A

DICTIONARY

OF

PRACTICAL SURGERY:

CONTAINING

A COMPLETE EXHIBITION OF THE PRESENT STATE

OF THE

PRINCIPLES AND PRACTICE

OF

SURGERY,

COLLECTED FROM THE BEST AND MOST ORIGINAL SOURCES OF INFORMATION,

AND ILLUSTRATED BY CRITICAL REMARKS.

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WITH NOTES AND ADDITIONS,

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IN TWO VOLUMES.

VOL. I.

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TO

DOCTOR EDWARD ROBERTS, F. R. S.

Senior Physician

TO

ST. BARTHOLOMEW'S HOSPITAL;

This Book is Dedicated,

AS A

TESTIMONY OF GRATITUDE FOR MANY FAVOURS AND CIVILITIES RECEIVED,

AND OF RESPECT

FOR HIS

PRIVATE AND PROFESSIONAL CHARACTER;

BY

THE AUTHOR.

March, 1809

ADVERTISEMENT.

THE principal reason which has induced the Editor to republish COOPER'S SURGICAL DICTIONARY, is a belief that it contains more useful practical knowledge than any other work of equal extent hitherto made public.

In the United States such a book has long been wanted. The great improvements which Surgery has received since the publication of any regular system, render peculiarly desirable some accurate account of the present state of Surgical practice.

The alphabetical arrangement adopted by Mr. Cooper gives to the present work the advantage of being readily consulted in cases of emergency; and as a book of reference for the younger members of the profession it is confidently recommended.

The Editor has not taken the liberty to alter or omit a single word of Mr. Cooper's book, but has enclosed in brackets [ ] such comments and additions as he has thought necessary or useful.

Philadelphia, March 1, 1810.

PREFACE.

IT seems rather extraordinary that, notwithstanding the study of Surgery has been, for many years past, carried on with indefatigable zeal and industry, no tolerable Dictionary on the subject should ever have made its appearance, at least, in the English language. Numerous systems of Surgery have certainly been written, and some of them, no doubt, have had very great effect, both in facilitating the acquirement of Surgical knowledge, and in giving publicity to the many new facts, which are continually becoming established by the genius and labours of different individuals. Still, however, I must confess, with regret, that I am not at this moment acquainted with any one work, which contains a full account of all the latest discoveries and improvements, or which is free from strong objections, in regard to, what is implied by, the doctrines of Surgery.

I shall not flatter myself with a hope, that this work will altogether supply the deficiency; but, I am certain of one thing, viz. that it comprehends an account of many new opinions and practices, which, though exceedingly interesting, remain unexplained in any systematical treatise hitherto published.

I am aware, that an alphabetical arrangement of Surgery, in the form of a Dictionary, is attended with some disadvantages. The chief of these are, the manner, in which some of the subjects are unavoidably scattered about in various parts of the book, and the frequent trouble, which the reader is put to by the numerous references. However, it is hoped, that these inconveniences, while they are diminished as much as possible, are more than counterbalanced by certain advantages, exclusively belonging to a Dictionary. One great recommendation of a work of this kind, is the ease with which any part of the subject may be immediately found. Another material advantage is, the opportunity, which has been afforded me, of introducing an explanation of the terms, and an account of the chief

remedies and applications used in Surgery. These latter objects, which are of infinite importance, I have endeavoured to fulfil with care and diligence.

A good deal of the matter, which forms the contents of this volume, has been taken from the writings of the most eminent Surgeons. The works of the late Mr. Pott, and the publications of Scarpa, have afforded me essential assistance. However, it is needless for me to enumerate here all the authors, whose labours have contributed to the present performance; because, I have interspersed in the body of the book the various authorities for what is described or recommended.

I have also endeavoured to render this Dictionary still more useful by concluding all the principal articles with a reference to books, from which further information on each particular subject may be derived.

My "First Lines of the Practice of Surgery," I wrote as an introduction to the subject, and the encouragement, which has been given to that work, has exceeded any expections, which I ever entertained.

The Dictionary, which I now publish, is undertaken with a view of making the reader a little more deeply acquainted with several parts of Surgery, than could well be done in an elementary treatise.

I have also chosen to print the work in its present style, in order that its portableness may be a recommendation with Military and Naval Surgeons. As these gentlemen are often not able to carry their libraries about with them, I think the plan of this volume will be certain of meeting their approbation. Indeed, it contains the pith of many works, which even men, who have better opportunities of collecting books, may not wish to possess, after having the publication, now offered to them.

