneous, and that behind this we have the ulnar and radial nerves, so that, by following the directions of Malgaigne, even the ordinary amount of anatomical knowledge, possessed by those long absent from the dissecting-rooms, will suffice for the operation.

SECTION II.

LIGATURE OF THE BRACHIAL ARTERY.

Anatomy.—At the lower border of the latissimus dorsi, and upon the anterior face of its insertion, the axillary artery takes the name of Brachial, which it continues as far as the bend of the elbow. Throughout its length its course is down the arm on the inner side, winding gradually forwards to reach the middle of the anterior face of the bend of the forearm. At first, it runs along the inner edge of the coraco-brachialis muscle; then from its insertion it lies upon the brachialis internus, following the inner edge of the biceps. (Plate LXV. Fig. 3.) In the upper three-fourths of its course, it is only covered by the integuments and fascia, but at the bend of the

elbow it perforates the fascia, and passes beneath the expansion from the tendon of the biceps. Passing under this, it sinks deep into the middle of the bend of the arm, and divides into the radial and ulnar arteries about a finger's breadth below the joint.* Two venæ satellites accompany it; the basilic vein is superficial, but runs parallel with it; and the median nerve courses along its outer side at its upper part between it and the coraco-brachialis. Sometimes this nerve crosses the artery obliquely in front of this point, and sometimes lower down, till it gets on the ulnar side of the vessel. The radial, ulnar, and internal cutaneous nerves are also upon its inner side, high up, but lower down they advance towards the posterior and internal face of the arm and recede from the artery. The brachial artery is, however, liable to great varieties, sometimes giving off the radial and ulnar as high up as the axilla.

§ 1.—LIGATURE OF THE BRACHIAL ARTERY AT THE MIDDLE OF THE ARM.

Lying on the inner side of the coraco-brachialis high up, and on the inner edge of the biceps lower down, the median nerve is external and anterior to the course of the artery. Four indications point out the line of the incision: 1, the external edge of the biceps, and higher up the coraco-brachialis (Hodgson); 2, a line drawn from the middle of the axilla to a point a little inside the middle of the bend of the elbow (Sabatier); 3, the ends of four fingers, placed upon the median nerve (which is here on the outside of the artery), the incision being made parallel with, and inside of them (Lisfranc); 4, the pulsation of the vessel.†

Operation.—Carry the limb a little off from the body, flex the forearm, and lay it over upon its back, feel for the bicipital fossa, and incise the skin for three inches in the line of the artery. On coming to the fascia, feel for the pulsation of the artery, pick it up, nick it, insert a director, and slit it up to the extent of two and a half inches, so as to expose the inner edge of the biceps muscle, when the thick yellow sheath of the vessel will be readily seen. Incise this on its inner edge, and the median nerve, which is the

* E. Geddings, Amer. Cyclop. Med. and Surg., p. 346.

† Malgaigne, Philad. edit., p. 145.

first white cord on the inside of the muscle, being found, the artery may be exposed beneath it, and easily ligated from without inwards, by drawing the nerve a little to the outside. (Plate LXVI. Fig. 2.) The internal cutaneous nerve is internal to, and the ulnar half an inch behind the artery.

§ 2.—LIGATURE OF THE BRACHIAL NEAR THE ELBOW.

OPERATION.—Make an incision through the skin on the inner edge of the biceps muscle, or in the line from the axilla to the elbow, before mentioned. Open the fascia and sheath as before, and the median nerve will be found about a quarter or half an inch on the *inside* of the vessel, when a ligature should be carried around the artery from within outwards. (Plate LXVI. Fig. 2.) Two inches above the epitrochlea, the median nerve passes underneath the artery, so that, though it is on its anterior and external side at the upper part of the arm, it is here posterior and internal to it.*

REMARKS.—The ligature of the brachial artery at any point is not a difficult operation to one familiar with the general relations of the median nerve to the artery, and though these vary a little at different points, as mentioned above, the nerve is never far from the artery. The most troublesome cases are those in which the radial and ulnar arteries are given off near the axilla; but these anomalies are not very common. When the ligature is applied upon the vessel, one end should be cut off, the wound closed by adhesive strips, and the arm kept moderately warm for a few hours until the circulation is established through the muscular and anastomosing branches. When, in ligating the artery, the arm is much swelled, the line described by Sabatier will furnish the best direction for the incision; but, when it is not, the course of the biceps or coraco-brachialis muscles will suffice. The rapid enlargement of the anastomosing arteries, though soon advantageously restoring the circulation sometimes, creates trouble in cases of aneurism at the bend of the elbow, and occasionally necessitate the application of two ligatures, one above and the other below the tumor.

* Malgaigne.

SECTION III.

LIGATURE OF THE RADIAL ARTERY.

Anatomy.—At the upper third of the forearm, the radial artery is placed in the groove that separates the supinator radii longus from the pronator radii teres and flexor carpi radialis muscles, where it is covered by the inner edge of the supinator muscle by the fascia and by the skin. The radial nerve is on its outside, and the venæ satellites accompanying it as usual. (Plate LXVI. Fig. 1.)

At the lower third of the forearm, the artery is only covered by the skin and fascia, has the tendon of the flexor carpi radialis on its inner side, and the radial nerve far outside of it.*

When the limb is too much swollen to permit the distinguishing of these marks of reference, a line drawn from a point half an inch outside of the middle of the front of the elbow to a point on the outer side of the forearm two inches and a half below would indicate its course above (Lisfranc), or from a similar point at the elbow to the middle of the space which separates the styloid process of the radius from the tendon of the flexor carpi radialis (Malgaigne) would show its position below.

Malgaigne's Operation at the Upper Third of the Forearm.—By an incision in the line just mentioned, the skin is divided to the extent of two and a half or three inches, the median vein pushed to one side, the supinator muscle exposed by laying open the fascia, and then its internal border raised with the finger or director, when the sheath of the vessels may be seen and opened. (Plate LXVI. Fig. 3). If the artery is not met with, draw the muscle outwards until the radial nerve is seen, which is never absent; and seeking between this nerve and the median line of the arm, the artery will be found unless there is an anomaly.

Ligature of the Radial at the Wrist.—Make an incision two inches long, parallel with and on the radial side of the tendon of the flexor carpi radialis about half an inch from the wrist; open the fascia upon a director; and the artery will be found on the outer or radial side of the tendon.† (Plate LXVI. Fig. 3.)

Remarks.—The ligature of the radial at the points mentioned may be required in cases of wounds, and readily accomplished under

* Malgaigne. † Ibid.

PLATE LXVI.

LIGATURE OF THE ARTERIES OF THE UPPER EXTREMITY.

Fig. 1. Surgical Anatomy of the Bloodvessels of the Forearm and Hand. 1. Brachial artery. 2. Radial artery. 3. Ulnar artery. 4. Position of radial artery at wrist. 5. Position of ulnar at wrist. 6. Palmar arch. 7. Radialis indicis. 8. Basilic vein. 9. Cephalic vein. 10. Venæ satellites of radial artery. 11. Venæ satellites of ulnar artery. 12. Median nerve. 13. Radial nerve. 14. Ulnar nerve. 15. Biceps tendon. 16. Supinator radii longus. 17. Flexor carpi radialis. 18. Flexor carpi ulnaris tendon.

After Bernard and Huette.

Fig. 2. Ligature of the Brachial Artery—*Upper Incision.* 1. Skin. 2. Fascia. 3. Brachial vein. 4. Median nerve. 5. Artery raised on a director. *Second Incision near the Elbow.* 1. Skin. 2. Fascia. 3. Inner edge of biceps. 4. Median nerve. 5. Artery on director.

After Bernard and Huette.

Fig. 3. Ligature of the Radial and Ulnar Arteries. *Upper Third*—1. Skin. 2. Fascia. 3. Radial artery. 4. Radial nerve. 5. Director under artery. 6. Inner edge supinator radii longus. *At Wrist.*—1. Skin. 2. Fascia. 3. Artery on director. 4. Radial nerve. *Ligature of the Ulnar Artery at the Middle of the Forearm.*—1. Skin. 2. Fascia. 3. Artery. 4. Vein. *Ligature of the Ulnar Artery at Wrist.*—1. Skin. 2. Fascia. 3. Artery on director. 4. Nerve. After Bernard and Huette.

Fig. 4. Anatomical Relations of the Arteria Dorsalis Pedis. 1. Anterior tibial artery. 2. Anterior tibial nerve. 3. Anterior annular ligament. 4. Tendon extensor proprius pollicis. 5. Extensor brevis digitor pedis.

After Bernard and Huette.

Fig. 5. Ligature of the Anterior Tibial Artery on the Foot. 1. Skin. 2. Fascia. 3. Director. 4. Artery raised on it.

After Bernard and Huette.

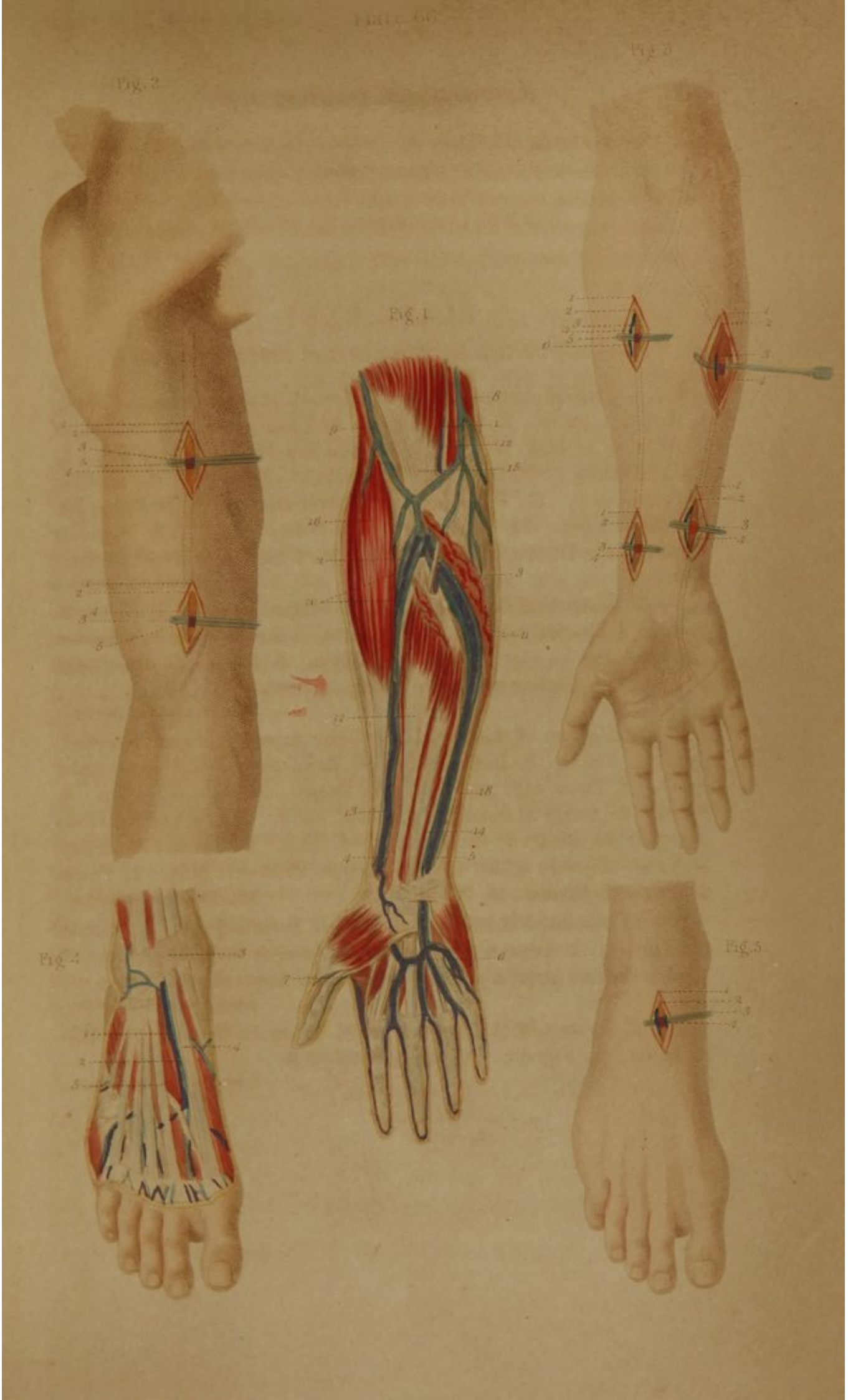
Fig. 2
Fig. 3
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the directions just given. The fondness of many of the French surgeons for practicing the ligature of arteries in the dissecting-room makes them excellent authorities, and I therefore have resorted, and shall freely resort to their directions, as considerable personal experience has tested the value of those that have been given.

The ligature of the magna pollicis, or of the radialis indicis, at the root of the thumb, can seldom be required in practice; compression, or the ligature of the radial at the wrist, answering a better purpose. The operation is, however, shown in Plate LXV. Fig. 6.

SECTION IV.

LIGATURE OF THE ULNAR ARTERY.

ANATOMY.—The thickness of the flexor muscles near the elbow placing the ulnar artery very deep at this point, no operation is usually attempted here, and it is therefore unnecessary to study its relations at its upper third. In its middle and lower third, it lies upon the flexor profundus between the flexor sublimis and the flexor carpi ulnaris. (Plate LXVI. Fig. 1.) The ulnar nerve is on its ulnar or inner side, and the vein upon its outside, but it is subject to many anomalies, in some of which it is quite superficially placed.

OPERATION AT THE MIDDLE THIRD OF THE FOREARM.—A line drawn from the internal condyle to the radial side of the pisiforme bone will indicate the usual course of the vessel. Upon this line make an incision three inches long, and not extending higher than three fingers' breadths from the internal condyle; open the fascia upon a director; carry the inner lip of the wound inwards with the forefinger until the internal edge of the ulnar can be felt, and the first yellowish line, which indicates a muscular interspace met with on the median or radial side, will point out the junction of the flexor carpi ulnaris and flexor sublimis. Separate this interstice with the finger or knife-handle, and at the bottom of the space there will be seen a large yellow or whitish cord (ulnar nerve), with the artery and its two venæ satellites on its radial side, when the ligature may be passed from within outwards, the hand being strongly flexed to relax the muscles. (Plate LXVI. Fig. 3.)

LIGATURE OF THE ULNAR ABOVE THE WRIST.—Make an incision two inches long and one inch above the joint parallel with the tendon of the flexor carpi ulnaris ; divide the fascia, draw the tendon a little

inwards, and the artery will be found on its external side beneath the deep fascia, the ulnar nerve being on its inside and posteriorly. Open the deep fascia, and pass the ligature from within outwards. (Plate LXVI. Fig. 3.)

Remarks.—The ligature of the ulnar at its upper third is now never attempted, on account of the difficulty of finding the artery, as well as on account of the subsequent suppuration of the wound. It is also better to avoid, if possible, ligating this vessel in its middle third, for the same reason, the ligature near the wrist being sufficient for wounds of the palmar arch, which most frequently demand the operation.

CHAPTER III.

LIGATURE OF THE ARTERIES OF THE LOWER EXTREMITY.

The main artery supplying the lower extremity is the continuation of the External Iliac, and is at different points named Femoral, Popliteal, &c., according to its position, and may be ligated at any point.

SECTION I.

LIGATURE OF THE FEMORAL ARTERY.

Surgical Anatomy.—The line of the groin, or that caused by the attachment of Poupart's ligament to the bones of the pelvis, constitutes the upper boundary of the Femoral artery, whilst below it takes the name of Popliteal, at a point which is about one-third of the whole length of the os femoris, above the knee-joint, or as soon as it has traversed the insertion of the adductor longus muscle. In the space thus circumscribed, the femoral artery runs a winding course, being first on the anterior, then on the interior, and lastly, near the posterior face of the thigh, following the direction of a line drawn from the middle of the crural arch to the posterior and internal part of the condyle of the femur, and being inclosed in a common sheath with the femoral vein, the latter being on its inner or pubic side near the

groin, behind it in the middle of the thigh, and a little to its outer side below. (Plate LXVII. Fig. 1.)

The anterior crural nerve lies upon the external side of the artery outside the sheath of the vessels, whilst the long saphenous nerve enters the upper fourth of the sheath, and lies upon the outer side of the artery (Plate LXVII. Fig. 1).* At its upper fourth, the artery is only covered by the skin and fascia, and may be easily compressed against the bones of the pelvis; but below it is crossed obliquely by the sartorius muscle, so that, at the upper part of the thigh, this muscle is on the outer side of the artery, covers it in its middle, and leaves the artery again to its outer side low down the thigh. The regular course of the muscle makes it a most useful point of reference when attention is given to its relations at the different points of the limb.

The artery may be tied either at its inferior, middle, or superior portions, the first two points being those most commonly resorted to, though it has been occasionally tied at its upper end.

§ 1.—LIGATURE OF THE FEMORAL ARTERY IN THE MIDDLE OF THE THIGH.

OPERATION OF HUNTER.—Flex the thigh on the pelvis, and the leg on the thigh, and lay the latter upon its outer face, so as to relax the muscles. Then, feeling for the inner edge of the sartorius muscle, make an incision three inches long, so that its lower end shall be about two lines from the inner edge of the muscle, and its upper about four, but without dividing the saphena vein. After incising the skin and fat, pick up the fascia in the forceps, nick it, introduce a director, and slit it up to the extent of the incision in the skin, so as to expose the internal border of the sartorius muscle, which may be recognized by the course of its fibres. Then carefully opening the sheath of the vessels, which here appears as a thick yellowish structure, incise it slightly upon a director, separate the vein from the inner side of the artery, and pass the aneurismal needle from *within outwards* (Plate LXVII. Fig. 2). If the needle is passed in the opposite direction, its point may wound the vein, and the escape of even a little blood will materially interfere with the sight of the surgeon and delay the operation.

* Bernard and Huette.

PLATE LXVII.

LIGATURE OF THE ARTERIES OF THE LOWER EXTREMITY.

Fig. 1. Anatomy of the Femoral Vessels. 1, 1. Femoral artery. 2, 2. Femoral vein. 3. Internal saphena vein. 4. Muscular branch of artery. 5. Long saphenous nerve. 6. Branch in front of sheath of vessels. 7. Arteria profunda. 8. Opening in adductor muscle. 9. Musculo-cutaneous nerves. 10. Anterior crural nerve. 11, 11. Hooks holding aside sartorius muscle. After Bernard and Huette.

Fig. 2. Ligature of the Femoral Artery. *At its Upper Third.*—1. Skin. 2. Fascia. 3. Sheath of vessels. 4. Artery raised on the director. 5. Femoral vein. 6. Long saphenous nerve. 7. Inner edge of sartorius muscle. *At its Lower Third.*—1. Skin. 2. Fascia. 3. External edge of sartorius muscle. 4. Femoral vein. 5. Long saphenous nerve. 6. Artery exposed in its sheath. After Bernard and Huette.

Fig. 3. Anatomy of the Popliteal Artery. 1. Artery. 2. Vein. 3. Semi-membranosus muscle. 4. Gastrocnemius. 5, 5. Hooks holding aside the muscles. After Bernard and Huette.

Fig. 4. Course and Relations of the Popliteal Artery to the Joint. 1, 1. Artery. 2. Femur. 3. Tibia. 4, 4. Posterior face of knee-joint. 5, 6, 7. Articulating arteries. After Bernard and Huette.

Fig. 5. Ligature of the Popliteal Artery in its *Upper Half.* 1. Skin. 2. Fascia. 3. Fat. 4. Peroneal nerve. 5. External saphena vein. 6. Popliteal vein. 7. Artery as shown by 8, the hook holding aside the veins. After Bernard and Huette.

Fig. 6. Ligature of the Posterior Tibial Artery—*At its Upper Third.* 1. Skin. 2. Fascia. 3, 3. Gastrocnemius muscle held aside by a blunt hook. 4. Artery on the needle. 5. Soleus muscle. *At its Middle Third.*—1. Skin. 2. Fascia. 3. External edge of soleus. 4. Artery. 5. Needle under it. 6. Posterior tibial nerve. *At the Ankle.*—1. Skin. 2. Director under artery. 3. Posterior tibial nerve. After Bernard and Huette.

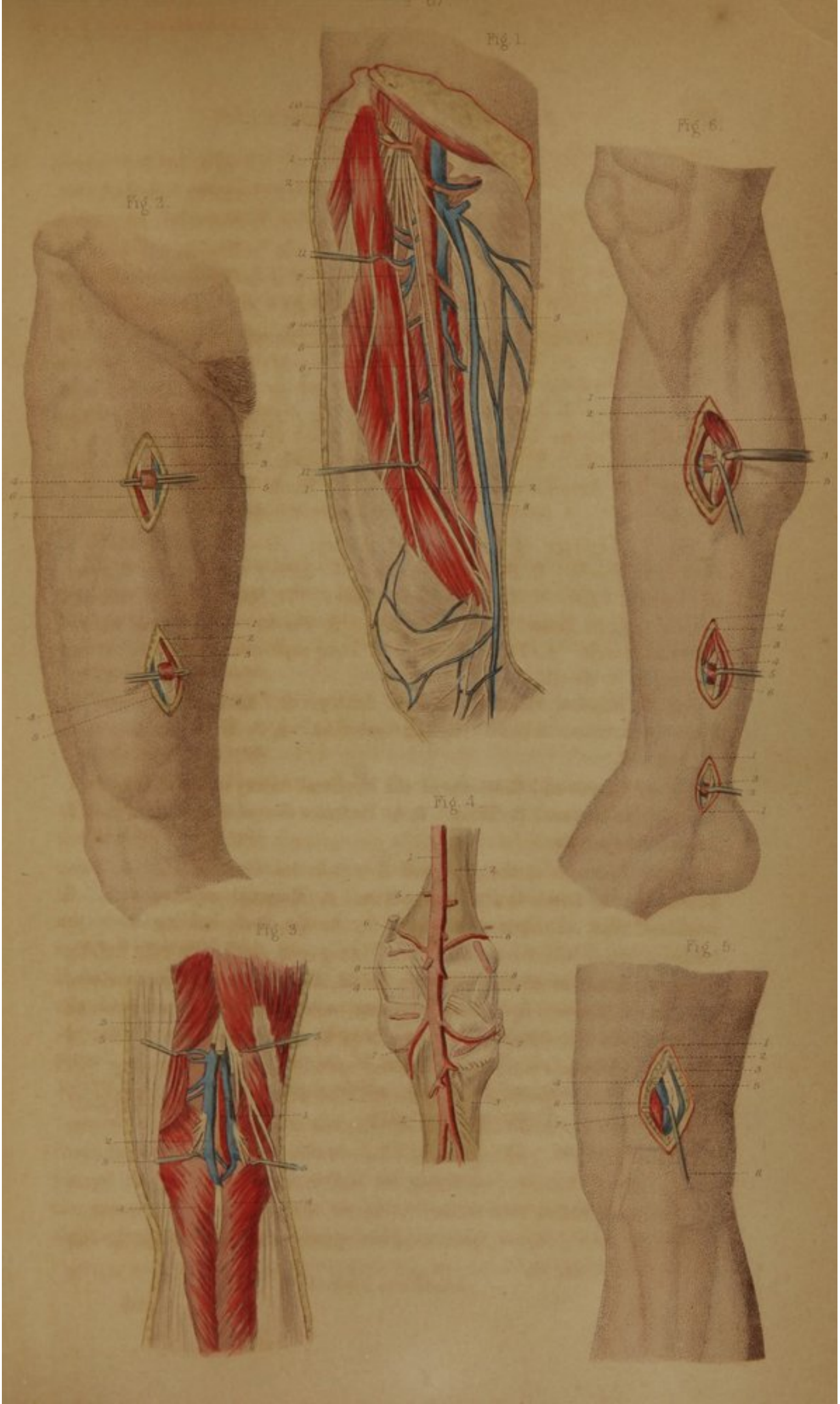
Fig. 1.
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§ 2.—LIGATURE OF THE FEMORAL ARTERY AT THE UPPER PART OF THE THIGH.

SCARPA'S OPERATION.—At this point, the artery is quite superficial, and may be readily felt pulsating in the triangular space formed by the junction of the sartorius, adductor brevis, and Poupart's ligament, the base of the triangle being above or at the groin, and its apex below. The most favorable point, according to Hodgson, for the application of a ligature, is about four or five inches below the crural arch,* because it gives room for the formation of a coagulum above the origin of the profunda. The operation should be performed as follows:—

Feel for the pulsation of the artery, and note the spot where it is faintest, which will indicate the point where it is crossed by the sartorius muscle, and commencing at this part incise the skin obliquely downwards to the extent of three inches, taking care to push the saphena vein inwards. On exposing the fascia lata, pick up a fold at the lower point of the incision; nick it, introduce a director, and slit it up to the same extent as the skin; open the sheath in the same manner, and expose the artery, the nerve being on its outside, and the vein still at its inner side, and tie it by passing the needle from within outwards so as to avoid the vein.

REMARKS.—The œdematous condition of the thigh, sometimes seen in cases demanding the ligature of the femoral artery, adds materially to the difficulties attending its ligation when required upon the patient. As above described, these operations are chiefly adapted to the dissecting-room, or to the natural condition of the parts. When, therefore, any difficulty is experienced in recognizing the muscular spaces in the middle of the thigh, a line drawn from the middle of the groin, as directed, will prove of great service. Occasionally, the Femoral artery has been tied close to the crural arch, where its position can be readily recognized as being half way between the spine of the pubis and the anterior superior spinous process of the ilium in man, though a little nearer to the pubis in woman; but this operation is not so favorable as that lower down, as it exposes the patient to greater risks from the occurrence of gangrene, the origin of the profunda favoring the course of the circulation when the ligature is applied in the middle of the thigh. The

* Malgaigne.

ligature of the femoral, as practiced in the lower third of the thigh, is shown (Plate LXVII. Fig. 2); but, as it requires the division of the arterial canal through the adductor magnus, and also makes a deep wound, it is seldom resorted to on the patient.

SECTION II.

LIGATURE OF THE POPLITEAL ARTERY.

Surgical Anatomy.—The popliteal artery is a continuation of the femoral, and extends from the adductor magnus tendon to the inferior margin of the popliteus muscle, being covered by the vein, which is between it and the skin, and somewhat internal to it above, but external below. The belly of the semi-membranosus, and the two heads of the gastrocnemius, also cover it. The artery is first on the inner side of the femur, then approaches its posterior face, and passing between the condyles is in contact with the back of the knee-joint.*

Lisfranc's Operation.—The patient being laid upon his face, with the limb extended, feel for the interval between the two heads of the gastrocnemius muscle, and make in this line a longitudinal incision three inches long, commencing at one-third of an inch below the joint and a little outside of the median line. Then, pushing aside the external saphena vein, pick up the fascia, nick it, introduce a director, and incise it to the extent of the opening in the skin; flex the leg on the thigh, and feel for the space between the two heads of the gastrocnemius, at the bottom of which the vessels and nerves will be found. Of these, the popliteal nerve is first seen, and on the inside of it is the vein, the artery being on the outside in the majority of cases, when it only remains to draw the nerve and vein inwards, and pass the needle under the artery from within outwards.† (Plate LXVII. Fig. 5.)

Remarks.—The ligature of the popliteal, as above described, is an operation that is seldom or never undertaken, the depth at which the artery is placed, its proximity to the joint, and the liability of the latter to inflame, as well as the risk arising from the suppuration travelling beneath the fascia of the leg, inducing surgeons to avoid it. In all cases of aneurism, or wounds of the

* Bernard and Huette, Med. Opératoire, p. 42.

† Malgaigne.

tibial arteries high up, it is easier and safer to tie the femoral at the middle of the thigh; and in the case of aneurism of the popliteal itself, the position of the tumor would render it absolutely necessary to place the ligature higher up. This operation is one, therefore, which is seldom practiced except in the dissecting-room.

SECTION III.

LIGATURE OF THE POSTERIOR TIBIAL ARTERY.

Surgical Anatomy.*—The posterior tibial artery arises from the popliteal, and terminates beneath the internal annular ligament of the ankle, where it gives off the two plantar arteries. Its course is indicated by a line drawn from the middle of the ham to a point half way between the internal malleolus and tendo-Achillis. At its upper third, it lies very deep, being beneath the tibialis posticus, and being also covered by the deep fascia and the muscles of the calf. In its middle third, it is more superficial, and passes along parallel with the inner side of the tibia, from which it is separated by the flexor longus digitorum pedis, though it is also covered by the deep fascia and internal margin of the soleus. (Plate LXVIII. Fig. 4.)

At its lower third, it is immediately beneath the fascia, passes beneath the tendons of the tibialis posticus and flexor longus digitorum pedis, and is almost parallel to the posterior margin of the malleolus internus. It may be ligated at its upper, middle, or lower third.

§ 1. Operation of Malgaigne at its Upper Third.†—Make an incision at least four inches long, entirely through the skin, cellular tissue, and fascia, commencing about half an inch from the inner margin of the tibia; introduce the forefinger, and detach and carry outwards the internal head of the gastrocnemius as well as the soleus. Then, whilst an assistant holds these muscles backward and outwards, open the deep fascia upon a director, and look for the artery; on finding it, separate it from its accompanying veins, and ligate it. (Plate LXVII. Fig. 6.)

* Bernard and Huette, p. 38.

† Ibid., p. 39.

PLATE LXVIII.

LIGATURE OF THE ARTERIES OF THE LEG.

Fig. 1. Anatomical Relations of the Popliteal Region, as shown after removal of the integuments. 1. External saphena vein. 2. Popliteal nerve. 3. Peroneal nerve. 4. External saphenous nerve. 5. Superficial branch of peroneal nerve. 6. Superficial nerves outside the fascia of the leg. 7. Semi-membranosus muscle. 9. Internal saphena vein. 8, 8, 10. Cutaneous veins. After Bernard and Huette.

Fig. 2. Anterior View of the Knee-Joint. 1. Femur. 2. Patella. 3. Tibia. 4. Fibula. 5. Tendon of patella. 6. External and internal lateral ligaments. After Bernard and Huette.

Fig. 3. Antero-Posterior Section of the Knee-Joint, showing the Relation of the Artery and Internal Parts of the Joint. 1. Section of the femur. 2. The Tibia. 3. The Patella. 4. The Crucial ligament. 5. The Popliteal artery. After Bernard and Huette.

Fig. 4. Anatomical Relations of the Posterior Tibial Artery. 1. The posterior tibial artery. 2, 3. Its two venæ comites. 4, 4. Section of the internal saphena vein. 5. Fascia of the leg. 6, 6. Hook holding back the fascia anteriorly, and the soleus muscle posteriorly, so as to expose the deep-seated parts. 7. Tibialis posticus muscle. 8. Flexor longus digitorum. 9. Internal malleolus. 10. Tendo-Achillis. After Bernard and Huette.

Fig. 5. Anatomical Relations of the Anterior Tibial Artery. 1, 1, 1. The anterior tibial artery in its entire course. 2, 2. Anterior tibial veins. 3. Anterior tibial nerve. 4. Peroneal artery and vein raised on a director. 5. Flexor longus pollicis. 6. Fibula. 7. Peroneus longus and brevis cut across. 8. Tibialis anticus, held back by the hook. 9. Extensor proprius pollicis. 10. External malleolus, covered by the fascia.

After Bernard and Huette.

Fig. 6. Ligature of the Anterior Tibial and Peroneal Arteries. *Upper Incision.*—Ligature of the Anterior Tibial, near its Upper Third. 1. Skin. 2. Fascia. 3. Tibialis anticus muscle. 4. Extensor proprius pollicis. 5. The vein. 6. The artery raised on the needle. *Middle or Posterior Incision.*—Ligature of Peroneal Artery below its Middle. 1. Skin. 2. Fascia. 3. Peroneus longus. 4. External border of soleus. 5. Needle under. 6. The Peroneal artery. *Lower Incision.*—Ligature of the Anterior Tibial at its Lower Third.—1. Artery. 2. Anterior tibial nerve.

After Bernard and Huette.

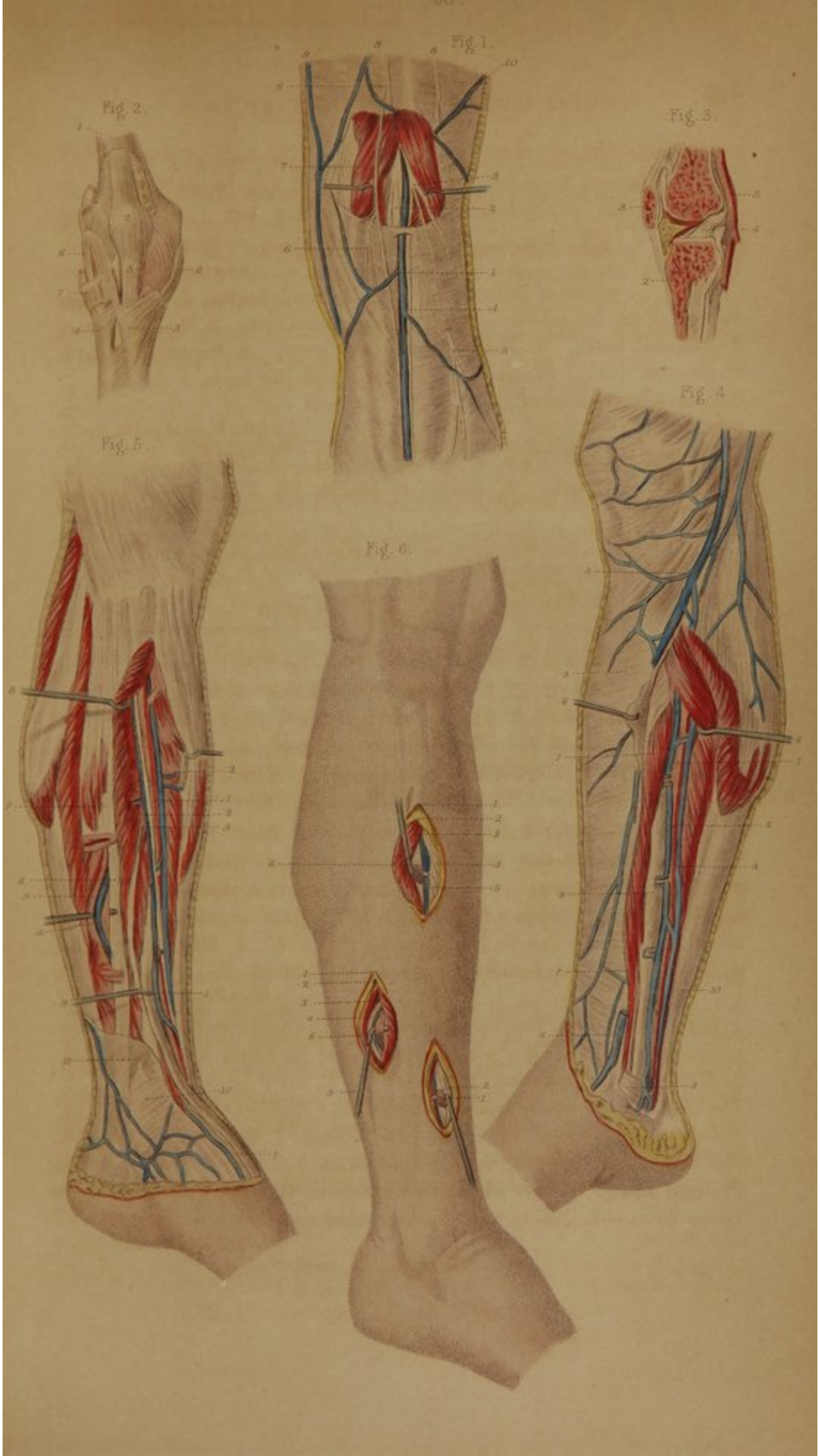


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.

REMARKS.—This operation is an exceedingly troublesome one, in consequence of the depth of the incision and the contraction of the muscles. A trial upon the subject will soon satisfy any one of the difficulties to be encountered in the patient. It is, therefore, rarely resorted to.

§ 1.—LIGATURE OF THE ARTERY AT ITS MIDDLE THIRD.

VELPEAU'S* OPERATION.—Make a straight incision, about three inches long, at an equal distance from the inner margin of the tibia and the tendo-Achillis, so as to divide the skin and fat; pick up the fascia, nick it, introduce a director, and slit it up to the same distance. Denude the deep fascia by separating the fibres of the muscle with the point of the director; incise it to the same extent as the skin; separate the artery, and tie it. (Plate LXVII. Fig. 6.)

§ 2.—LIGATURE OF THE ARTERY BEHIND THE MALLEOLUS INTERNUS.

LISFRANC'S OPERATION.—Make a longitudinal incision in the skin parallel to the internal malleolus, but two lines posterior to it, extending half an inch below and one inch and a quarter above it. Pick up the fascia, and divide it carefully upon a director, when the artery will be fully exposed, accompanied by its venæ satellites. The nerve lies posteriorly and externally to the artery. (Plate LXVII. Fig. 6.)

REMARKS.—Ligature of the posterior tibial artery near the malleolus, is a simple operation, and one that is well adapted to the treatment of wounds of the plantar arteries. That in the middle of the leg is somewhat more difficult, owing to the depth at which the artery is placed.

SECTION IV.

LIGATURE OF THE ANTERIOR TIBIAL ARTERY.

SURGICAL ANATOMY.—The anterior tibial artery, after passing through the interosseous ligament in the upper part of the leg, lies

* Operat. Surgery, by Mott and Townsend, vol. ii. p. 127.

upon the interosseous ligament in the upper two-thirds of the leg, but is upon the anterior face of the tibia below, till it gets upon the dorsum of the foot, where it terminates by dipping into the first metatarsal interosseous space to anastomose with the branches of the plantar arch. (Plate LXVIII. Fig. 5.) In this course on the leg, it follows a line which is drawn from the middle of the space between the head of the fibula and spine of the tibia to the middle of the inter-malleolar space, and from this space to the middle of the first metatarsal interosseous space of the foot. Owing to its depth, this artery is seldom tied high up, though it may be accomplished, and, in consequence of the proximity of the ankle-joint, it is seldom tied near the joint. The most common points are, therefore, its middle third, and that on the dorsum of the foot.

§ 1.—LIGATURE OF THE ANTERIOR TIBIAL AT ITS MIDDLE THIRD.

ORDINARY OPERATION.*—The patient lying, or sitting with the leg extended, move the foot so as to cause the tendon of the tibialis posticus to become prominent, and following the course of the tendon when it can be felt, or the line above described when it cannot, make an incision three inches long through the skin and foot; open the fascia freely, and seek for the first tendon, or the first intermuscular space from the spine of the tibia. Separate the muscles at this point with the finger or director; flex the foot; hold back the muscles at the side of the wound with blunt hooks, and the artery will be seen at the bottom of the space, with the anterior tibial nerve crossing it at this point of the limb, though it is on the inner side of the artery lower down. Pass the needle from the fibula towards the tibia, and from below upwards, and apply the ligature. (Plate LXVIII. Fig. 6.) Should the operator carry the incision too far outwards, the second intermuscular space may be found, and mislead him; to remedy which it is better, in case of doubt, to feel from the spine of the tibia outwards, and the error will soon be indicated.

* Malgaigne, Philad. edit. p. 157.

§ 2.—LIGATURE OF THE ANTERIOR TIBIAL ON THE DORSUM OF THE FOOT.

ORDINARY OPERATION.—Draw a line from the middle of the space between the two malleoli to the first metatarsal interosseous space, and make an incision through the skin along the *external* border of the tendon of the extensor proprius pollicis pedis, but parallel to it, or between it and the first tendon of the extensor communis, which may be made prominent by causing the patient to extend his toes. After which, the sheath of the extensor communis, or the deeper fascia, should be incised and opened upon a director, when the artery, with its two veins, will be clearly seen. The branch of the nerve lies to its outer side. (Plate LXVI. Fig. 4.)

REMARKS.—This operation is very simple, and may be performed in less time than it takes to describe it, as a little practice upon the subject will soon prove. It may be required in the treatment of aneurism, as once happened to myself, or for wounds, though most frequently pressure suffices for the latter. The spica of the instep* will be the proper dressing.

CHAPTER IV.

OPERATIONS ON THE BONES OF THE UPPER EXTREMITY.

THE operations performed for the relief of the affections of the bones of the upper extremity do not differ from those practiced in the lower limbs, except in the slight modifications rendered necessary by their relations to surrounding parts. Certain general rules are, therefore, applicable to both extremities, and will be referred to under one general head, the special operative proceedings being detailed in connection with the extremity to which they belong.

* Smith's Minor Surgery, p. 101.

SECTION I.

RESECTIONS IN GENERAL.

By resection of the bones of the extremities, is usually meant such an operation as removes a sufficient portion to create a void or destruction of continuity. In many instances, resection of the heads of these bones results in more or less shortening of the limb, though even then the member will be much more serviceable than an artificial limb; and it is, therefore, an operation by which the surgeon can remove a disease, and yet not destroy the usefulness of the member. Without entering into the question of the advantages of resection over amputation in disorders limited to the articulations, it must suffice in this account to give expression to the opinion that the experience of surgeons is now gradually establishing its superiority over amputation, and the propriety of attempting the relief of the diseases of the joints by its means should, therefore, be always thought of before resorting to amputation.

The general conditions which are essential for the proper performance of a resection may be divided into such as concern the patient, and such as pertain to the surgeon.

It is essential on the part of the patient that the disorder, whether caries, necrosis, exostosis, or other bony tumor, should be limited in its extent, so that the surgeon may be certain of removing the entire complaint. The surrounding soft parts should also be in a condition favorable to the healing of the wound, without being liable to such contraction, suppuration, or ulceration as might subsequently impair the motion of the limb, the function of which should always be preserved after the operation, if only in a modified form.

The surgeon, in addition to the ordinary attributes of an operator, such as coolness and dexterity, should have an accurate knowledge of the relations of the adjoining structures, as the various muscles, tendons, nerves, and bloodvessels in the neighborhood must all be left untouched, if possible. Especially is it important to avoid unnecessary injury to the periosteum, as through this membrane the new structure will often be replaced in such a manner as to add much to the usefulness of the limb.

As the resection of the bones of the extremities is also very liable to induce severe constitutional disturbance, and to give rise to fever, erysipelas, or long-continued suppuration, much medical skill will be necessary to conduct the case to a favorable termination; it being essential to success that the after-treatment of the case be judiciously directed, the diet, and internal as well as local remedies, being carefully superintended by the operator.

For the performance of any resection, various saws, chisels, gouges, bone-nippers, &c., will be required, together with proper means for accomplishing the division of the soft parts, arresting hemorrhage, and dressing the wound. As the number of instruments resorted to in operations upon the bones is nearly indefinite, the reader is simply referred to Plate VI. for a view of such as are most frequently wanted.

SECTION II.

RESECTION OF THE BONES OF THE UPPER EXTREMITIES.

The resection of the bones of the upper extremities may be practiced either upon their diaphyses or upon their articulating extremities. In operating upon the diaphysis, a free external incision is necessary, in order that the entire removal of the diseased structure by saws, chisels, and gouges may be accomplished without creating a fracture.

§ 1.—RESECTION OF THE SHOULDER-JOINT.

The head of the humerus and the articulating surfaces of the scapula may, from caries, necrosis, or other complaints, demand resection, which may be accomplished by exposing the articulation, and removing them with the saw or gouge.

SYME'S OPERATION.—Whilst an assistant compresses the subclavian artery, make a longitudinal incision, three and a half inches long, in the middle of the deltoid, and a shorter one from its inferior extremity upwards and backwards, towards the posterior border of the axilla, so as to form a triangular flap. Raise it up, and whilst it is held by the assistant, carry the elbow in towards the side of the

body, so as to render the capsular ligament tense. Open it by a circular incision around the head of the bone, luxate it, slip a piece of binders' board under it, and saw it off with the amputating saw. Then cleanse the wound (Plate LXIX. Fig. 1.), bring down the flap, and attach its point to the skin of the arm by a single stitch of the interrupted suture, taking care to insure a vent for any pus that may accumulate; after which it only remains to apply the starch bandage and spica of the shoulder,* so as to leave the wound open.