SAMUEL COOPER.

Golden Square, March 1, 1809.

A

NEW DICTIONARY

OF

PRACTICAL SURGERY.

ABAPTISTON, or ABAPTISTA (from ἀ priv. and βάπτιζω, to plunge). Galen Fabricius ab Aquapendente, and especially Scultetus, in his *Armamentarium Chirurgicum*, so denominate the crown of the trepan; or, in other words, the circular saw which makes the perforation in the bone, when the above is used. The term came into use, in consequence of this part of the trepan having had, at its first invention, a conical form, which kept it from penetrating the cranium too rapidly, so as to plunge the teeth of the saw in the dura mater and brain.—*Encyclopédie Methodique ; Partie Chirurgicale.*

Whatever suppositious advantages the ancient practitioners of surgery may have imputed to the conical shape of the crowns of their trepans, certain it is, that modern surgeons do not, in general, adopt their notions on this subject; but, almost universally, make use of a circular saw, the figure of which is simply cylindrical.

Mr. Samuel Sharp notices the idea of there being the above danger in employing a cylindrical trepan, and remarks, that the great labour of working so slowly and difficultly (with a conical one) is not only very inconvenient to an operator, but by no means serviceable to the operation; for, notwithstanding the saw be cylindrical, and work without any other impediment than what lies before the teeth, yet, even with this advantage, the operation goes on so gradually, that from the experience Mr. Sharp has had, he never found the least danger of suddenly passing through to the brain, if care be taken not to lean too hard on the instrument, when the bone is almost sawn through. With respect to the impracticableness of inclining the cylindrical saw, on any particular part of the circle, when sawn unevenly, (which was formerly alleged) whoever will try the experiment, will in a moment discover the falseness of the assertion. The very instance stated overthrows this reasoning; for, if the circle has already been made more deeply in one part than another, it must imply, that we have leaned with more force on one part than another, and, consequently, may at pleasure do the very same thing again. Mr. Sharp next takes notice of the supposed advantage which the conical saw had, in receiving and retaining the piece of bone; a circumstance which he, very properly, calls frivolous. *Sharp on the Operation of Surgery.*

ABDOMEN. The BELLY. The term is said to be derived from the Latin verb *abdo*, to hide, because many of the chief viscera of the body are concealed in the cavity which it denotes.

When a surgeon speaks of the cavity of the abdomen, he confines his meaning to the space which is included within the bag of the peritoneum. Hence, neither the kidneys, nor the pelvic viscera, are, strictly speaking, parts of the abdomen.

Anatomists have distinguished this large cavity into different regions, and the terms allotted to these are so very frequent in the language of surgical books, that some account of them in this Dictionary seems indispensable.

The middle of the upper part of the abdomen, from the ensiform cartilage, as low down as a line drawn across from the greatest convexity of the cartilages of the ribs, is called the *epigastric regions.*

The spaces at the side of the epigastric region, are termed, the *right* and *left hypochondria*, or *hypochondriac regions.*

The *umbilical region* extends upwards to the line, forming the lower boundary of the epigastric region, and downward, to a line drawn across from the anterior superior spinous processes of the ilium.

All below the last line, down to the os pubis, is named the *hypogastric region.*

Tne abdomen is a part of the body, claiming the particular attention of every practical surgeon; for, it is the frequent situation of several of the most important surgical diseases. It is also very much exposed to wounds, and various operations are often requisite to be done in different parts of it. One of the most common afflictions to which mankind are subject, is that in which some of the bowels are protruded, pushing out before them a portion of the peritoneum. This disease is called *hernia*, and ought to be well understood by every practitioner, who, however, can never acquire the necessary knowledge, without being well acquainted with the anatomy of the abdomen. In dropsical cases, it is frequently proper to tap the abdomen, and this operation, named *paracentesis*, simple as it may seem, requires more consideration, and attention to anatomy, than surgeons often bestow on the subject. But the abdomen is, above all, particularly liable to be wounded, to which case we shall confine our present remarks, referring the reader to *hernia* and *paracentesis* for information on these subjects.

WOUNDS OF THE ABDOMEN.

These are divided by almost all writers, into such as penetrate the cavity of the abdomen, and into others, which only interest the skin and muscles.

The former differ very much in their nature and degree of danger, according as they do, or do not, injure parts of importance, contained in the peritoneum. The latter are not very different from the generality of other superficial wounds. The chief indications are to lower inflammation, and to prevent collections of matter. A few particularities, however, in the treatment of superficial wounds of the abdomen, seem to merit attention.