Lisfranc's Operation.—In this operation, a posterior flap is formed as in his amputation of the shoulders, the head of the bone luxated, sawed off, and treated as above directed.

Operation of White, of England.—Make an incision down to the bone, parallel with the fibres of the deltoid muscle, and extending from the apex of the acromion four or five inches downwards; open the capsule on the outer side of the joint; carry the elbow into the body; luxate the head of the bone through the muscle, and saw it off.

Remarks.—Resection of the head of the humerus is an operation that has been repeatedly performed with success in cases of caries of the head of the bone, as well as of the glenoid cavity, the removal of the latter being readily accomplished by the bone-nippers, after the articulation is exposed. As a means of saving the patient the partial use of an important member, which in former times would have been amputated, this operation must be regarded as one of the most useful of those suggested within the last century. Although the scapula and end of the humerus are no longer in contact after the performance of this resection, a considerable amount of motion has been preserved at the shoulder, and in a case reported by Mr. Syme the use of the arm was almost completely established.

Resection of the head of the humerus has not, I think, been performed by surgeons in the United States, except in the case reported by Dr. Hunt, of Washington;† and in one of a partial character by Dr. Pinkney, U. S. Navy,‡ though amputation of the shoulder for disease of the bone has often been resorted to. It is, however, one which is well worthy of a trial. In selecting a method, that of White should be preferred, if the induration and other changes in the soft parts do not forbid it, as it preserves the more perfect action

* Smith's Minor Surgery, p. 39.

† Med. Record., vol. i. p. 365, 1818.

‡ Am. Journ. of Med. Sciences, vol. xii. N. S. p. 330, 1846.

of the deltoid, and thus facilitates the subsequent motion of the shoulder; but the section of the deltoid, as advised by Syme and Lisfranc, exposes the joint more freely, and is better adapted to such cases as may also require resection of the glenoid cavity of the scapula.

§ 2.—FALSE JOINT IN THE HUMERUS.

Resection of the ends of a false joint in the Humerus have been cured by the introduction of a seton, as suggested by Dr. Physick;* by the application of caustic by Dr. Rhea Barton, of Phila.;† by resecting the ends of the bone, by Dr. J. Kearney Rogers, of N. Y.;‡ and by many others.

Operation of Dr. Physick, of Philadelphia.—In the year 1802, a patient afflicted with a false joint in the middle of the humerus was cured in the following manner:—

A long seton-needle, armed with a skein of silk, being prepared, extension and counter-extension of the limb was made by two assistants, and the seton passed between the fractured ends of the bone in such a manner as to avoid the course of the artery. A pledget being then applied on each orifice made by the needle, the silk was left in the wound, the arm in a few days placed in the splints, and the dressing renewed daily. For *twelve weeks* no amendment was perceptible; but, soon after, the patient complained of pain, the bending at the seat of fracture became less apparent, and in about *five months* the arm was as strong as ever. Several other surgeons in the United States have since been equally successful.§

§ 3.—RESECTION OF THE ELBOW-JOINT.

Resection of the bones of the elbow-joint, like that of the shoulder, is also among the more recent operations of surgery, having been suggested by Park, of England, in 1781, and performed in 1782 by Moreau.‖ The process of Moreau is that which has been most

* Med. Repository, vol. vii. p. 122, 1804.
† Med. Record., vol. ix. p. 275, 1826.
‡ N. York Med. and Phys. Journ., vol. vi. p. 521, 1827.
§ Bibliographical Index, p. xc.
‖ Velpeau, Op. Surg.

PLATE LXIX.

RESECTION OF THE BONES OF THE UPPER EXTREMITY.

Fig. 1. Syme's Operation for Resection of the Head of the Humerus. The patient being seated, an assistant compresses the subclavian artery with 1, his right forefinger, whilst with 2, the fingers of his left hand, he holds up the triangular flap. As the operation is just completed, 4 shows the glenoid cavity, and 5 the section of the humerus. After Bourgery and Jacob.

Fig. 2. Bourgery's Operation for Resection of the Head of the Humerus. The arm being carried off from the body by 2, the left hand of the surgeon, the subclavian artery is compressed by one assistant, whilst the surgeon transfixes the soft parts near the end of the bone by a catlin, and cuts downwards, parallel with the humerus, to the length of three inches. Another assistant then passes 1, 1, a piece of bandage, through the wound and around the bone above and below, so as to protect the soft parts. The head of the bone being now isolated, it is sawed off by the chain-saw.

After Bourgery and Jacob.

Fig. 3. Moreau's Operation for Resection of the Elbow-Joint. 1. Hand of assistant reverting the quadrilateral flap. 2. Condyles of humerus. 3. Strip beneath the bone to protect the soft parts from the action of 4, the saw.

After Bernard and Huette.

Fig. 4. The same Operation concluded. 1, 2, 3, 4. The quadrilateral flap replaced and held in position by the sutures. After Bernard and Huette.

Fig. 5. Resection of the Radius. 1, 2. Incision. 3. Hand of surgeon, disarticulating the bone. 4. The knife. 5. The inferior end of the radius. 6. Its superior portion. This operation should have been represented as the extirpation of the ulna, which has been accomplished by Dr. Butt, of Virginia, in a similar manner. After Bernard and Huette.

Fig. 6. Resection of the Lower End of the Ulna. 1. Triangular flap turned back. 2. The articulating surface of the bone. 3. A strip passed beneath the bone, to protect the soft parts from 4, the saw. After Bernard and Huette.

Fig. 7. Velpeau's Operation for Resection of the Carpal Surface of the Radius and Ulna. 1, 1. Vertical incision. 2, 3. The transverse cut. This transverse incision is wrongly represented, as it should have been carried across from 1, 1, so as to revert the flap downwards.

After Bernard and Huette.

Fig. 1.

Fig. 2.

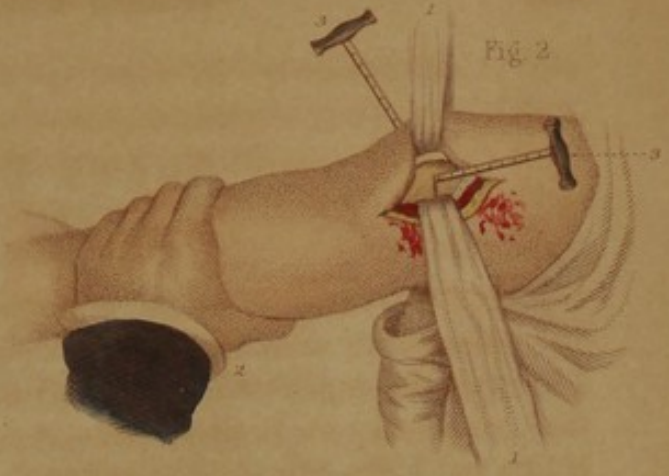


Fig. 3.

Fig. 4.

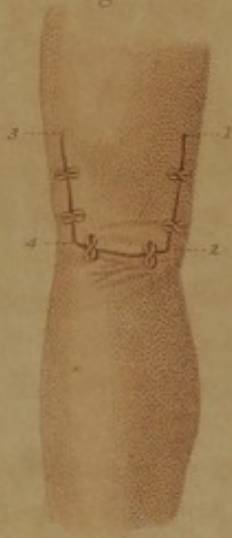


Fig. 5.

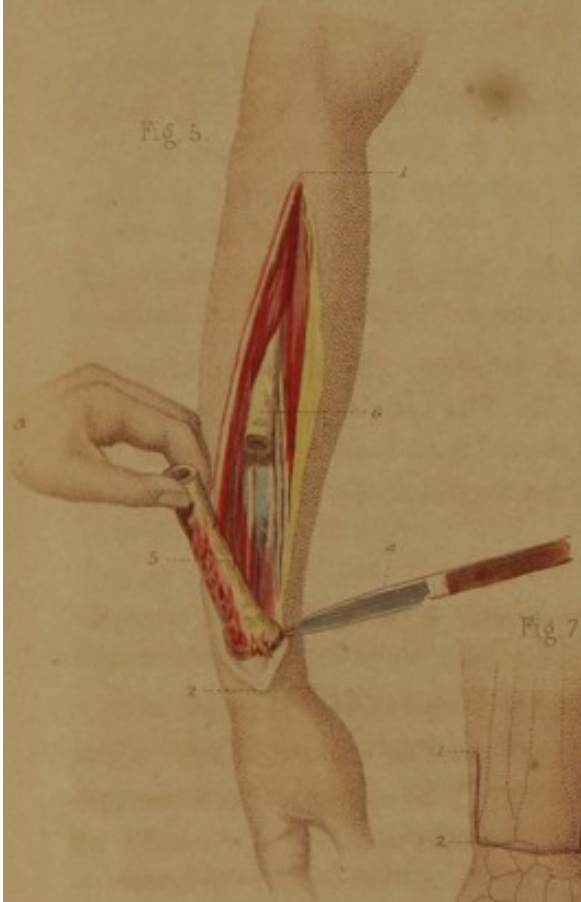
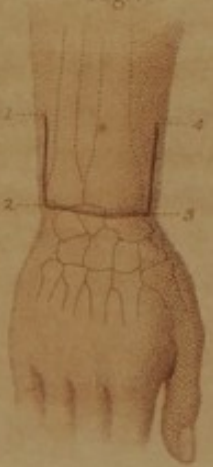


Fig. 6.

Fig. 7.



generally approved, and it has been selected with occasional modification as the plan of most of the operations performed in the United States.

Operation of Dr. Thomas Harris, of Philadelphia.*—In the case of a woman, twenty-six years of age, laboring under hectic with suppuration in the elbow-joint, the following operation was performed:—

The operating table being covered by a mattress, the patient was placed on it with her face downwards, and with the posterior internal portion of the elbow presenting to the surgeon, whilst the point of a strong bistoury was passed transversely so as to divide the skin, cellular tissue, and tendon of the triceps, above and close to the olecranon process, and extend from the radial side of one condyle of the humerus to near the inner condyle, avoiding the position of the ulnar nerve. Two longitudinal incisions, three inches long, were then made on each side of the transverse one, so as to form a letter H, and make two quadrilateral flaps, which, on being dissected off, fully exposed the joint. The soft parts at each side, including the ulnar nerve, being now drawn to one side, by means of curved spatulæ, the olecranon process was removed by the common amputating saw. (Plate LXIX. Fig. 3.) The condition of the joint was then carefully examined, and all the articulating surfaces being found in a carious condition, the head of the radius and the diseased surfaces of the ulna and humerus were perfectly removed with the bone-nippers, two branches of the articulating arteries tied, the joint carefully cleaned, and the parts closed by sutures, and dressed with angular splints. The patient ultimately recovered with considerable motion of the joint.

Remarks.—Since the introduction of anæsthetics, the pain and shock from this operation have been materially reduced, and the chances of success thereby increased. One of the chief difficulties attendant on its performance is the risk of wounding the ulnar nerve, and in the patient operated on by Dr. Harris this was increased by the thickening and adhesion of the soft parts. To obviate this, Dupuytren proposed to open the sheath of the nerve cautiously behind the internal condyle, as soon as the upper flap was dissected, and have it held inwards and forwards by an assistant during the operation. A reference to the bibliographical index will show the reports of the operations performed by Dr. Gurdon Buck, Jr., of New York,†

* Am. Journ. Med. Sciences, vol. xix. p. 341.

† Ibid., vol. v. N. S. p. 299.

and by Dr. J. Pancoast, of Philadelphia. In that of Dr. Buck, for the removal of the olecranon process, the longitudinal incision was substituted for that of the H, the sides being dissected up so as to expose the bone without dividing the attachment of the triceps tendon, and is a valuable improvement where it is admissible.

§ 4.—RESECTION OF THE BONES OF THE FOREARM AND HAND.

The bones of the forearm may be resected at any portion of their length; the removal of the upper articulating surfaces belongs, however, to the operation as detailed in the resection of the elbow-joint, whilst the removal of the lower constitutes resection of the wrist.

I. RESECTION OF THE BODY OF THE ULNA.

The ulna or radius, when diseased to a considerable extent, may be removed from the arm without necessarily destroying the usefulness of the limb.

Operation of Dr. Butt, of Va.*—In consequence of a long-continued necrosis of the ulna, it was determined to remove the entire bone in the following manner:—

Operation.—The patient being seated in a chair, and the tourniquet applied as usual, a transverse incision was made down to the bone, about four inches and a half below the olecranon, and extending to a little more than half the diameter of the arm. A longitudinal one intersecting the lower part of this cut being then made in the line of the most superficial part of the bone, and extended to the wrist-joint, the dissection of the soft parts around the bone was commenced at the transverse incision, and carried down three inches, until a spatula could be insinuated beneath the bone, so as to protect the soft parts from the action of the saw. The ulna being now divided transversely, the dissection was continued along the whole course of the bone down to the wrist-joint, a piece of twine being passed around the denuded end of the bone, so as to enable an assistant to elevate it, after which the bone was disarticulated

* Philad. Journ. Med. and Phys. Science, vol. i. N. S. p. 115, 1825.

from the wrist and removed. (Plate LXIX. Fig. 5.) The wound being cleansed, the tourniquet was loosened, the ulnar and interosseous arteries tied, and the edges of the longitudinal wound closed by adhesive strips, and that of the transverse by sutures. In three months the patient was enabled to pursue his usual avocation as a carpenter; flexion, extension, and rotation of the wrist being as free and uninterrupted as ever, declaring subsequently that he had as much strength in this hand (the left) as most people had in the right.

II. RESECTION OF THE INFERIOR EXTREMITY OF THE ULNA.

Operation.—"The hand being carried outwards, make a longitudinal incision along the internal border of the ulna, and terminate it inferiorly by a transverse cut across the back of the joint. The triangular flap thus made being now raised and carefully dissected back, the tendons should be drawn aside, the artery avoided, and the bone disarticulated. A small piece of wood being then passed beneath the end of the bone, it may be readily sawed through."* (Plate LXIX. Fig. 6.)

Remarks.—The success attending resection of the ulna has certainly been such as may induce others to repeat the operation in similar cases rather than amputate the limb, and in the variety of diseases of this bone which are met with from time to time, the surgeon should hesitate before consenting to such a mutilation, especially if the arm is the right one. A case of resection of the middle two-thirds of the ulna has lately been reported† by Dr. Carter Johnston, of Richmond, Virginia, which resulted most fortunately.

In quoting the case of Dr. Butt, which is, I believe, unique in its character (though smaller portions have frequently been extirpated), the French surgeons have been misinformed, both Malgaigne and Velpeau referring to it as a resection of the radius, whereas it was the removal of the lower two-thirds of the ulna. Dr. Pancoast, of Philadelphia, seems also to have fallen into the same error.‡

In operating upon the radius, the same steps would be required, as are described for the resection of the ulna, but the subsequent use-

* Bernard and Huette.

† Philadelphia Med. Examiner, vol. vii. N. S. p. 644, 1851.

‡ Operative Surgery, by Joseph Pancoast, M. D., Philad. p. 125.

fulness of the limb would be necessarily much more impaired, as the hand would be thrown out of its line with the arm, and pronation and supination destroyed.

III. RESECTION OF THE WRIST-JOINT.

In the case of a dislocation of the bones of the forearm upon those of the carpus, in such a manner as to forbid their reduction, the resection of the inferior extremities of the radius and ulna has been advised and successfully practiced. It has also been recommended to apply this resection to cases of caries of the wrist; but any one at all familiar with the structure of this joint must readily see that such an operation could offer but little prospect of success, as, under such circumstances, the bones of the carpus would probably participate in the complaint.

Operation of Velpeau.*—By an incision on each side of the forearm, reaching from the root of the thumb, and from the last metacarpal bone upwards for two inches above the level of the styloid process of the radius, and united by a transverse incision, a flap is formed and turned from above downwards over the back of the hand. The articulation being now carefully opened, and the ends of the bones turned out, the tissues on the front of the arm are to be dissected off, so as not to injure the radial and ulnar arteries, when a thin piece of board or lead being passed beneath, the bones may be readily sawed off with the amputating saw. The flap being replaced and united by sutures (Plate LXIX. Fig. 7), gentle pressure will unite it to the anterior surface, and the hand be ultimately useful to some extent.

IV. RESECTION OF THE METACARPUS.

One or more of the last four metacarpal bones may, occasionally, require resection in their middle, in consequence of a limited caries, or badly-treated fracture. When needed, the bone should be carefully exposed from the back of the hand, the soft parts protected, and then the portion excised by the bone-nippers.

Resection of the metacarpal bone of the thumb is to be accom-

* Velpeau, Op. Surg.

plished by a longitudinal incision, similar to that referred to under Amputations, and shown in Plate LXXIV. Fig. 7.

The operation presents, however, but an uncertain prospect of success, as regards the ultimate usefulness of the remaining portion of the thumb.

V. RESECTION OF THE BONES OF THE HAND.

The phalangeal articulations may require resection in consequence of their becoming anchylosed in a straight position, and causing the patient the inconvenience of a straight and stiff finger. Under such circumstances, the bone should be exposed on the back of the finger, a V-shaped piece sawed out with a fine watch-spring saw, the finger kept flexed like a hook, and the parts allowed to heal in this position.

CHAPTER V.

OPERATIONS ON THE BONES OF THE LOWER EXTREMITY.

THE success attending the resection of the bones of the lower extremity has been even more brilliant than that ensuing upon the operations performed on the thoracic limbs, and it is to the surgeons of the United States, and especially to Dr. J. Rhea Barton, of Philadelphia, that the world is indebted for a most happy illustration of the advantages to be gained from a scientific application of mechanical principles when aided by the efforts of nature in the formation of a new joint.

SECTION I.

RESECTION OF THE FEMUR.

The femur has been resected at its head, trochanters, shaft, and condyles, either for the removal of such portions as were diseased, or to restore the usefulness of the limb.

§ 1.—RESECTION OF THE HEAD OF THE FEMUR.

The head of the femur has been removed in cases of compound fracture, coxalgia, and caries, especially the latter; but though some few patients have ultimately recovered, it has only been after a long-continued and dangerous illness arising from the free suppuration and hectic which supervened, and these few were children about fourteen years of age, who were afflicted with caries. This operation should, therefore, be considered as a most dangerous one, especially as the natural tendency of the complaint is to a cure, and anchylosis is as apt to follow the resection as the progress of the disease. A reference to Plate LXX. Fig. 2, will sufficiently explain the steps to be pursued should any surgeon feel justified in attempting it.

§ 2.—RESECTION OF THE FEMUR FOR ANCHYLOSIS, AND FORMATION OF A NEW JOINT AT THE HIP.

Operation of Dr. Jno. Rhea Barton, of Philadelphia.*—A young man, 21 years of age, having his thigh immovably fixed at a right angle with his pelvis, and carried across the opposite thigh, whilst the foot rotated inwards, was operated on as follows:—

The patient being laid partially on the opposite side, a crucial incision, seven inches long, was made over the prominence of the trochanter major, and a transverse cut of five inches made to cross it at the same point. The four flaps thus formed, being dissected back, the fascia was freely opened, and the muscular fibres over the trochanter incised and detached from around the bone, so as to permit the two index fingers to be passed around the neck of the femur, until they met on the opposite side. With the strong narrow saw (Plate LXXI. Fig. 12), the bone was then nearly divided through the upper part of the great trochanter; and the neck—when the limb which had been adducted—was drawn into its proper line, and the remaining portion snapped. No artery was cut; the wound was closed by a few sutures, and then dressed in Physick's modification of Dessault's splints.† The patient subsequently recovered, and by the formation

* North Amer. Med. and Surg. Journ. vol. iii. pp. 279, 400, 1827.

† Smith's Minor Surgery, p. 252, 3d edit.

of a false joint produced at the resected portion had during six years a limb upon which he could walk without apparent lameness. Dr. J. Kearney Rogers, of New York, about four years afterwards successfully performed a similar operation.*

SECTION II.

INTRODUCTION OF A SETON FOR FALSE JOINT IN THE FEMUR.

PHYSICK'S OPERATION for false joint in this bone was similar to that reported under false joint in the humerus, but was not successful. The operation has also failed in other cases in the femur, and was not thought by Dr. Physick to be adapted to the treatment of the disease in this bone.†

SECTION III.

RESECTION OF THE KNEE-JOINT.

In cases of anchylosis of the knee-joint, resection of a V-shaped piece of the femur was also suggested by Dr. Barton as a means of furnishing a useful limb, especially when the joint was flexed. As this operation has since been successfully performed, and repeated by various surgeons in the United States, it is now justly regarded as a standard one in cases of true anchylosis resulting in permanent flexion of the knee.

OPERATION OF DR. JNO. RHEA BARTON, OF PHILADELPHIA.‡—A physician, having his leg permanently flexed and anchylosed upon the thigh, to a degree somewhat less than a right angle, as the result of inflammation which had existed in childhood, determined to obtain relief, and underwent the following operation in the hands and at the suggestion of Dr. Barton, on the 27th of May, 1835:—

OPERATION.—By an incision which commenced at a point opposite the upper and anterior margin of the external condyle of the femur, and passed obliquely across the front of the thigh to terminate on the inner side, the soft tissues were incised. A second, which commenced also on the outer side about two and a half inches above the

* Am. Journ. Med. Sciences, vol. i. N. S. p. 507, 1840. Reference to this paper has been overlooked in the Bibliographical Index.

† Dorsey's Surgery, vol. i. p. 135.

‡ Am. Journ. Med. Sciences, vol. xxi. p. 332, 1837.

PLATE LXX.

RESECTION OF THE BONES OF THE LOWER EXTREMITY.

Fig. 1. Barton's Operation for Resection of the Neck of the Femur, and the Formation of a False Joint in a case of Anchylosis of the Hip. 1, 1. Flaps of integument formed by a crucial incision, and turned back. 2. Incision of muscles over trochanter major. 3. The retractor passed around the bone, to protect the soft parts from 4, the narrow saw. After Nature.

Fig. 2. Sedillot's Operation for Resection of the Head of the Femur in Caries. 1, 1, 1. Semilunar incision through the soft parts, convex above, and exposing the joint. 2. A strip slipped beneath the bone. 3, 4. The chain-saw in the act of excising the head of the bone. After Bernard and Huette.

Fig. 3. Barton's Resection of the Femur by the removal of a V-shaped piece, in order to straighten a limb which was anchylosed at the knee nearly to a right angle. The flap has been reverted to show the section of the bone. After Nature.

Fig. 4. Resection of the Lower Extremity of the Femur. 1, 1. Retractor applied to the soft part. 2. Strips beneath the bone. 3. Portion of the femur to be excised. 4. The amputating saw. After Bernard and Huette.

Fig. 5. Resection of the External Malleolus. 1. Left hand of the surgeon. 2. The chisel. 3. A steel hammer. After Bernard and Huette.

Fig. 6. Roux's Operation for Resection of the Lower Extremity of the Tibia. The soft parts being freed by a vertical incision, a retractor, 1, has been passed beneath the anterior flap to elevate it. 2. A strip beneath the posterior edge of the bone. 8. A small saw, dividing the bone before it is reverted and disarticulated. After Bernard and Huette.

Fig. 1.

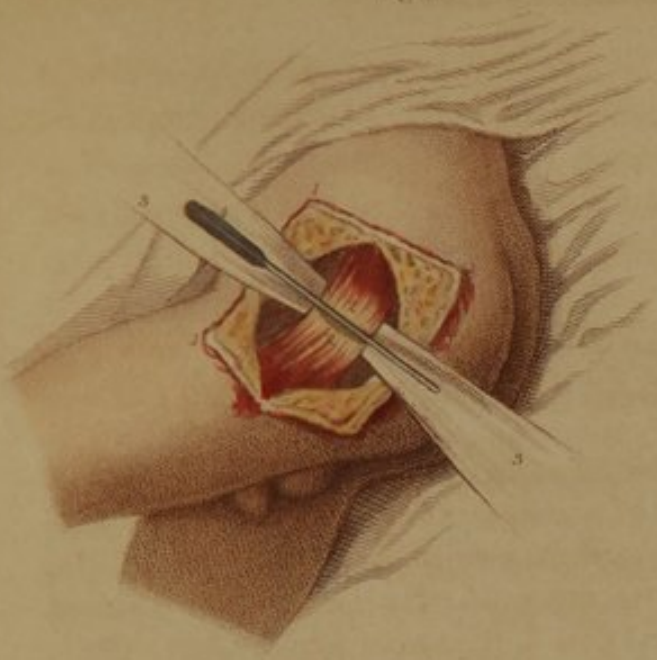


Fig. 2.

Fig. 3.

Fig. 4.

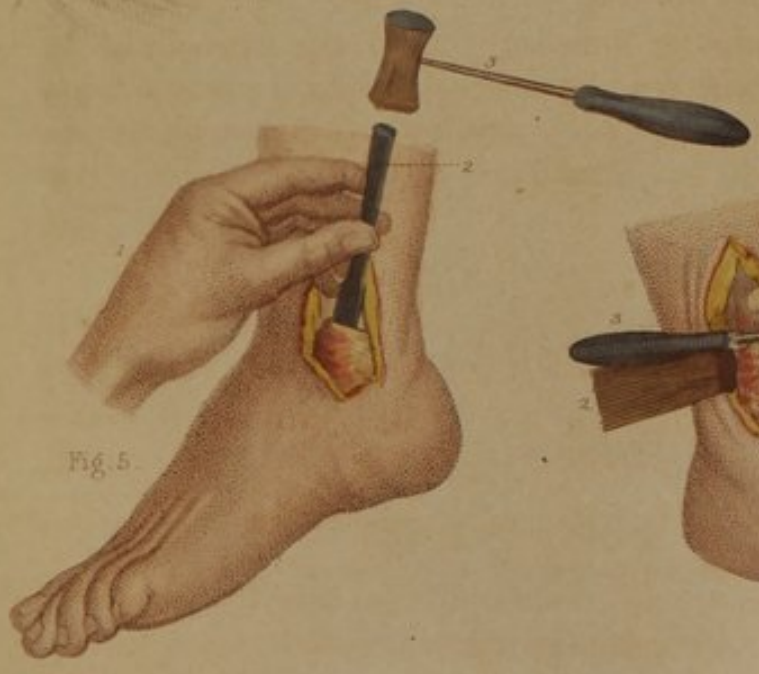


Fig. 5.

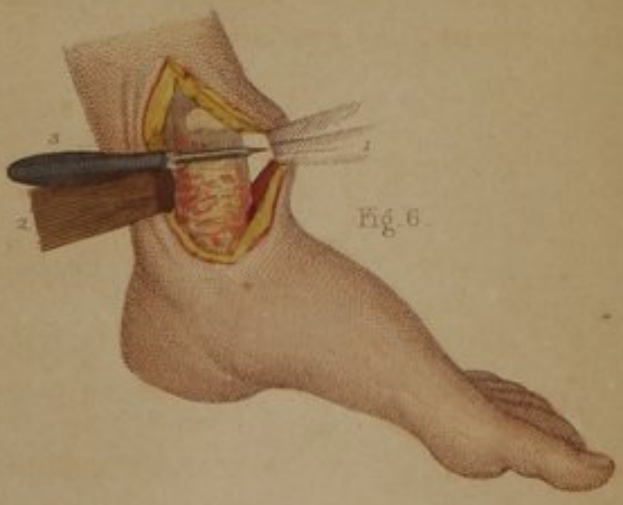


Fig. 6.

first, and also passed obliquely across the thigh to join the other in an acute angle, being now made, the tendon of the quadriceps femoris, and some of the fibres of the muscles, were divided, the flap turned back, the bone freely exposed, and a triangular, or wedge, or V-shaped piece of bone (Plate LXX. Fig. 3), easily removed by means of a small narrow-bladed saw. This wedge of bone not including the entire diameter of the femur at this point, a portion of the shaft of the bone was left undivided posteriorly, that it might at first protect the artery from the saw, and by subsequently interlocking the fragments, prevent the sharp edges of the bone from injuring the soft parts. By slightly bending the leg backwards, these fibres were now gently broken, and the operation, which lasted about five minutes, entirely completed.

No bloodvessel being injured, the flap was restored to its place, the wound lightly dressed, the patient placed in bed upon his back, and the limb supported upon a splint *of an angle corresponding to that of the knee before the operation*. This position being retained until it was supposed that the asperities of the bone were removed, a splint, with a more obtuse angle, was applied, and changed from time to time until the limb had attained a position almost straight, when it was kept permanently in that line until the bones united. During the treatment, special care was taken to protect the popliteal vessels from pressure by employing long hair bags at the sides of the splint, so as to leave a vacancy in the course of the artery, the interspace being filled with lightly carded cotton. The constitutional symptoms, though somewhat severe, resembled those usually seen in a compound fracture, but, in four months, the patient stood erect, with the feet in their natural position, and both heels touching the floor, although a slight angle had been designedly left at the knee in order to obviate the necessity of throwing out the limb in the act of walking, which would have been the case if the knee had been kept perfectly straight. The patient ultimately recovered perfectly.

Remarks.—In the observations of Dr. Barton, connected with the history of this case, there may be found some most valuable remarks on the advantages of the plan which he pursued, and especially on the value of the section of the bone at a proper angle. To obtain this, and it is essential to the cure, it will be found advantageous to resort to the rule proposed by Dr. Goddard, of Phila-

delphia,* and practiced by Dr. Mütter, which is as follows: "Take the angle of deformity, and then remove from the bone the complement of the angle." The use of Stromeyer's splint, as employed by Dr. Mütter in his case, would also be an improvement on the original dressing, as the popliteal space will thus be left entirely free from pressure, and the limb may be readily and gradually extended, as required. This operation has also been successfully performed by Dr. Platt Burr, of Louisiana, and by Drs. Gibson and Pancoast, of Philadelphia.

§ 1.—REMOVAL OF A PORTION OF THE PATELLA, CONDYLES, AND ARTICULATING SURFACES OF THE TIBIA.

OPERATION OF DR. GURDON BUCK, JR., OF NEW YORK.†—A patient, twenty-two years of age, had his right knee anchylosed at a right angle, in consequence of traumatic inflammation, seven years previous. The condyles of the femur were prominent, and stood in advance of the tuberosity of the tibia, with the patella deeply and immovably imbedded between them; the tendons in the ham stood out in bold relief from the limb, but the surrounding soft tissues were healthy, though the deformed limb was shortened and less developed in every respect than its fellow. By modifying the operation of Dr. Barton, it was supposed that it would be feasible to obtain greater strength of limb, and less remaining deformity.

OPERATION.—The hamstring tendons having been divided, some days before, by a subcutaneous section in which the peroneal nerve was cut across, the patient was placed in a proper position, the tourniquet applied, and an incision made from the outer to the inner condyle, across the middle of the patella, and a second incision from the middle of this, perpendicularly, downwards to the tuberosity of the tibia. The integuments being dissected as low down as a finger's breadth below and parallel with the margin of the articulating surface of the tibia, the ligament of the patella and fibro-ligamentous tissues on either side were cut through on the same level, to nearly the extent of two-thirds of the circumference of the bone. A section of the tibia was then made, three-fourths of an inch below the joint anteriorly, and directed obliquely upwards so as to terminate

* Philad. Med. Examiner, vol. vii. N. S. p. 39, 1851.

† Am. Journ. Med. Sciences, vol. x. N. S. p. 277.

at the margin of the articulating surface posteriorly, two-thirds of this section being accomplished by the amputating saw. Another section was then made with the same saw through the upper part of the patella parallel with the first, and on a plane forming an angle with it less than a right angle, and continued to about the same extent, the remainder of the section through the tibia and condyles being completed with a metacarpal saw. The wedge-shaped piece being removed, it was found that the section had not divided the posterior portion of the condyles, which still remained consolidated with the tibia. A new section was therefore undertaken, commencing upon the cut surface of the femur three-fourths of an inch anterior to the angle at which the previous sections met, and directed more obliquely upwards and backward. The remaining points of connection being then cautiously ruptured by flexing the leg, the rough prominences were pared away with the forceps. On attempting to extend the leg, it was found that the bony surfaces could only be brought to within a finger's-breadth anteriorly, as the soft parts in the ham offered great resistance. These were therefore dissected up, and a further section, five-eighths of an inch thick, removed from the anterior two-thirds of the femur, which enabled the surgeon to extend the leg and bring the bony surfaces in contact. The section of the condyles now exceeding that of the tibia in its antero-posterior diameter, there was an overlapping in front of about half an inch. But two ligatures were required; and the soft parts posterior to the joint, and separating it from the artery, were very little disturbed; but the angular flaps of integument being redundant were pared away to the requisite extent, and secured in contact by seven sutures. The limb being then placed on an inclined plane, adhesive strips were applied between the sutures, and dry lint laid over the whole. The operation lasted forty minutes, and the patient left his bed in about three months with an apparatus, but shortly recovered, and was able to walk on a sort of stirrup-iron beneath the foot, the leg on this side being about five inches shorter than the other at the heel, though half of this might be ascribed to the defective development of the limb subsequent to the inflammation of the joint.

Remarks.—The selection of this plan of operating having probably been caused by the peculiar difficulties of the case, it is difficult to make a just comparison between these two methods. The opinion of a want of strength in the support afforded by the

operation of Dr. Barton, which seems to have originated the plan pursued by Dr. Buck, is, however, an erroneous one, as has been proved in several instances, whilst the section above the condyles, as practiced by Dr. Barton, can be made to remove the difficulties connected with contractions about the ham. Except under peculiar circumstances, I think, therefore, that the operation above the knee would be the best, as it causes little deformity from shortening, and is much more simple.

§ 2.—RESECTION OF THE BONES OF THE LEG.

Resection of the bones of the leg, in order to cure a false joint, has been repeatedly performed, but requires no special description, being effected usually by incising the soft parts, turning out the ends of the bones, sawing them off, and then treating the case as a compound fracture. It is, however, a very serious operation, and one that exposes the patient's life unnecessarily, especially as a cure may be accomplished, or a useful limb obtained with less risk, by means of the use of splints applied so as to enable the patient to walk about, as I have succeeded in doing in two instances,* in one of which an ununited fracture of several months' standing recovered simply in consequence of the stimulus of motion. In no case, therefore, would I attempt this operation until these or similar splints had been worn for a twelvemonth.

SECTION IV.

RESECTION OF THE ANKLE.

One or both bones of the leg may be resected at the ankle-joint, in the manner described in the ensuing cases.

§ 1.—RESECTION OF THE INFERIOR EXTREMITY OF THE TIBIA AND FIBULA.

Resection of the inferior extremity of the bones of the leg has been performed in cases of severe wounds of the joint complicated with dislocation, as well as in those of compound fracture. These operations have, in a few instances, been attended with more suc-

* On the treatment of Pseudarthrosis by an apparatus which permits the use of the limb, and obviates the necessity of the amputation. (Am. Journ. of Med. Sciences, vol. xxi. p. 106, 1851).

cess than might have been anticipated from a knowledge of the structure concerned; a French surgeon, named Josse, "having removed, in one instance, two inches of the right tibia, and in another more than an inch from the left tibia and fibula of a patient, who yet, at the end of three months, walked with the aid of a cane."* Such cases must, however, be regarded as wonderful instances rather than as ordinary examples of success. More frequently, the patient will suffer from severe constitutional disturbance, and if he recovers will have a limb considerably shortened, as well as a stiff ankle. It becomes, therefore, questionable whether, under such circumstances, an artificial foot and leg would not answer better than the natural one. When, however, it is desired to perform this resection, it may be accomplished in several ways.

ROUX'S OPERATION.—Make a longitudinal incision, three inches long, on the outer side of the fibula, commencing over the external malleolus. From the inferior extremity of this, carry a transverse incision as far as the tendon of the peroneus tertius. Dissect up the flap, and open the sheath of the two other peronei tendons, push them back, expose the fibula from behind, avoiding the vessels and nerves; insinuate a chain-saw between the tibia and fibula from within outwards, divide the bone, raise up its lower extremity and disarticulate it. Then place the leg on its external side, and make a longitudinal incision on the tibia from the internal malleolus, about three and a half inches upwards, and from its extremity make a transverse cut as far as the tendon of the tibialis anticus. Dissect up the flap and isolate the surrounding parts by passing a piece of pasteboard beneath the bone, drawing the vessels and tendon to one side, and then cut across the bone with a narrow saw. The tibia being thus divided, it is to be disarticulated in the same manner as the fibula† (Plate LXX. Fig. 6).

§ 2.—EXTRACTION OF THE FIBULA.

Make an incision down to the bone at its central portion, denude it of the soft parts, pass the chain-saw around, saw it across, and then disarticulate it at each extremity. But in removing the upper portion, the surgeon will probably be compelled to divide the anterior tibial nerve, where it winds round the neck of the bone.‡

* Velpeau, Op. Surgery, by Mott and Townsend, vol. ii. p. 822.

† Bernard and Huette, Med. Operat. p. 103.

‡ Malgaigne.

§ 3.—RESECTION OF THE ASTRAGALUS.

The removal of any of the bones of the tarsus must be the result of circumstances, and the only directions which can be given in relation to them is to open the integuments freely at the most prominent point of the bone, and then free its attachments.

The astragalus has been successfully removed in cases of compound dislocation, by Drs. William A. Gillespie, of Virginia;* Barton, of Philadelphia, in 1831;† Alexander H. Stevens, of New York; and in a few other instances. There is, therefore, sufficient evidence to show that, in compound dislocations of this bone, it is desirable to attempt its resection or extirpation before resorting to amputation of the leg.

§ 4.—RESECTION OF THE METATARSAL BONES AND PHALANGES.

The resection of these bones is to be conducted on the same principles as those of other parts, and the incisions to expose the bone will be similar to those described under Amputations.

CHAPTER VI.

GENERAL REMARKS ON AMPUTATIONS.

THE amputation of a large limb necessarily destroying the equilibrium which had previously existed in the forces of the economy, should always be regarded as a serious operation, and liable to involve the life of the patient. As it also removes a part which is often essential to the daily maintenance of the individual, and, in too many instances among the poor, renders them paupers for life, it is an operation which should be resorted to as seldom as possible, and only when a careful review of the moral and physical condition of

* See Bibliographical Index, p. xci.

† Liston's Pract. Surgery, Philad. edit. p. 141, 1842.

the patient establishes the fact that the mutilation of the body is better than the loss of life. Possessed of a very moderate amount of mechanical skill, and with a little resolution, any one may be able to perform an amputation; and the *éclat* sometimes supposed by young surgeons to be attached to the performance of this operation, may well be deemed of a doubtful character, as it tacitly implies that, by a more judicious and skillful treatment, they might perhaps have avoided such a mutilation. As such an operation is also liable to affect injuriously the reputation of a young surgeon, it will prove to be a good rule never to amputate a limb without having a consultation with two or more other practitioners, if it is at all possible to obtain their opinion, as the most serious cases have occasionally recovered without losing the limb, even when the surgeon has openly declared such an event to be impossible.

SECTION I.

CASES FOR AMPUTATION.

The propriety of performing amputation in cases of gunshot wounds and compound fractures, in gangrene, or for the removal of malignant growths, is a question on which there has been much diversity of sentiment, and if my present limits permitted, this subject might advantageously be allowed to occupy several pages. I shall, however, be compelled to confine its consideration to a very brief statement of the opinions of distinguished authorities in a few of the more serious cases.

§ 1.—GUNSHOT WOUNDS.

The necessity of amputating in these injuries, it has been generally admitted, should be regulated by the fact of their producing a compound fracture opening into a large joint, or the mutilation of the principal bloodvessels and nerves; but, in all these cases, the position and circumstances of the patient should not be overlooked, as injuries may demand amputation in the field, which, in private life, would recover without it.

The views of surgeons in regard to the indications for amputation in gunshot fractures differ somewhat, according to the position of the injury. In the femur, it is nearly universally admitted to be

PLATE LXXI.

INSTRUMENTS FOR AMPUTATION, ETC.

Fig. 1. Trocar for Tapping the Bladder through the Rectum. Schively's pattern.

Fig. 2. Petit's Tourniquet. " "

Fig. 3. A Large round-bellied Scalpel for dissecting back the integuments in the circular amputation. Schively's pattern.

Fig. 4. A Small Catlin for the interosseous space. " "

Fig. 5. Large Amputating Knife, for the circular operation. " "

Fig. 6. The Long Ten Inch Catlin, for the flap " " "

Fig. 7. An Eight Inch " " " " "

Fig. 8. Bone-Nippers, for removing any sharp points left by the action of the saw. Schively's pattern.

Fig. 9. Dissecting Forceps, to hold the integuments whilst they are dissected from the fascia before they are reverted, as in the circular operation. Schively's pattern.

Fig. 10. Spring Forceps of Dr. Nathan R. Smith. " "

Fig. 11. Artery Tenaculum. " "

Fig. 12. Barton's Metacarpal Saw. " "

Fig. 13. Ordinary " " " "

Fig. 14. The Large Amputating Saw. " "

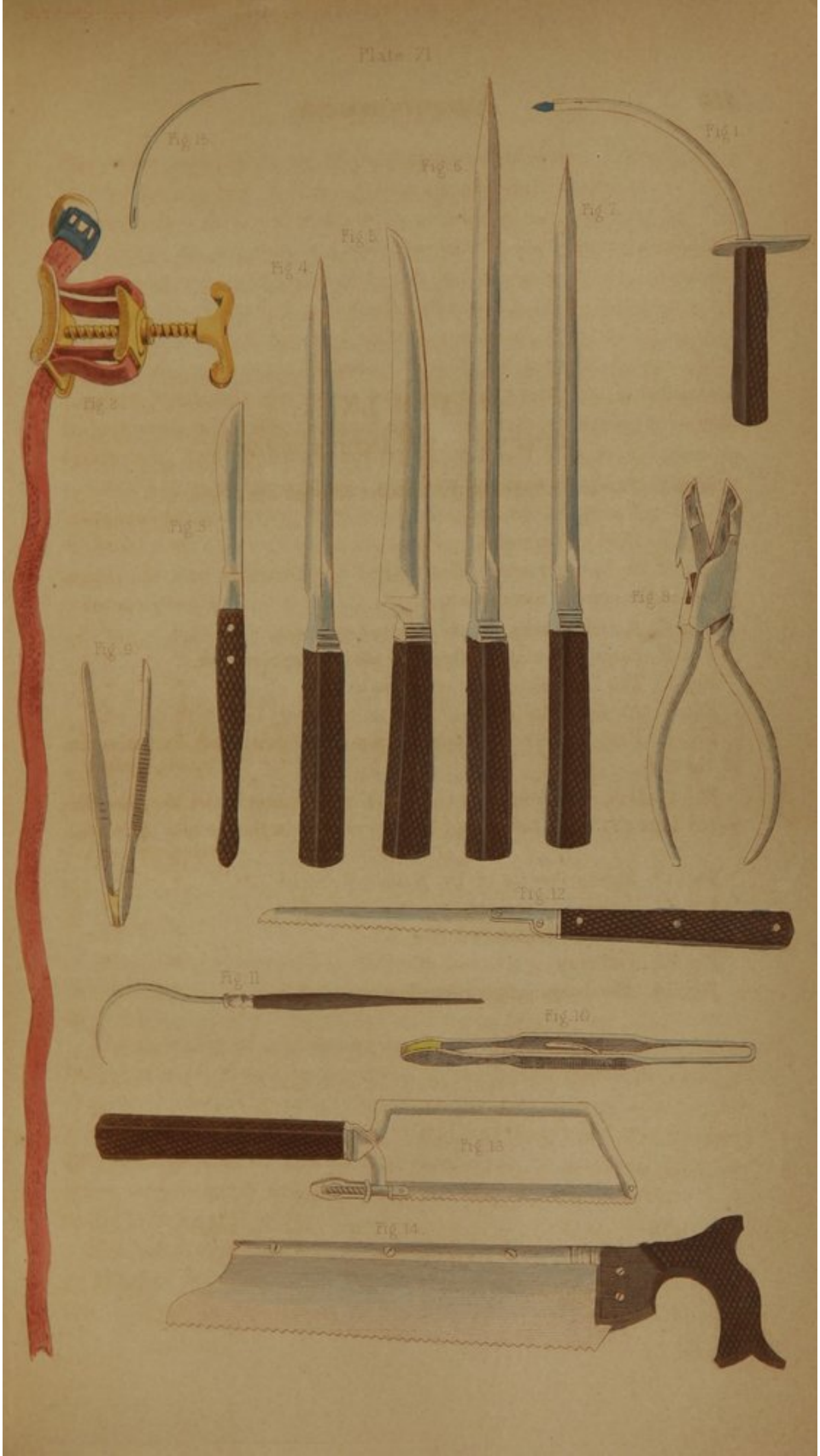


Plate 71
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.

imperative. Thus, Ravaton thinks such a fracture is nearly always fatal; Ribes mentions that, in an aggregate of four thousand cases at the Hôtel des Invalides, in Paris, there was not a single cure; De Claubry, surgeon of the imperial guard, was of the same opinion, most of the soldiers in Spain dying unless the limb was promptly amputated; and Percy, Thompson, Larrey, Guthrie, and Hennen express nearly the same views.*

Mr. Guthrie, however, states that in the upper extremity it is very different, and that "this limb should not be amputated for almost any accident that can be produced in this way."†

§ 2.—RAILROAD ACCIDENTS.

A class of injuries unknown to the older surgeons are now so common as to furnish those of the present day with many examples of compound fractures of the most serious kind. These injuries, together with those resulting from the use of thrashing-machines, as well as those created in mills, are the result of the application of force to the limb, in such a manner as to produce extensive contusion of neighboring parts as well as laceration at the seat of injury. It is, therefore, not uncommon, in amputations after such injuries, for the stump to slough, after an attempt has been made to heal it, and this should always be guarded against by amputating sufficiently far from the seat of injury to be sure of a sound circulation in the flaps. This sloughing arises, according to Dr. George Hayward, of Boston,‡ "from a condition of parts resembling that which has been spoken of by military surgeons as a local asphyxia, and is a state of suspended animation, differing from death only in the fact that the power of resisting decomposition is retained for a time, though certainly destroyed by the debilitating effects of the operation." The shock created by these accidents usually results in a state of extreme depression, and in such cases I think the amputation should be delayed until the reaction is established, though on this point there is a diversity of sentiment.

* Velpeau's Op. Surg. by Mott, vol. ii. p. 454.

† Velpeau, loc. cit.

‡ Paper on Amputations in Massachusetts General Hospital, p. 16, Boston, September, 1850.

For the consideration of other injuries requiring amputation, the reader must refer to the more general surgical treatises, as the subject is too extended for a work of a purely operative character.

§ 3.—THE PERIOD FOR AMPUTATING.

The advantages of a primary over a secondary amputation are also a serious question, and one with respect to which there is diversity of sentiment.

Larrey* asserts that, in the American war, the French surgeons lost almost all their patients by deferring their amputations, whilst the Americans, by immediate amputation, saved nearly all of theirs.

Velpeau,† after a careful and learned examination of this question, states that amputation should in these cases be performed within the first twenty-four hours after the accident.

Sir George Ballingall‡ is, however, "satisfied that in civil hospitals primary amputations do not do so well as in military life, owing to the difference of moral causes in these two conditions, the soldier being robust at the time of the accident, and brought to a purer air in a hospital than he had had in barracks."

Dr. Norris,§ in a paper published in 1838, furnishes the statistics of the amputations in the Pennsylvania Hospital for the seven preceding years, and shows that, of 24 primary operations, 14 were cured and 10 died. In another paper,‖ containing the results of the same hospital from 1838 to 1840, he also shows that of 35 primary operations 24 were cured and 11 died, and that of 25 secondary amputations, 13 were cured and 11 died. By combining these tables, he therefore concludes "that immediate amputations after injuries are less fatal than secondary, the mortality after the former being 1 in $3\frac{2}{11}$, and in the latter 1 in $2\frac{6}{7}$."

Dr. George Hayward, of the Massachusetts General Hospital at Boston, in some valuable statistics from that Institution,¶ affords

* Clinique Chirurg. tome 3me, p. 518.

† Op. Surg. by Mott, vol. ii. p. 470.

‡ Ibid. 471, note by Dr. Townsend.

§ Am. Journ. of Med. Sci. vol. xxii. p. 356.

‖ Ibid. vol. i. N. S. p. 38, 1840.

¶ Am. Journ. of Med. Sci. vol. i. N. S. p. 64, 1840. A reference to this paper, as well as a second one by Dr. Norris, has been accidentally omitted in the Bibliographical Index, owing to an error of the press.

the observer an opportunity of learning this fact, by comparing the date of admission with that of the operation, though he does not directly mention the fact of the operation being primary. From an examination of his dates, it appears that of fourteen primary amputations, ten were cured and four died; but he fears that the operation in recent injuries is often resorted to too early.*

Dr. Buel,† of the New York City Hospital, in an exceedingly well-arranged statistical table of the amputations performed in that hospital from 1839 to 1848, says, "that it is customary, in the New York Hospital, to amputate before the accession of inflammatory action, so that the occasions for secondary amputations are rare." The mortality after primary amputations was 27.77, of others 30.76 per cent. The mortality after amputations for chronic affections was 20.67.

Judging from these statements, as well as from personal experience, I should therefore advise the performance of amputation in such accidents as require it, as soon after the injury as reaction is fairly established, that is, as soon as warmth and a free circulation have returned, the patient being fully etherized before the performance of the operation, so as to escape the shock.

SECTION II.

POINTS FOR THE PERFORMANCE OF AMPUTATION.

Amputation of an extremity may be performed either at the "place of election" or at "the place of necessity," and by a circular, oval, or flap-like incision of the soft parts which are to cover the bone and form the stump.

§ 1.—THE PLACE OF ELECTION.

The selection of a spot in which amputation can be most advantageously performed is a point which the character of the limb, the occupation of the patient, and the probable substitute for the

* Opus citat., p. 70.

† Am. Journ. of Med. Sciences, vol. xvi. p. 39.

limb subsequently to be obtained, must chiefly decide. As a general rule, where the pecuniary circumstances of the patient admit of his obtaining an artificial limb, the surgeon should leave as long a stump as possible, in order to secure a firmer attachment; but when the amputation is to be performed on the leg of a poor man, whose means will compel the use of the common peg or wooden leg, the stump should, on the contrary, be made at least within four fingers' breadth of the tubercle of the tibia, in order to prevent the protrusion of the stump behind, when the knee is bent upon the peg.

Surgeons of all countries yet differ widely in regard to the advantages of amputating through a joint in preference to above it. But when it is recollected that every articulating surface is covered by a synovial membrane, which is liable to keep up a secretion, prevent the healing of the flap, and create a fistula, and that, as a general rule, the joints present prominences of bone which often can only be covered by the integuments, and that the latter will subsequently sustain friction very badly, it must, I think, be admitted that the trifling increase in the length of the stump is more than compensated by its subsequent ability to resist pressure and the creation of ulcers.

"The place of necessity knows no law."

SECTION III.

THE DIFFERENT KINDS OF AMPUTATION.

Three principal methods are employed in incising the soft tissues in an amputation, and they are usually designated as the circular, the oval, and the flap operation.

§ 1.—THE CIRCULAR OPERATION.

This ancient method of operating has been described by all surgeons from the earliest periods, especially from the time of Celsus, though it has been modified at different times, in order to guard against a "conical stump," or to prevent such a retraction of the muscles as would diminish the amount of covering to the bone. Without specifying these modifications, it must suffice to state that

the plan of operating at present generally pursued by the profession, appears to have been adopted with a full knowledge of the views of surgeons of a preceding period, in respect to the advantages of each, and may therefore be presumed to be the best.

Ordinary Operation.—After applying the tourniquet, or some other means of arresting the circulation, the skin should be divided by a circular sweep of the amputating knife, held so that the incision may commence with the heel of the blade, and terminate with the same point. The attachment of the skin to the fascia being then divided so as to enable the integuments to retract, or to be turned back like the cuff of a coat, the muscles should be incised down to the bone by a second sweep of the knife, and the division of the fibres which adhere directly to the bone thoroughly accomplished by two or three shorter cuts. The soft parts being now forced or drawn back by means of a retractor in the hands of an assistant, the bone should be cut transversely across, and the operation completed by tying the arteries and closing the stump, as will be subsequently described.

The necessary instruments may be seen in Plate LXXI.

Remarks.—In the formation of a stump by the circular operation, the surgeon usually has to decide whether he will bring the sides of the integuments together vertically or transversely to the thickness of the limb. This point, though chiefly dependent on the peculiar circumstances of each case, may generally be decided by the position in which the limb is to be placed in bed during the cure, it being desirable always to approximate the integuments in such a manner as to favor the subsequent escape of any purulent collections. In the United States, it is the almost universal practice to attempt union by the first intention, and it is under such circumstances that the line of union in a circular operation may become a matter of importance.

§ 2.—THE OVAL METHOD.

The oblique or oval form of the flap is the result of such an incision as is made by carrying the knife a little higher on one side of the limb than on the other, so as to form an oval, instead of a circular wound, and is especially applicable to amputations through the joints. In performing it, the knife should be carried around the limb in a direction which is oblique to its perpendicular diameter,

so as to divide all the parts down to the bone and form a wound which is angular at its point of commencement and termination, but rounded in the intermediate part something like the letter U, when its two ends are brought nearly in contact.

REMARKS.—The oval method is seldom applied to amputations of the shaft of the bones, though where there is a large amount of muscle and integument, as in a well-developed thigh or arm, I have found it to form a better stump than the circular method, as it avoids the folds and puckering so generally caused by the approximation of the edges of a circular wound.

§ 3.—THE FLAP OPERATION.

In the formation of a flap of the integuments to cover the end of the bone, two methods have been employed, the difference being the formation of one or two flaps.

When two flaps are desired, they may be formed either by cutting from the skin to the bone, or from the bone outwards.

In operating from without inwards, the cut is made through all the tissues, at an angle capable of furnishing a sufficient amount to form a cushion for the end of the bone. This flap being held by an assistant, a second is formed on the side of the vessels of the limb, by commencing at the bone, and cutting outwards, when the latter is to be sawed off, and the flaps approximated.

In the single flap operation, the structures are divided on one side, either with or without other incisions.

REMARKS.—The flap operation is the favorite mode of amputating with some surgeons, on account, apparently, of the rapidity with which it may be performed. Sometimes, however, it is the result of necessity, as in cases of laceration, where the integuments are destroyed on one side of the limb.

SECTION IV.

ESTIMATE OF THE DIFFERENT FORMS OF AMPUTATION.

The variety of cases requiring amputation, and the different results obtained under such circumstances, has apparently caused a

want of harmony among experienced surgeons in deciding this question, which it is difficult to credit. Such a diversity of sentiment is, however, rather apparent than real, and must be ascribed to the predilections consequent on the force of circumstances; thus, an amputation that might be instantly demanded on a field of battle and without assistants, might be performed very differently, when the operator was in a civil hospital, and with every convenience, so that, if two surgeons were similarly situated, they would doubtless coincide perfectly on this, as on most other practical points.

The advocates of the flap operation state that it is more prompt, less painful, exposes less to hemorrhage, obtains a rapid cure, and forms a stump well adapted to an artificial limb.

Its opponents contend that it exposes a greater surface for suppuration; that there is greater difficulty in finding the vessels that are to be tied, owing to their being obliquely divided; and that secondary hemorrhage is, therefore, more common after the flap than after the circular operation.

The advocates of the circular operation claim that it is most likely to form a good "apple-dumpling-like stump;" that the arteries may be easily found and tied; that secondary hemorrhage is rare; and that, by giving the wound a conical shape with the bone in the centre, the flesh is placed in the most favorable condition for properly covering the bone, and sustaining pressure.

Its opponents object to its slowness, to the pain caused by dissecting back the cuff-like portion of the skin, when anæsthetics are not employed, and to the excessive and irregular contraction of the various layers of the muscles when transversely divided.

Chelius,* from "personal experience, prefers amputation by the circular cut, with the eversion of the skin, believing the advantages ascribed to the flap operation to be groundless."

Velpeau† thinks, "too much importance has generally been accorded to the flap operation; that it has many partisans in the dissecting-room, but is seldom resorted to for amputation in the continuity of the limb."

Fergusson,‡ although performing the flap operation most frequently, owing to special circumstances, states "that, at the present day, more amputations are done by the circular than by the flap

* System of Surgery, by South, vol. iii. p. 652.

† Operat. Surg., by Mott, vol. iii. p. 484.

‡ Practical Surgery, p. 152.

operation, and that, fifteen or twenty years back, not one surgeon in fifty ever thought of performing any other," and he, therefore, doubts whether the flap can present any special advantages.

In the United States, GIBSON* advocates the circular operation upon the thigh, and the flap in the leg.

NORRIS† states "that, with very few exceptions, the circular amputation is the operation performed in the Pennsylvania Hospital, union being always attempted by the first intention."

HAYWARD‡ says "that, in the Massachusetts General Hospital, a large proportion of the amputations were done by the circular method, the flap being adopted only when it was thought likely to afford a better stump."

BUEL§ remarks "that, in 49 cases occurring in the New York City Hospital, 24 were performed by the double flap operation, and 25 by the circular method. Of the flap operations, the mortality was 17.66 per cent., and of the circular, only 12 per cent."

Dr. Buel, however, thinks that the greater mortality of the flap operation may have been due to the greater proportion of thighs in which it was performed.

Dr. PORTER, U. S. A., who served in the Mexican war, expresses the opinion‖ that the army surgeons were greatly in favor of the circular operation in Mexico, one of them of extended experience, and who previously advocated the flap operation, changing his opinion and practice on the ground that the stump made by the circular operation was the best, and his own opinion is decidedly in favor of the circular method.

Personal experience has long induced me to think that, in attempting to settle this question, there has been too much ascribed to the defects of each method of operating; that the circular operation is the best in the middle of the limb, but that the flap is best adapted to the extremities or to the articulations; and that the rapidity with which one can be performed instead of the other, is owing rather to the greater practice of such surgeons as confine themselves to one kind of operation than to the superiority of either in respect to time. In some cases (laceration), the flap is the only

* Practice of Surg. vol. ii. pp. 488, 489.

† Am. Journ. Med. Sciences, vol. xxii. p. 359.

‡ Ibid. vol. i. N. S. p. 65, 1840.

§ Ibid. vol. xvi. N. S. p. 38.

‖ Am. Journ. Med. Sciences, vol. xxiv. N. S. p. 24, 1852.

means of forming a covering to the stump without removing a large amount of the limb.

SECTION V.

GENERAL MEASURES REQUISITE IN AMPUTATION.

The mere division and removal of the limb being the simplest portion of an amputation, the surgeon should pay special attention to the other measures connected with the operation, as these are mainly conducive to its prompt and fortunate performance. In every important amputation, the duties of the assistants, and the preparatory as well as the secondary steps, should therefore be thoroughly considered.

§ 1.—PREPARATORY MEASURES.

The general preparatory measures required in an amputation are very much the same as those demanded in other operations.* The necessary instruments, which may be seen in Plate LXXI., should all be in perfect order. The ligatures should be carefully made; the bandage and compress prepared for the tourniquet, if it is to be employed; the hair shaved off the skin, so as not to interfere with the subsequent dressings; a retractor† of muslin or buckskin, cut with one or two tails, so as to protect the soft parts from the saw; and the limb elevated for a few hours previous to the operation, so as to drain it of blood, if the debilitated condition of the patient renders it desirable to prevent the loss of even a moderate amount.

The dressings for an amputation were formerly very varied; but a wiser view of the changes in the condition of parts after an amputation has led to a most judicious change. Instead of the spread cerate, Maltese cross, tow, bandages, &c., which were prepared to envelop the stump, many surgeons now resort to the water dressing, and require, therefore, a few needles and ligatures to make the interrupted suture, a piece of oiled cloth to place under the limb to protect the bed, and sufficient lint or wet cloths to cover the stump and guard it from external irritants.

* Part I. page 21.

† Smith's Minor Surgery, p. 39, 3d edit.

PLATE LXXII.

AMPUTATIONS OF THE ARM.

Fig. 1. View of the Head of the Humerus, showing its Hemispherical Character.—1. Greater tuberosity. After Bernard and Huette.

Fig. 2. Side View of the Bones forming the Shoulder-Joint.—1. Head of the humerus. 2. The clavicle. 3. Acromion process of the scapula. 4. Coracoid process. 5. Dorsum of the scapula. 6. Section of the biceps tendon. After Bernard and Huette.

Fig. 3. A Three-quarter View of the Scapula.—1. Glenoid cavity. 2. Spine of the scapula. 3. Coracoid process. After Bernard and Huette.

Fig. 4. Lisfranc's Operation for Amputation at the Shoulder-Joint.—1. The long ten-inch catlin transfixing the deltoid muscle from behind. 2. Its point of exit in front. 2, 3, 4. Shape of the posterior flap. After Bernard and Huette.

Fig. 5. The same Operation, showing the Formation of the Anterior or Internal Flap.—1. The long catlin. 2. Hand of the surgeon. 3. Anterior angle of flaps, or point of exit of the catlin. 3, 4, 5. Posterior flap raised up, so as to show, 6, the head of the humerus. After Bernard and Huette.

Fig. 6. Larrey's Operation for Amputation at the Shoulder-Joint.—1, 2. The first, or vertical incision. 3, 4. The posterior incision, commencing near the middle of the first. 5. The anterior incision, starting from the same point. After Bernard and Huette.

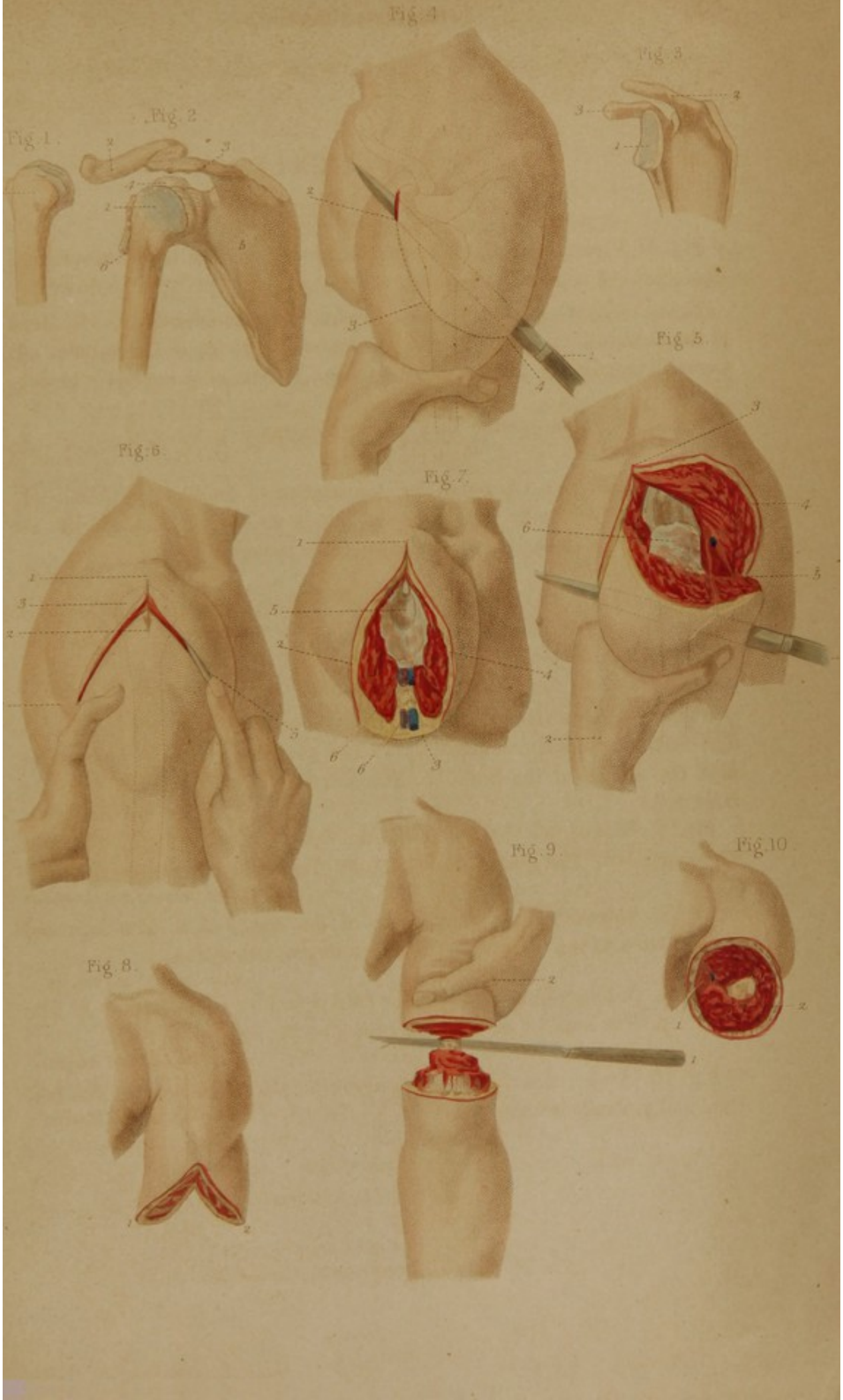
Fig. 7. Wound left by the preceding Operation.—1, 2, 3, 4. Shape of the wound. 5. The glenoid cavity. 6, 6. The axillary vessel. After Bernard and Huette.

Fig. 8. Velpeau's Flap Amputation of the Arm.—1, 2. The flaps and their relation to the bone, which is shown in the dotted lines. After Bernard and Huette.

Fig. 9. Ordinary Circular Operation for Amputation of the Arm.—1. The knife. 2. The hand of an assistant retracting the soft parts. After Bernard and Huette.

Fig. 10. Appearance of the Stump after the Operation.—1, 2. The brachial and profunda arteries. After Bernard and Huette.

Plate 72



§ 2.—DUTIES OF ASSISTANTS.

Before commencing an important amputation, as that of the thigh for example, the surgeon should select four capable assistants, and assign to them their special duties: thus, the first may attend to the etherization, and carefully watch its effects; the second control the hemorrhage, either by pressing on the main artery or by the application of the tourniquet; the third should support the lower portion of the limb, and be especially careful in holding it steady during the action of the saw, neither raising it so as to bind the instrument, nor depressing it so as to snap and splinter the bone; whilst the fourth should hand the instruments, attend to retracting the soft parts, so as to protect them from the saw, and tie the arteries as they are picked out by the surgeon. This assistant may also aid in approximating the flaps during the dressing, whilst the third warms the adhesive strips when they are required.

§ 3.—AFTER-TREATMENT.*

The dressing of an amputation may be advantageously performed as soon as the hemorrhage is entirely checked, in the following manner: Cleanse the surface of the stump by gently squeezing on it the water from a sponge, but do not brush it roughly with the sponge; gather together the ends of the ligatures, and bring as many as possible out of the lower angle of the wound. If the stump presents a large surface, it will also prove useful to introduce a small strip of linen at this angle and between the edges of the skin, as was the practice of Dr. Physick. Then with the needle and ligature make two or three stitches of the interrupted suture, in order to close the stump, placing the first stitch so as to unite the flaps in the centre, adding to these, if deemed useful, two or three strips of adhesive plaster. Place over this a soft linen towel or piece of lint wet with tepid water, and then place the patient in bed, with the limb slightly elevated by means of a pillow doubled under it, and covered by the oil-cloth. The tourniquet may either be left loosely applied around the limb, or kept near the bed ready for use. In order to prevent spasm of the stump, and such muscular contraction as might derange the dressing, a broad band should be carried over the limb above

* See Part I. p. 28, *et supra*.

the stump, and its ends pinned fast to the bed; after which, a hoop should be so arranged as to keep off the weight of the bed-clothes. One assistant should then be left on guard for twenty-four hours, and an anodyne administered, if the patient require it.

During the first forty-eight hours, after a primary amputation in a patient in good health, the diet may consist of light nutritious articles and broths, and then if fever or a tendency to active inflammation is not apparent, he may be allowed to eat meat and resume his ordinary diet. But if the patient has been previously confined to bed by a chronic disease, no change should be made in the diet previously given.*

The only attention required by the stump, in many instances, during the first forty-eight or seventy-two hours, is to keep the lint or cloth moist by squeezing upon it water of such a temperature as is most agreeable to the feelings of the patient, some liking it cold and others tepid, the oiled cloth beneath the stump being so arranged as to carry off the surplus water and keep the patient dry. On the fifth day, if ulceration is apparent about the stitches, one or more may be removed, and the flaps supported by long adhesive strips, or by the turns of a bandage. About the sixth or tenth day, one or more of the ligatures will be loosened, and may be quietly drawn away; but, should they adhere too long, and delay the cure, then the means before referred to† should be resorted to. As soon as the ligatures have separated, the stump may be advantageously compressed by the gentle traction of a bandage until the newly-formed adhesions have acquired firmness. When, in the course of the treatment, the stump shows a disposition to high inflammation, warm cloths may be substituted, if suppuration seems likely to relieve it; but whenever the latter is freely established, the stump should be placed horizontally, or slightly inclined downwards, so as to favor the escape of the matter, and prevent its burrowing in the muscular interspaces. Although the water dressing, as thus practiced, occasionally presents examples of union by the first intention throughout a considerable portion of the stump, it will not always do so. When, therefore, suppuration is freely established, the wet cloths should be frequently changed and fresh ones substituted, so as to prevent decomposition of the pus and consequent irritation. By these means, the secretions never become offensive, and both patient and

* See Part I. p. 29.

† Ibid., p. 61.

surgeon obtain a degree of comfort that was impossible under the old method of dressing the stump.

§ 4.—ACCIDENTS THAT MAY OCCUR EITHER DURING OR AFTER AMPUTATION.

The occurrence of an accident *during* an amputation is an event which proper foresight will always prevent, and it should, therefore, be regarded, like many other "accidents," as positive evidence of the carelessness of the operator. This carelessness may be shown: 1. In the occurrence of hemorrhage. 2. In cutting openings in the flaps. 3. In splintering the bone.

The occurrence of hemorrhage during an amputation may arise from breaking of the tourniquet, or from failure to compress the artery, by the assistant intrusted with it, both of which ought to be avoided by proper care.

The flaps may be cut or perforated in the circular operation by careless dissection of the skin, or by thoughtlessly transfixing one point instead of another; whilst splintering of the bone may arise from want of ability or proper information in the assistant who holds the limb during the act of sawing. Such accidents require merely to be enumerated, in order to be avoided. Fainting is the only event truly accidental that can occur during an amputation, and it may be readily remedied by lowering the patient's head, and administering stimulants.

After an operation, hemorrhage may occur at any moment. If it shows itself within forty-eight hours, it is evidence of the neglect of the surgeon, in ligating the vessels of the stump; and if not severe, may be checked by compression; but, if more profuse, it may be requisite to open the stump and seek for the bleeding vessels, and then ligate them properly.

Spasm, or twitching of the stump, is not an unfrequent occurrence after an amputation, and is due to the irregular contraction of the muscles, sometimes caused by the pressure against the sharp end of the bone, and sometimes due to nervous irritation. Gentle circular compression of the limb, and the free use of opiates internally will usually afford relief. Should the recurrent bandage of stumps have been applied, the turns should be examined to see that

PLATE LXXIII.

AMPUTATION AT THE ELBOW-JOINT IN THE FOREARM.

Fig. 1. A Front View of the Articulating Surfaces of the Bones composing the Elbow-Joint.—1. The humerus. 2. The radius. 3. The ulna. After Bernard and Huette.

Fig. 2. A Side View of the Elbow-Joint.—1. The humerus. 2. Head of the radius. 3. The ulna. After Bernard and Huette.

Fig. 3. A Front View of the Elbow-Joint.—1. The humerus. 2. The radius. 3. The ulna. 4. The external condyle. 5. The internal condyle. 6. Articulating surface of the radius. 7. Articulating surface of the ulna. After Bernard and Huette.

Fig. 4. Amputation at the Elbow-Joint by the Flap Operation.—1, 2, 3. The shape of the anterior flap. After Bernard and Huette.

Fig. 5.—Continuation of the same Operation.—1, 2, 3. The anterior flap turned upwards. 4. The knife in the act of completing the division of the anterior ligament of the joint. 5, 6, 7. Shape of the surface from which the flap has been cut. After Bernard and Huette.

Fig. 6. Velpeau's Circular Operation at the Elbow-Joint.—1, 2. Fold of integuments turned up, showing the knife dividing the capsular ligament. After Bernard and Huette.

Fig. 7. The Wound left by the preceding Operation.—1. The epitrochlea of the humerus. A ligature has been placed on the brachial artery. After Bernard and Huette.

Fig. 8. Circular Amputation of the Forearm.—1. Hand of assistant retracting the soft parts. 2. The flap of skin turned back. The hand of the surgeon holding the knife firmly in its grasp, with the point inclined to the surgeon's shoulder, so as to sweep entirely around the arm, is also shown. After Bernard and Huette.

Fig. 9. Sawing the Bones of the Forearm in the same Operation.—A retractor has been passed through the interosseous space and around the bones, so as to protect the soft parts from the action of the saw.

Fig. 10. The Appearance of the Wound after a Circular Amputation of the Thigh.—1. The femur. 2, 2. The arteries. After Bernard and Huette.

Plate 73.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

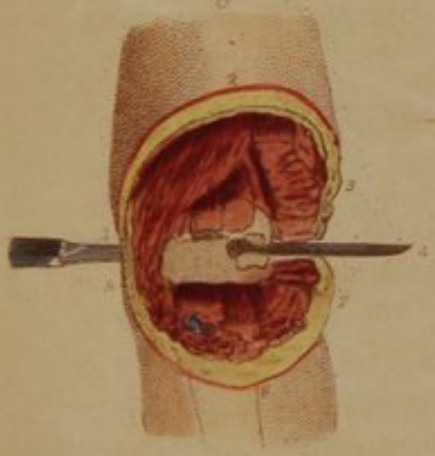


Fig. 6.

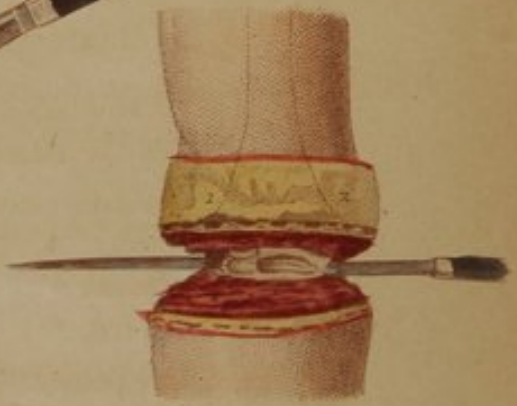


Fig. 7.

Fig. 8.

Fig. 9.

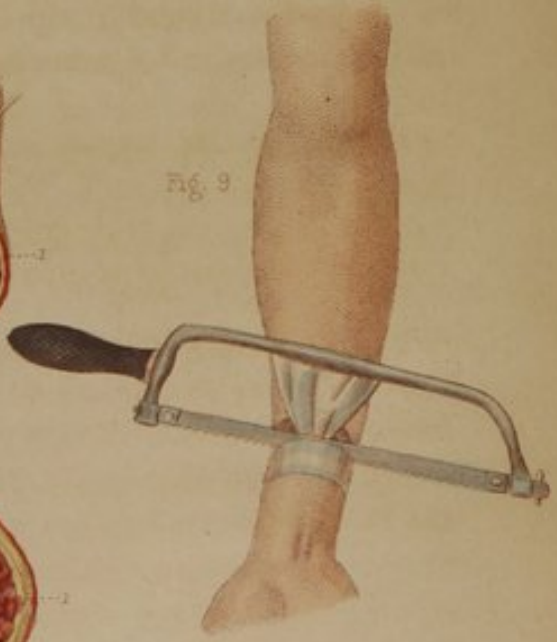


Fig. 10.

they do not compress the end of the soft parts of the stump against the freshly sawed edge of the bone.

Inflammation of the stump, abscesses, or exfoliation of a lamina of bone may also complicate the after-treatment, but they may be relieved on the ordinary principles of the treatment of such affections elsewhere.

When the removal of the ligature is delayed beyond the proper time (three to four weeks), a resort to the means before referred to* is all that is necessary. Neuralgia of the stump may arise, either from the inflammation and enlargement of the end of the nerve, or from its adhesion to the cicatrix. The principles before spoken of, in connection with neuralgia, will here suffice for the relief of this condition of the part.

CHAPTER VII.

AMPUTATIONS OF THE UPPER EXTREMITY.

In describing the various methods of amputating the extremities, I shall have nothing new to offer, and having learned in the Parisian schools the methods of the French surgeons, I am merely prepared to present them as described by themselves, and to offer the results of personal experience. Most of the methods, hereafter detailed, may, therefore, be found in the various works of the day, though I have selected the manuals of Bernard and Huette, and of Malgaigne, as the best authorities.

SECTION I.

AMPUTATION AT THE SHOULDER.

Lisfranc's Operation.—The patient being seated, or propped up in the bed near its edge, the arm should be placed close to the side, and the head of the humerus pushed upwards and outwards as much as possible, by carrying the elbow upwards and inwards by the sur-

* Part I. p. 61.

geon grasping the humerus near its middle; then feeling for the acromion, and coracoid processes, or for the acromio-coracoid triangle, plunge an eight-inch catlin in at the external side of the posterior margin of the axilla above the tendons of the latissimus dorsi and teres major muscles, and carry it across the shoulder with its blade inclined flatwise, till the point touches the under surface of the acromion process. Then raising the handle sufficiently to lower the point beneath this process, bring it out below the clavicle in the triangular space between the clavicle, coracoid, and acromion. Let an assistant now raise the arm from the side, and carry it off from the body, whilst the surgeon grasps the relaxed deltoid in his left hand, elevates it as much as possible from the bone, and shaves it off so as to form a posterior semicircular flap about three inches long (Plate LXXII. Fig. 4). This incision should divide the external portion of the capsular ligament, and the tendons of the latissimus and teres major and minor muscles, as well as the deltoid; but if the capsule has not been freely divided by the point of the knife passing over it as it was introduced, it may now be effected by incising it with its heel, whilst the assistant holds up the flap.

On again carrying the elbow a little towards the side, the head of the humerus will escape through the opening in the capsule, when the knife should be passed around it to the inside of the bone, and carried downwards and forward, so as to shave off an internal flap of about two and a half inches (Plate LXXII. Fig. 5), the artery which remains in the flap being held by an assistant grasping the flap before it is detached from the arm below.

When operating on the right shoulder, the same steps are taken; but the point of the knife is inserted in front of the axilla at the acromio-coracoid triangle, and made to come out behind at the same point as was above directed for its insertion in the left shoulder.

Larrey's Operation.—Amputation of the shoulder by the formation of an oval flap is the method sanctioned by the experience of this well-known surgeon, who had frequent occasion to perform it in his campaigns.

Operation.*—Make a vertical incision on the external side of the shoulder, down to the bone, and carry it from the edge of the acromion process to within about one inch of the level of the surgical neck of the humerus. Then, commencing at the point, make two

* Bernard and Huette, Med. Op. p. 70.

oblique incisions, one anteriorly and the other posteriorly, so as to divide the integuments and flesh on the anterior and posterior parietes of the axilla, as well as the insertions of the pectoralis and latissimus muscles (Plate LXXII. Fig. 6). Push back the edges of this wound, and open the joint by a single cut of the knife, drawing slightly upon the humerus, so as to put the ligaments on the stretch. Luxate the head of the bone, pass the knife behind it, and terminate the operation by dividing the structure in the axilla, in which are found the arteries and nerves, which should, at the moment, be compressed by an assistant. The wound which is left is perfectly oval, and well adapted to healing. (Plate LXXII. Fig. 7.)

Remarks.—The plans above stated presenting two excellent methods of amputating at this joint, it is unnecessary to enter into the description of the various modifications that have been proposed by others. The circular operation presents us at this joint with nothing peculiar. Sanson, of Paris, who, in connection with Velpeau, recommended it strongly, divided all the structures at one sweep of the knife applied one inch below the acromion, and then disarticulated the bone.

The objection to this mode of amputating, or rather the advantages possessed by either that of Lisfranc or Larrey, is that, as the artery is not divided until the last moment, it can then be promptly seized and tied as the arm is out of the way.

Amputation at the shoulder-joint has been frequently performed in the United States, having been done by Dr. John Warren, of Boston, as early as 1781; by Dr. Bayley, of New York, in 1782; and subsequently by Drs. Bowen, of Providence; Whitridge, of South Carolina; William E. Horner, of Philadelphia; N. Pinkney, U. S. Navy; D. Gilbert and Page, Philadelphia; and by Dr. Eve, of Georgia; as well as by many others, whose cases cannot now be recalled. Of those, above mentioned, a large proportion proved successful.

SECTION II.

AMPUTATION OF THE ARM.

The amputation of the arm may be accomplished at any point, either by the circular or flap operation.

Circular Operation.—The patient being etherized, and then

PLATE LXXIV.

AMPUTATION OF THE HAND.

Fig. 1. A View of the Anatomical Relations of the Bones of the Wrist.—1. The lower extremity of radius. 2. The ulna. 3. The first row of the carpal bones. 4. The second row. 5. The bones of the metacarpus. After Bernard and Huette.

Fig. 2. Circular Amputation at the Wrist-Joint.—1. The radius. 2. The ulna. 3, 3. Flap of skin reverted. 4. The catlin dividing the front of the joint. After Bernard and Huette.

Fig. 3. Denonvillier's Operation at the Wrist.—1. The radius. 2. The ulna. 3. Semicircular incision on the back of the wrist. 4. The knife about to cut a flap from the palm of the hand. After Bernard and Huette.

Fig. 4. The Stump after the preceding Operation. " "

Fig. 5. Maingault's Operation for Amputation of all the Metacarpal Bones, except that of the Thumb.—1, 2, 3. Anterior flap. 4. The knife, which, having transfixed the palm, is about to cut the flap. After Bernard and Huette.

Fig. 6. Completion of the same Operation.—1, 2, 3. The posterior section. 4. The knife incising the joint. After Bernard and Huette.

Fig. 7. Disarticulation of the Thumb.—1, 2, 3. Line of the incision so as to form an oval wound. After Bernard and Huette.

Fig. 8. The Thumb, being carried across the Palm of the Joint, is opened on its External Side.—1. The head of the metacarpal bone. 2. The bistoury. After Bernard and Huette.

Fig. 9. Union of the Wound, showing the Line of the Cicatrix and the Appearance of the Hand after the Amputation. After Bernard and Huette.

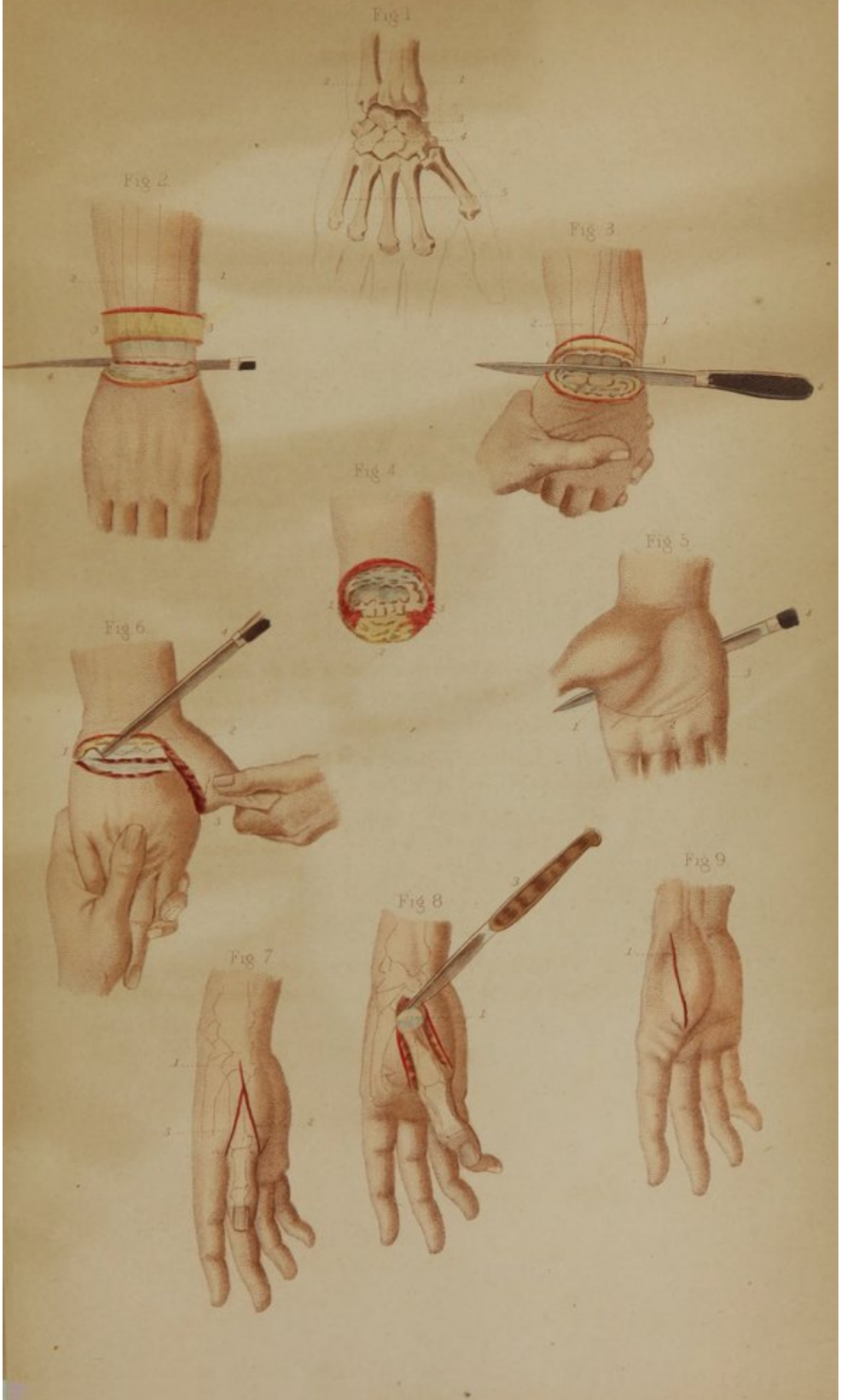


Fig 1
Fig 2
Fig 3
Fig 4
Fig 5
Fig 6
Fig 7
Fig 8
Fig 9

placed in a suitable position, the tourniquet, or manual compression, should be applied to the artery, and the limb carried off from the trunk to nearly a right angle with the body, whilst the surgeon places himself in such a position as will give him perfect freedom in his movements. Then, holding the large amputating-knife firmly in the right hand, let him grasp the upper part of the patient's arm with his left hand, the lower being supported by an assistant, and stooping down, carry the knife so far round the arm that he may commence the incision well on the top of it, the point of the knife presenting to his own shoulder. On applying the blade to the skin, let him now divide it by one steady circular sweep, by bringing his elbow to his side, and turning the knife-handle in his hand so as to bring the heel of the blade to terminate the incision. The looseness of the attachment of the skin to the fascia permitting considerable motion, it is only necessary for the assistant to retract it (Plate LXXII. Fig. 9) until the surgeon again, by one sweep and firm pressure, divides all the tissues down to the bone. The double-tailed retractor being now applied, the bone should be carefully sawed off, any spiculæ that remain excised by the bone-nippers, the main artery picked out and tied, and then the tourniquet loosened, or the compression lessened so as to show the smaller vessels.

The hemorrhage being carefully arrested, the ligatures should be so arranged that they may be brought out of the angles of the wound, the two sides of which should then be closed and united by one or two sutures, and the stump (Plate LXXII. Fig. 10) dressed with cold or tepid water-dressing, according to the season.

Should the inflammation of the part, or the effects of disease, have led to thickening and adhesions of the skin to the fascia, the former may be turned back, like the cuff of a coat, before the division of the muscles, as in the circular amputation of the leg.

The flap operation, as shown in Plate LXXII. Fig. 8.

SECTION III.

AMPUTATION AT THE ELBOW-JOINT.

Velpeau's Operation.—The hand being strongly supinated, and the forearm slightly flexed, a circular cut should be made through the integuments about three fingers' width below the bend of the

PLATE LXXV.

AMPUTATION OF THE FINGERS.

Fig. 1. Amputation of all the Fingers at once.—1, 2, 3. Semicircular line of incision over the metacarpo-phalangeal articulations. 4. The catlin about to form flaps from the palmar surfaces of the four fingers.
After Bernard and Huette.

Fig. 2. The Stump after the preceding Operation.—1, 2, 3. The palmar flap. After Bernard and Huette.

Fig. 3. Circular Amputation through the Metacarpal Bones.—1, 1. Retractors passed between each bone. 2. The saw in the act of dividing them. After Bernard and Huette.

Fig. 4. Disarticulation of the Metacarpal Bone of the Little Finger by the Oval Method.—1, 2, 3. Line of incision. After Bernard and Huette.

Fig. 5. Amputation through the Fifth Metacarpal Bone.—The bone has been sawed through obliquely, whilst a compress protects the soft parts.
After Bernard and Huette.

Fig. 6. Appearance of the Cicatrix after the Operation of Fig. 4.
After Bernard and Huette.

Fig. 7. Disarticulation of a Finger by the Oval and Flap Operations.—*Little finger*, 1, 2, 3. Wound left by the oval method. *Middle finger*, 1, 2, 3. Wound left by the flap operation. After Bernard and Huette.

Fig. 8. Anatomical Relations of the Palmar Surface of the Phalanges of a Finger.—1. The metacarpal bone. 2. The first phalanx. 3. Its lower extremity. 4. Second phalanx. 5. The third phalanx.
After Bernard and Huette.

Fig. 9. Relations of the Flexor Tendons to the Bones.—1, 1, 1. The three phalanges. 2. Tendon of the flexor sublimis. 3. Tendon of the flexor profundus. After Bernard and Huette.

Fig. 10. A side View of the Relations of the Bones of a Finger when flexed, as in Amputation at the joints. After Bernard and Huette.

Fig. 11. Lisfranc's Amputation of the Phalanx of a Finger at the Joint, showing the position of the finger and the knife in the first incision.
After Bernard and Huette.

Fig. 12. The same Operation.—A flap is about to be formed from the palmar surface of the finger. After Bernard and Huette.

Fig. 13. Palmar View of Lisfranc's Operation, when it is commenced on the Front of the Finger.—1, 2, 3. The flap. After Bernard and Huette.

Fig. 14. The Flap turned up to show the Disarticulation.
After Bernard and Huette.

Figs. 15, 16, 17. Different Stumps resulting from the flap, oval, and circular operations. After Bernard and Huette.

Tate 75

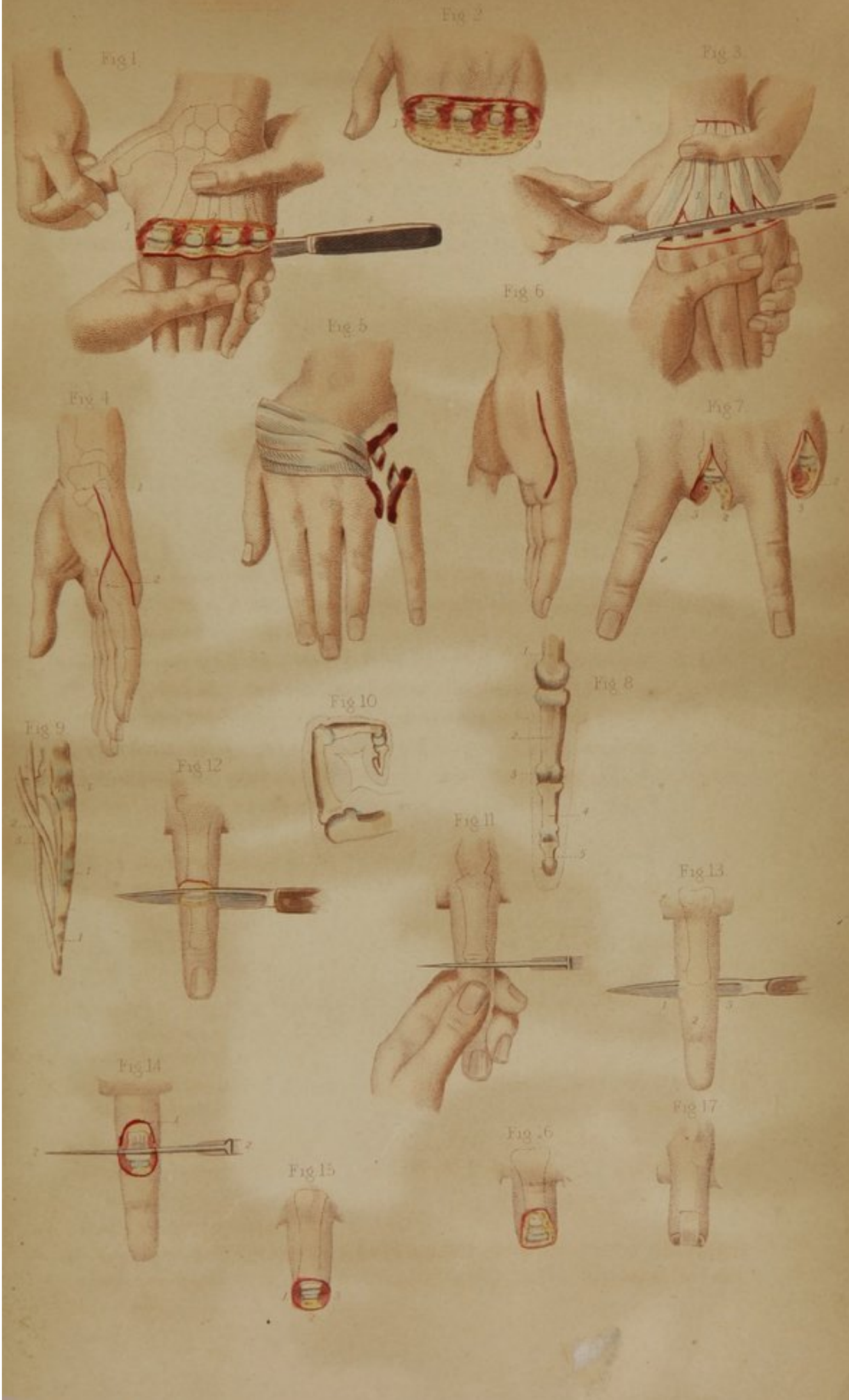


Fig 1
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Fig 17

below; then, dissecting up and reverting this flap (Plate LXXIII. Fig. 6), cut through the muscles at one sweep, divide the lateral ligaments, open the joint in front, and then divide the triceps tendon above the olecranon process. The main trunk of the brachial is the principal artery to be tied, after which the wound can be readily closed by uniting the skin transversely.

SECTION IV.

AMPUTATION OF THE FOREARM.

In amputating this portion of the upper extremity, every effort should be made to preserve as great an amount of the member as possible, in order to facilitate its subsequent usefulness, whether the patient contemplates using an artificial limb, or merely a hook.

This amputation may be best accomplished by the ordinary circular method (Plate LXXIII. Fig. 8), a retractor of two tails being prepared in order to protect the parts more effectually by one tail being passed through the interosseous space (Plate LXXIII. Fig. 9).

The flap operation is also applicable to this member, but does not form so good a stump, when the amputation is required at the lower third of the arm. At its upper third, it may be performed by forming a flap anteriorly and posteriorly out of the thickness of the flexor and extensor muscles. The circular operation at the wrist-joint forms a good stump (Plate LXXIV. Fig. 2), and should be performed in preference to the amputation at the upper third of the forearm, whenever the injury is confined to the hand.

SECTION V.

AMPUTATION OF THE FINGERS.

Amputation of the various phalanges may be accomplished by either the flap, oval, or circular methods, and is sufficiently explained in Plate LXXV.

The flap method, by the plan of Lisfranc (Plate LXXV. Figs. 11, 12), is generally the best for an amputation at the different articulations of the phalanges with each other; the circular is best

adapted to the operation through the body of each phalanx, and the oval to the removal of the finger at the metacarpo-phalangeal articulation, as shown in Plate LXXV. Fig. 7.

CHAPTER VIII.

AMPUTATIONS OF THE LOWER EXTREMITY.

Amputation of the lower extremity requires the observance of nearly the same general rules as have been detailed under the head of amputations in general. The necessity for the preservation of as great a length of limb as possible is also absolute in this extremity, except when the amputation is to be performed on the leg, and the patient anticipates wearing the common wooden leg, or peg. Under these circumstances, the limb should not be taken off at more than four fingers' breadth from the tubercle of the tibia, as a greater length of stump would incommode the patient, in consequence of its protruding behind the perpendicular line of the opposite limb when the patient walked.

Amputation of the lower extremity may be performed either at its different articulations or in the continuity of the bones.

SECTION I.

AMPUTATION AT THE HIP-JOINT.

Amputations of the femur by disarticulating the head of the bone has occasionally been practiced, but, as it generally leaves a large suppurating surface, and a stump upon which it is exceedingly difficult to apply an artificial limb, it should not be resorted to if it is possible to remove the disease by an amputation high up through the shaft of the bone.

In the United States, this operation was first performed by Dr. Walter Brashear, of Kentucky, now of New Orleans, in 1806,* and

* Trans. Am. Med. Association, vol. iv. p. 269, 1851.

by Dr. Mott, of New York, in October, 1824,* by disarticulating the bone after ligating the femoral artery. It has since been performed by Dr. Brainard, of Chicago,† and Van Buren, of New York,‡ in a case in which the shaft of the femur had been previously amputated; by May, of Washington; and by Drs. Richards and Clagget, of Maryland.§

Of the various methods of operating, the flap and oval are the best, the circular being objectionable on various grounds. In either method, it is, however, essential that the anatomical relations of the articulation should be kept distinctly in view by the operator. As these are figured in Plate LXXVI. Fig. 1, the repetition of them may be omitted at present. When the flap operation can be attempted, the methods by the formation of one flap, as shown in Plate LXXVI. Figs. 2, 3, will prove the best.

Lalouette's Operation.‖—The patient lying on the sound side, make a semicircular incision from the upper and external part of the great trochanter to the tuberosity of the ischium, so as to divide all the soft parts down to the joint. On recognizing the articulation, direct the assistant to rotate the limb inwards, so as to cause the external surface of the capsular ligament to be put upon the stretch, and then with a strong bistoury or the knife, divide the posterior and external face of the capsule, as well as the round ligament; flex the thigh strongly on the abdomen, so as to disarticulate the head of the bone, traverse the front of the joint with the knife, and, passing along the internal side of the thigh, cut a flap on its inner side, four or five inches long (Plate LXXVI. Fig. 3), the artery being compressed in the flap, or upon the bones of the pelvis by the hand of an assistant. After checking the hemorrhage, bring the flaps together, and let the ligatures come out below, unite the skin by a stitch or two, and then apply adhesive strips, a compress and firm bandage, in order to facilitate the union of the deeper-seated parts.

Operation of Dr. Van Buren, of New York.¶—Having amputated the thigh two years previously, near its middle, in consequence of the formation of a "true osteo-cartilaginous exostosis," and the

* Phil. Journ. Med. and Phys. Sciences, vol. xiv., or v. N. S. p. 107, 1837.
† Am. Journ. Med. Sciences, vol. xxii. p. 37, 1838.
‡ Trans. of New York Acad. of Medicine, vol. i. p. 123.
§ Trans. Am. Med. Association, vol. iv. p. 270.
‖ Malgaigne, Phil. edit. p. 266.
¶ Trans. New York Acad. of Medicine, p. 135.

PLATE LXXVI.

AMPUTATION AT THE HIP-JOINT.

Fig. 1. Anatomical Relations of the Bones forming the Joint, together with the Position of the Artery.—1. Iliac fossa. 2. Shaft of femur. 3. Position of its head in the joint. 4. External iliac artery. 5, 6. Anterior, superior, and inferior spinous processes. 7. Trochanter minor of the femur. 8. Ischium. 9. Pubis. After Bernard and Huette.

Fig. 2. Amputation at the Hip-Joint by the Flap Operation.—1, 2, 3. Anterior flap. 4. The long catlin about to cut the anterior flap. After Bernard and Huette.

Fig. 3. Amputation at the Hip-Joint by Lateral or External and Internal Flaps.—1. The long catlin transfixing the limb directly behind the head and neck of the femur. 2, 3, 4. Line of external flap. 2, 5, 6. Line of internal flap. After Bernard and Huette.

Fig. 4. Continuation of this Operation, when it only remains to Disarticulate the Bone.—1, 2, 3. The external flap. 4. The internal flap. 5. The femur. The position of the vessels is shown by the ligatures. After Bernard and Huette.

Fig. 5. Continuation of the Flap Operation, as shown in Fig. 2.—1. Hand of assistant raising the anterior flap. 2. The head of the femur disarticulated. 3, 4. The arteries as tied. 5. A compress protecting the scrotum and opposite thigh. 6. The long catlin, which, after dividing the capsular ligament, is about to shave the posterior flap from the bone. After Bernard and Huette.

Fig. 6. Appearance of the Wound left in the preceding Operation.—1, 2, 3. Line of the anterior flap as reverted upwards, in order to show the position of the vessels, as well as the acetabulum. 1, 3, 4. Posterior flap. 5. The acetabulum. After Bernard and Huette.

Fig. 7. Van Buren's Operation for Amputation at the Hip-Joint by the formation of an Anterior Flap in front and a Circular Incision behind, so as to diminish the time required in the formation of two flaps by the withdrawal of the catlin.—1. Right hand of surgeon. 2. Position of the catlin in the posterior or circular incision. 3. Left hand of the surgeon abducting the thigh so as to disarticulate the bone. 4. Hands of the first assistant holding up the anterior flap, and compressing the artery in it. 5. Hands of the second assistant. After Van Buren.

Fig. 1.

Fig. 2.

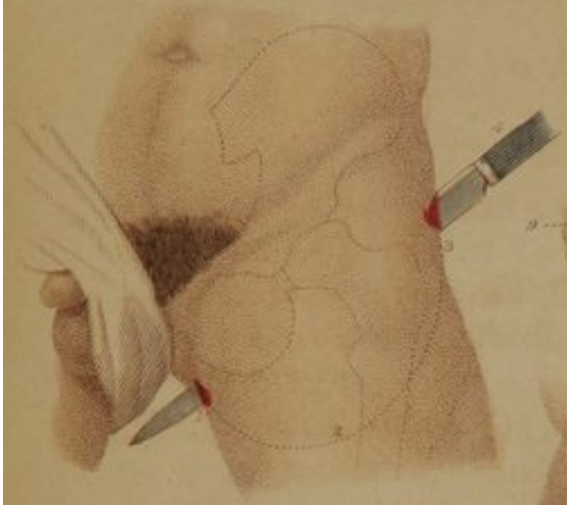


Fig. 3.

Fig. 4.

Fig. 5.

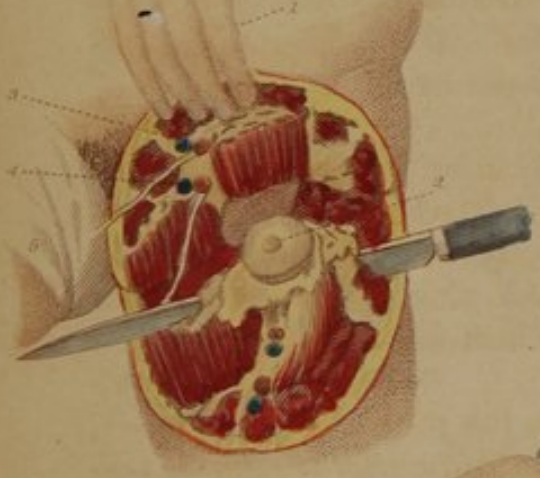


Fig. 6.

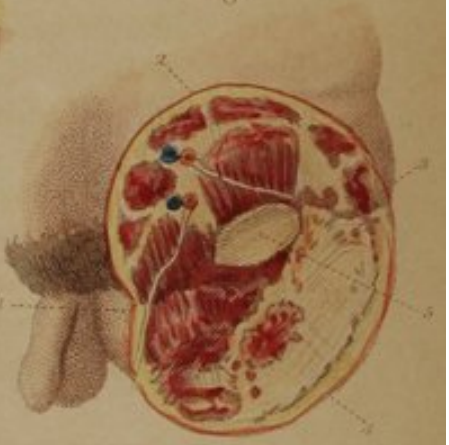


Fig. 7.

disease having subsequently returned, Dr. Van Buren advised amputation at the hip-joint, to which the patient consented.

Operation.—The patient, being in a perfect state of anæsthesia through the influence of chloroform, was placed upon the table, with the buttocks projecting over the edge, the diseased limb held by an assistant previously instructed as to its management, and the other limb and scrotum being held out of the way, the artery was firmly compressed against the pubes.

The surgeon, having now placed himself on the outer side of the limb, seizes it near its middle with his left hand, and with the long ten-inch catlin in his right hand transfixes the hip by entering the knife about one inch above the great trochanter, grazing the head and neck of the femur, if possible, as it passes in front of it, and then pushing its point through the integuments near the anus, at a point diametrically opposite to its point of entrance, so as to cut an anterior flap at least six inches long. The first assistant should now pass one hand into the wound behind the knife, and grasp the flap, and with it the artery, carrying the flap forcibly upwards with both hands over the groin (Plate LXXVI. Fig. 7). The surgeon, then kneeling a little, should carry the knife to the inner side of the thigh, taking care not to injure the neighboring parts with its point, as it is carried round, and placing the heel of the knife on the integuments at the internal angle of the wound (Plate LXXVI. Fig. 7), carry it across the tissues on the back of the thigh, down to the bone, so as to join the opposite angle of the anterior incision. The catlin being now laid down, the femur should be forcibly abducted, and the capsule of the joint opened by a strong and large scalpel, as near as possible to the acetabulum; the round ligament and the rotator muscles near the trochanter divided; and the limb removed. A large compress or folded towel being then immediately applied to the surface of the posterior flap by the assistant who lays down the amputated limb, the arteries are to be secured in detail, the gluteal and ischiatic being tied before the femoral and profunda if the latter are well controlled in the anterior flap. The wound is then closed, as before directed.

Remarks.—Various modifications of the amputation at the hip-joint have been from time to time suggested, among which is that of Dr. Ashmead, of Philadelphia, in which flaps are formed by cutting from the surface inwards, and then disarticulating the bones. But I should prefer the method of Lalouette to all of them, when circumstances permit it, as the hemorrhage can be more readily and

PLATE LXXVII.

AMPUTATIONS OF THE THIGH.

Fig. 1. The Circular Operation.—1. The knife dividing the muscles. 2. Hand of assistant favoring their retraction, and holding back the skin. 3. Hand of another assistant compressing the femoral artery when the tourniquet is not employed. 4. Circular incision in the integuments. The perspective of this line is slightly misrepresented in the drawing.

After Bernard and Huette.

Fig. 2. Amputation of the Thigh by the Double Flap Operation of Sedillot. —1. Tourniquet applied on the artery. 2. The long catlin about to form the second flap. 3. Hand of the surgeon grasping the soft parts, and drawing them off from the bone. 4. First or exterior flap, as cut from the centre of the thigh outwards. 5, 6. Line of incision for the inner flap.

After Bernard and Huette.

Fig. 3. Sawing the Bone in the Circular Operation.—1. A retractor protecting and retracting the soft parts. 2. The large amputating saw.

After Bernard and Huette.

Fig. 4. Amputation through the Knee-Joint by the Flap Operation.—1, 2, 3. Line of anterior incision. After Bernard and Huette.

Fig. 5. Circular Amputation through the Knee-Joint.—1, 2, 3. Line of the incision below the joint. 4. The integuments turned back. 5. The knife opening the joint in front. After Bernard and Huette.

Fig. 6. Amputation by the Oval Method.—1, 2, 3. Line of the incision below the joint. 4. Flap reverted. 5. The knife disarticulating the bones. After Bernard and Huette.

Fig. 7. Continuation of the Flap Operation as commenced in Fig. 4.—1, 2, 3. Line of incision for the formation of the posterior flap. 4. Front of the condyles of femur. 5. The catlin. 6. Hand of the surgeon holding the tibia so as to favor the formation of the flap. After Bernard and Huette.

Plate 77.

Fig.1.

Fig.2.

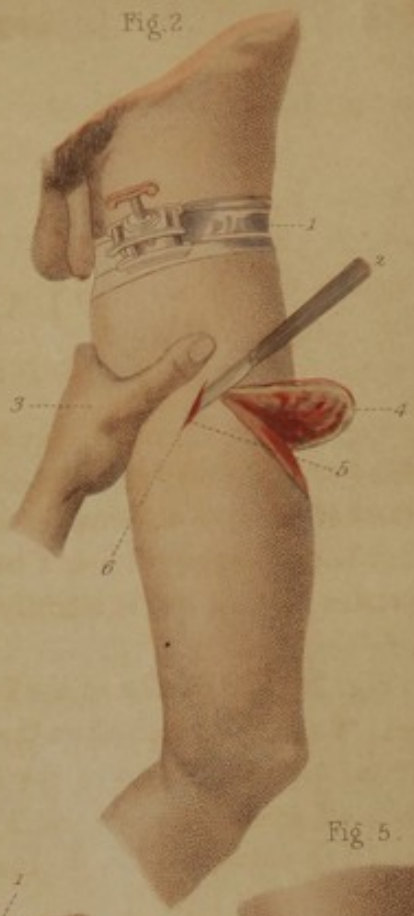


Fig.3.

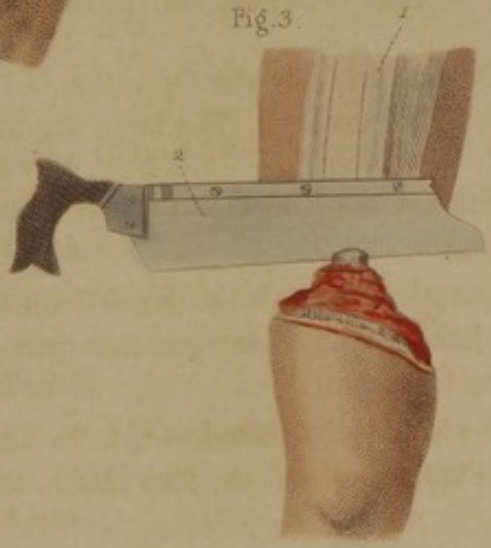


Fig.4.

Fig.5.

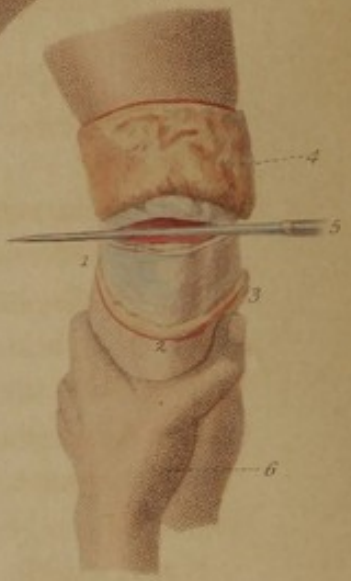
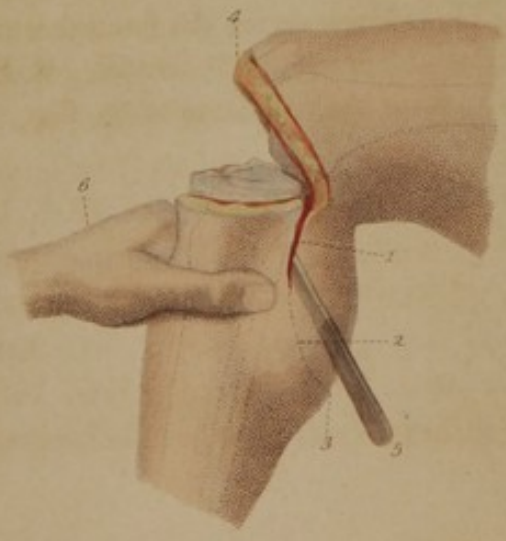


Fig.6.

Fig.7.



coolly arrested by tying the vessels in the outer incision before dividing those in the flap formed on the inside of the limb. The surface of the flap is also well adapted to closing up the acetabulum and surrounding parts.

SECTION II.

CIRCULAR AMPUTATION OF THE THIGH.

As usually performed, this operation corresponds with the circular operation, described upon the humerus. In a large and muscular limb, the following operation may, however, be made to form quite as good a stump, and be more quickly performed, as it removes the necessity of dissecting up the cuff of the skin.

Operation of Alanson.—The limb being carried off from the other, and the artery compressed, the surgeon should place himself between the limbs or upon the outer side, as he finds most convenient, and then, whilst the skin is retracted by the hands of an assistant, divide it circularly, by holding the knife as directed for amputation of the arm. After making this incision, touch with the point of the knife the cellular attachments of the skin to the fascia, so as to favor its retraction by the assistant (Plate LXXVII. Fig. 1), and again applying the knife with its edge directed obliquely upwards, divide the muscles to the bone; have them also retracted by the hand; divide the few fibres adherent to the bone, a little higher up; apply the retractor; and saw the bone close to the muscles, when a conical hollow stump will thus be formed with the bone in the end of the cone. Ligate the femoral and other arteries; see that the ischiatic nerve does not protrude; cut it short, if it does; bring the ligatures out of the lower side of the wound, and unite it longitudinally to the axis of the limb by two sutures and adhesive strips, applying subsequently the water dressing.

Flap Operation.—The flap operation may be performed either by forming an anterior or posterior flap, or by an external and internal one (Plate LXXVII. Fig. 2). The first is preferable, as it prevents the tendency of the end of the bone to project at the anterior end of the angle formed by the union of the internal and external flaps, which is very apt to ensue unless care is taken to support the muscles and prevent their gravitating to the back of the

PLATE LXXVIII.

AMPUTATIONS OF THE LEG.

Fig. 1. The Circular Amputation of the Leg, as usually performed below the Knee.—1, 2, 3. Line of circular incision through the skin. 4. The cuff of skin reverted. 5. Hand of the surgeon holding the knife in its proper position for commencing the circular sweep which divides the muscles.

After Bernard and Huette.

Fig. 2. Continuation of the same Operation.—1, 2, 3. Line of incision in the skin. 4. The retractor protecting the soft parts. 5. The large amputating saw applied so as to divide the fibula and tibia nearly at the same moment. After Bernard and Huette.

Fig. 3. Appearance of the Wound left in this Operation.—1. Hand holding up the integuments. 2, 2, 2. Position of the bloodvessels in the stump. 3. Section of the tibia. 4. Section of the fibula. After Bernard and Huette.

Fig. 4. Different Positions of the Catlin in dividing the Muscles close to the Bones and in the Interosseous Space.—1. Tibia. 2. Fibula. 3. Position of the catlin in clearing the superior and inner side of the fibula. 4. The same for the parts around the tibia. After Bernard and Huette.

Fig. 5. The same Operation, as performed on the Under Side of the Leg.—1, 2. Tibia and fibula. 3. First position of the knife.

After Bernard and Huette.

Fig. 6. Appearance of the Wound after Lenoir's Amputation of the Right Leg.—1, 2. Lateral angles of the flap. 3. Tibia. 4. Fibula.

After Bernard and Huette.

Fig. 7. Changes made by Nature in the Femur after an Amputation.—1. The shaft. 2. Cut extremity as closed and rounded by nature.

After Bourgery and Jacob.

Fig. 8. Changes in the Stump, as seen several months after an Amputation.—1. Upper part of stump. 2. Integuments on its end. 3. Muscle cut across. 4. The artery. 5, 5. The veins. 6. The nerve. 7. Muscular branch of the artery. After Bourgery and Jacob.

Fig. 9. Appearance of the Tibia after Amputation.—1. Its head.—2. Portion cut by the saw, and rounded off by nature.

After Bourgery and Jacob.

Fig. 10. Application of a Boot to the Stump formed by amputating at the Ankle-Joint.—1. The leg. 2. A cushion. 3. A cork in the heel of the boot.

After Bourgery and Jacob.

Fig. 11. A Boot adapted to the Stump of the Foot, after Lisfranc's Operation.—1. The leg. 2. A cushion. 3. A cork to fill up the toe of the boot.

After Bourgery and Jacob.

Plate 78.

Fig 1.

Fig 2.

Fig 3.

Fig 5.

Fig 4.

Fig 6.

Fig 8.

Fig 7

Fig 10.

Fig 9.

Fig 11.

thigh. The operation by the external and internal flaps is shown in Plate LXXVII., and the antero-posterior flaps may be formed as follows:—

Operation of Vermale.—Seize the muscles on the front of the thigh with the left hand, elevate them from the bone, and, transfixing them with the long catlin, cut a flap of proper length by passing the catlin from within outwards, and from above downwards. Then insert the point of the knife at the same spot, working it around the bone; bring it out at the spot where it first appeared; and then, cutting the posterior flap, divide the few fibres immediately around the bone, apply the retractor, draw back the flaps, saw the bone, and unite the flaps transversely. Care should be subsequently taken, in the cold water dressing, to make pressure on the lower flap by the pillow, so as to guard against collections of pus.

SECTION III.

AMPUTATION AT THE KNEE-JOINT.

Amputation at this articulation has been accomplished by all the methods before mentioned, the flaps being differently formed by different surgeons, and Plate LXXVII. explains these methods sufficiently well without further reference.

Remarks.—Amputation at the knee-joint is an operation that has been variously estimated by different surgeons; but, without referring to their views in detail, in relation to the greater mortality consequent upon the amputation through or above the articulating surfaces, I may mention that one serious objection to it is the difficulty of obtaining a stump that will subsequently sustain pressure without leading to ulceration of the soft parts. The shape of the condyles unfits them for this, and, as an artificial limb can be quite as readily applied to a stump formed by amputating a few inches higher, where the parts are fully able to bear pressure, I should always prefer the amputation above the joint to that through it. There are other serious objections that might be urged against this operation; but my space compels me to pass them by.

SECTION IV.

AMPUTATION OF THE LEG.

The circular operation for amputation of the leg is so similar to that of the forearm as not to require a special description, except to mention that, in sawing the bones, it is best to saw through the fibula first, and at a point a little above that selected for the tibia (Plate LXXVIII. Figs. 1, 2).

Flap Operation of Verduin.—The artery being compressed on the thigh, and the leg carried somewhat off from its fellow, the surgeon, standing on the inner side of the limb for the left leg, and on the outer for the right, unless the operator is ambidexter, should feel for the fibula, and, drawing the muscles of the calf off from the bones, transfix them with an eight-inch catlin, passed close to the bones, but not so as to pass between them, and cut a flap about three and a half inches long. Withdrawing the catlin, place it with its heel on the far side of the limb, at the point where it punctured the skin, and form an anterior semicircular flap, by drawing it towards you, terminating the incision at the internal point of puncture. Perforate the interosseous ligament with a small catlin, cut the fibres around the bones (Plate LXXVIII. Figs. 4 and 5), apply the double retractor, saw the bones, and unite the flaps by one or two sutures.

Remarks.—This operation usually forms a well-covered stump, and may, with a little practice, be very promptly performed.

Lenoir's operation, which is figured in Plate LXXVIII. Fig. 6, forms a good stump, and is well calculated for the attachment of an artificial limb.

SECTION V.

AMPUTATION OF THE FOOT AT THE TARSUS.

In order to save as much of the foot as might suffice to support the patient, amputation through the tarsal and metatarsal joints has been suggested, and often practiced. Either of these amputations requires an accurate knowledge of the relations of the articulating surfaces of the bones, and should not be attempted without a recent

examination of the part by those not perfectly familiar with it. In the hands of an anatomist, they constitute two of the most valuable and scientific methods of amputating ever resorted to. To facilitate reference, the parts have been fully shown in Plates LXXIX., LXXX.; and their anatomical relations may, therefore, be omitted here.

CHOPART'S OPERATION.—After recognizing the position of the joint, grasp the foot with the left hand, so that its palm may present to the sole of the patient, placing the thumb upon the external extremity of the joint, and the forefinger upon the internal. In the right foot, the thumb would rest against the cuboid, and the forefinger on the scaphoid bones, whilst in the left foot it would be the reverse.

Then carry a small catlin across the top of the foot from the thumb to the point of the forefinger, making a semicircular incision which shall descend about half an inch in front of the articulation. Let the assistant draw up the skin, and then divide the extensor tendons and the dorsal ligaments, rendering the latter tense by pressing the toes downwards (Plate LXXIX. Fig. 2). Then divide the lateral ligaments, and pass the knife through the articulation at such an angle of inclination as will enable it to adapt itself to the surface of the bones, after which the flap should be formed by shaving it off from the sole of the foot (Plate LXXIX. Fig. 3).

LISFRANC'S OPERATION.—Amputation at the metatarso-tarsal articulation was suggested by Mr. Hey, of England, who accomplished it by sawing off the ends of the metatarsal bones; and the amputation is, therefore, now often spoken of as Hey's operation. The disarticulation is, however, the operation of Lisfranc, and should be so called. To find the joint,* "draw a transverse line across the foot, from the superior extremity of the fifth metatarsal bone, and it will fall upon the inside of the foot two-thirds of an inch *behind* (or above) the articulation."

OPERATION.—After finding the position of the joint, seize the foot, so that the thumb, if in the right foot, shall rest on the tuberosity of the fifth metatarsal bone, and the index or second finger half an inch in advance of the internal side of the joint at the cuneiforme internum (Plate LXXIX. Fig. 9). Then, with a strong short catlin, make a semicircular incision on the dorsum of the foot,

* Malgaigne.

PLATE LXXIX.

AMPUTATIONS OF THE FOOT.

Fig. 1. A View of the Bones composing the Tarsal Articulation, as concerned in Chopart's Operation.—1. Astragalus. 2. Os calcis. 3. Cuboid. 4. Scaphoid. 5. Internal point of joint, or tuberosity of scaphoid bone. 6. External point of the articulation. 7. Head of fifth metatarsal bone. 8. Fibula. 9. Tibia. 10, 10. Two pins to show the direction of the articulating surfaces or line in which the knife must be passed.

After Bernard and Huette.

Fig. 2. Position of the Hand of the Surgeon, and Line of Incision in Chopart's Operation.—1, 2, 3. Line of incision. After Bernard and Huette.

Fig. 3. Continuation of same Operation.—The joint being opened, the knife is about to form a flap from the sole of the foot. 1. Anterior tibial artery. 2. The knife. After Bernard and Huette.

Fig. 4. Sedillot's Operation.—1, 2, 3. Line of incision.

After Bernard and Huette.

Fig. 5. Side View of the Outer Side of the Bones of the Tarsus, showing the Oblique Direction of the Articulating Surfaces over which the Knife is to pass.—1. Os calcis. 2. Cuboid. 3. Pin in the joint. 4. Joint between the astragalus and scaphoid, with a pin in it to show its inclination.

After Bernard and Huette.

Fig. 6. Side View of the Inner Side of the same Bones.—1. Astragalus. 2. Scaphoid. 3, 4. Pins in the joints. After Bernard and Huette.

Fig. 7. Dorsal View of the Bones of the Entire Foot.—1. Tibia. 2. Fibula. 3. Astragalus. 4. Os calcis. 5. Scaphoid. 6. Cuboid. 7. Internal cuneiforme. 10, 11, 12, 13, 14. The five bones of the metatarsus. 15. The phalanges of the toes. After Bernard and Huette.

Fig. 8. Dorsal Articulating Ligaments of the Foot.—1, 1. Anterior tibio-tarsal ligament. 2. Anterior portion of the external lateral ligament. 3. Internal calcaneo-scaphoid. 4. External calcaneo-scaphoid. 5. Astragalo-scaphoid. 6. Calcaneo-cuboid. 7. Scaphoideo-cuneiforme. 8. Cuboideo-metatarsal. 9. Cuneiforme-metatarsal ligaments. After Bernard and Huette.

Fig. 9. Lisfranc's or Hey's Operation on the Right Foot.—1, 2, 3. Line of incision in the skin. 4. Thumb of the surgeon on the extremity of the fifth metatarsal bone. 5. His forefinger on the metatarsal bone of the first toe.

After Bernard and Huette.

Fig. 10. Manner of Opening the Articulation of the Second Metatarsal with the Middle Cuneiforme Bone.—1, 2, 3. Arch of the circle formed by the knife in its different positions. 4. Second metatarsal bone. 5. First metatarsal bone. 6. End of the fifth metatarsal bone. After Bernard and Huette.

Tafel 79.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 10.

Fig. 7.

Fig. 9.

Fig. 8.

cutting from the thumb towards the finger half an inch in front of the articulation, and by a few touches of the point of the knife upon the adhesions facilitate the retraction of the skin by an assistant. Then placing the point of the knife close to the end of the fifth metatarsal bone, divide the lateral and dorsal ligaments, and open the joint as far as the third metatarsal bone. At this point, carry the point of the knife half an inch backwards, or near the ankle; cut the dorsal ligaments; and expose the second metatarsal bone. Then cutting only with the point of the knife, and holding it perpendicularly (Plate LXXIX. Fig. 10), graze the tibial surface of the first metatarsal bone, and by a sawing motion open the joint between it and the internal cuneiforme. Divide the interosseous ligament, press upon the metatarsus, and complete the division of the remaining ligaments, when the flap should be formed out of the integuments on the sole of the foot by shaving them off close to the metatarsal bones.

SECTION VI.

AMPUTATION OF THE TOES.

Amputation of the Toes (Plate LXXX.) may be usually accomplished by the same methods as the fingers, with the exception of the articulation at the metatarsal bone of the first toe. In this amputation, whether performed by the flap, oval, or circular method, it has been recommended to saw off the round head of the first metatarsal bone after the phalanx is removed, as it is apt to become a source of irritation from pressure against the boot. But if the hard skin of the under surface of the foot can be made to cover it thoroughly, I think it is better not to do so, as this end of the bone is of great service in giving the patient a firm step, and preventing an inclination of the foot inwards. The other amputations of the toes are sufficiently explained in Plate LXXX. Figs. 5 to 12.

SECTION VII.

ORGANIC CHANGES RESULTING FROM AMPUTATIONS.

The changes which result from the removal of a portion of the extremities by amputation may be noticed both in the part and in

PLATE LXXX.

AMPUTATION OF THE TOES.

Fig. 1. The Dorsal Ligaments opened by the Puncture of the Knife in Lisfranc's Operation, as shown in Fig. 10, Plate 79.—1, 2, 3. Points opened. 4. Hand of surgeon. After Bernard and Huette.

Fig. 2. Manner of forming the Flap from the Sole of the Foot in Lisfranc's Operation.—1. Anterior tibial artery. 2. Resection of hand of surgeon on the foot whilst forming the flap. 3. Position of the knife. After Bernard and Huette.

Fig. 3. Wound left after Lisfranc's Operation.—1, 2, 3. Shape of plantar flap. 4. Dorsal flap. After Bernard and Huette.

Fig. 4. Wound left in Chopart's Operation.—1, 2, 3. Plantar flap. 4, 4. Bloodvessels. After Bernard and Huette.

Fig. 5. Amputation of all the Toes through the Metatarsal Bones.—1. The retractor passed in each interosseous space. 2. The saw. After Bernard and Huette.

Fig. 6. Wound left by the preceding Operation.—1, 2, 3. The plantar flap. After Bernard and Huette.

Fig. 7. Disarticulation of all the Toes.—1, 2, 3. Line of the dorsal incision in front of the joints. After Bernard and Huette.

Fig. 8. Continuation of the same Operation.—1, 2, 3. The dorsal incision. 4. The catlin, after opening the joints, about to form a plantar flap. After Bernard and Huette.

Fig. 9. Wound left by the preceding Operation. After Bernard and Huette.

Fig. 10. Disarticulation of the Third and First Toes.—1, 2, 3, 4. Wounds resulting from the oval method on the great toe. 1, 2, 3. Wound formed by two flaps on the third toe. After Bernard and Huette.

Fig. 11. 1, 2, 3. Line of incision in disarticulation or resection of the first metatarsal bone. After Bernard and Huette.

Fig. 12. Amputation of the Great Toe.—1, 2, 3, 4. Line of incision in the oval operation. After Bernard and Huette.

Fig. 1.

Fig. 4.

Fig. 2.

Fig. 3.

Fig. 6.

Fig. 5.

Fig. 9.

Fig. 8.

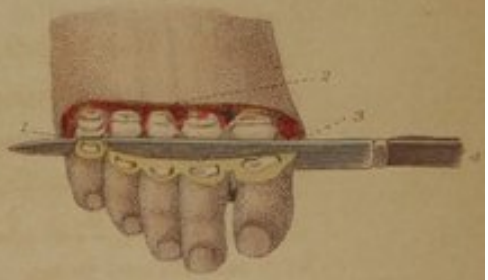


Fig. 7.

Fig. 10.

Fig. 11.

Fig. 12.

the general health of the patient within a short period after the operation.

In the stump, the approximation of the superficial to the deeper-seated parts produced by closing the wound naturally leads to a general matting together of the skin, fascia, muscles, bloodvessels, and nerves, whilst the inflammatory changes connected with the process of healing often create bands of condensed cellular tissue, which, when thickened by pressure, become almost cartilaginous in their density. The division of the nerves of the part is most frequently followed by a bulbous enlargement at, or near the point of section, and if their extremities become inflamed, or involved in the line of the cicatrix, the contraction of the latter, by pressing upon them, will occasionally induce severe neuralgia, which, in some instances, has required the stump to be opened, and the nerves to be dissected from the part. For a few weeks after the healing of the stump, any angles caused by closing the wound remain prominent, and the cicatrices which are formed near them cause a wrinkling of the surrounding integuments; but ultimately the process of absorption and deposition equalizes the surface to a considerable extent, making it much more round and ball-like than before, provided a free amount of integument has been preserved in forming the flap. The cancellated structure of the bone becoming also more or less inflamed after its section, effusion of lymph ensues, and this becoming organized a new deposition of bone follows, closes the medullary cavity, and gives to the extremity a sort of cap, which, becoming rounded and convex (Plate LXXVIII. Figs. 7, 9), is well adapted to sustain pressure without irritating the soft parts which are forced against it.

The constitutional changes ensuing upon amputation are often not less marked than the local alterations. In amputations for chronic diseases, and especially in those accompanied by hectic fever, the first night of comfort obtained by the patient is often that immediately ensuing on the operation, whilst the fever will sometimes disappear promptly. When the portion of the extremity that has been removed is considerable, there is apt to be considerable disturbance of the equilibrium of the system, the process of nutrition goes on rapidly, and the patient increases in size to a remarkable degree. At the same time, there is a liability to plethora which may require treatment.

SECTION VII.

SUBSTITUTES FOR THE NATURAL LIMB.

After the cure of an amputated limb, the surgeon should make it a point of duty to direct the patient in the attainment of some useful substitute for the portion which has been removed. This must, of course, vary with his social condition.

For the arm of the laboring man, a cap formed of strong leather, to which an iron hook can be attached, and which should be made to strap on to the stump, will answer the purposes of prehension, whilst those of larger means can now obtain excellent substitutes for the arm and hand from various ingenious mechanics. In one instance, a patient, for whom I obtained one of these artificial limbs, was able to grasp his hat and hold other light articles by a neat mechanism that caused the fingers to approach the palm of the hand.

Many varieties of artificial legs can now also be readily obtained, in which the support is furnished by a graduated pressure around the stump. In Plate LXXVIII. Figs. 10, 11, are represented two boots, which will prove useful in affording support to the foot after the performance of Lisfranc's or Chopart's operations. The common peg or wooden leg, usually employed by laboring men as a substitute for the natural leg, requires no further reference, as it is universally known.

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