SUPERFICIAL WOUNDS.

The most ancient surgeons, and their successors, regularly up to the present day, have recorded, that wounds of tendinous parts are more perilous, than those of fleshy ones. Almost the whole front of the abdomen is covered with tendinous expansions, and on this account it is not unusual to see wounds in this situation followed by great local inflammations, and the formation of abcesses. The patient is, at the same time, affected with a great deal of the sympathetic inflammatory fever. (See *Fever.*) When the tension and swelling of the abdomen abate, shiverings sometimes occur, and indicate the occurrence of suppuration.

The matter, which forms in these cases, sometimes makes its way into the tendinous sheath of the rectus muscle, and, when the collection of matter in this situation remains undiscovered until a pointing appears, no sooner does the abscess burst or is it opened, than an extraordinary quantity of matter is discharged. The surgeon should carefully remember the nature of this kind of case, as there is frequently no alteration in the appearance of the integuments to denote, either the existence, or the extent of the suppuration.

This kind of abscess forms one remarkable exception to the excellent general rule of allowing acute phlegmonous abscesses to burst of their own accord. In the present instance, there is an aponeurotic expansion, intervening between the abscess and the skin, and nothing retards the natural progress of the matter to the surface of the body so powerfully, as the interposition of a tendinous fascia. But, even in this circumstance, the propensity of pus to make its way outward is often seen to have immense influence. Though there is only a thin membrane, (viz. the peritoneum) between matter so situated, and the cavity of the abdomen, yet, in time, the abcess mostly points externally.

The proper treatment of this case is to prevent the surprising accumulation of matter, and rapid increase of mischief, by making a depending opening,

sometimes at the very lowest part of the sheath of the rectus muscle, and this, as soon as the lodgment of matter is clearly ascertained.

Superficial wounds of the abdomen are to be treated on the same principles, as similar wounds in other situations. The indications are to prevent inflammation as much as possible, and, if suppuration should be inevitable to let out the matter by a depending opening, as soon as the abscess is known to exist. The inflammation is to be checked by general and topical bleeding, low diet, emollient clysters, diluent beverages, quietude, and the mildest, and most simple dressings. (See *Inflammation.*)

Whenever the abdominal muscles are wounded, it is desirable to relax them; but, this object should not lead us to put the patient out of a horizontal position. A very important point, in the treatment of wounds, which interest the parietes of the abdomen, is to afford a certain degree of support to the wounded part, when there seems the smallest chance of their being too weak to resist the pressure of the viscera. The parietes of the abdomen are almost wholly composed of soft parts, which easily yield. No part of the front, or sides, of the abdomen, is supported by the stability of a bony structure, and, as the viscera are, for the most part, more or less moveable, and closely compressed by the abdominal muscles, and diaphragm, they are very apt to be protruded, whenever the resistance of the parietes of the abdomen is not sufficiently potent. Thus very perilous cases of herniæ may originate.

For the above reasons, all wounds of the abdomen, especially those in which both the integuments and muscles have been cut, demand strict attention to the precaution of supporting the wounded part, and this, though the peritoneum itself should not happen to be divided. The patient ought to keep as much as possible in a horizontal position, while suitable compresses and bandages should be applied to the situation of the wound. In order to guard against the occurrence of hernia, the part should be supported, in this way, a considerable time after the wound is healed.

The peritoneum being connected by means of cellular substance, with the inner surface of the abdominal muscles, there is always some risk of the inflammation of these muscles extending to the membranous lining of the abdomen. The occurrence must be averted by the rigorous employment of the antiphlogistic treatment. What renders the event still more dangerous is, that when one point of the peritoneum is affected, the inflammation usually spreads with immense rapidity over its whole extent, and too often proves fatal.

As superficial wounds of the abdomen are to be treated on the general principles, applicable to all other wounds of this sort in other situations, it is hardly necessary to state, that union by the first intention is always, when possible, to be attempted.

OF WOUNDS PENETRATING THE CAVITY OF THE ABDOMEN.

In these cases, the first thing, which the surgeon is generally anxious to know, is, whether the wound penetrates the cavity of the abdomen, and whether any of the viscera are probably injured.

When the wound is extensive, and any of the bowels protrude, the first part of the question is at once decided. But, when the wound is narrow, and allows none of the viscera to protrude, it is often exceedingly difficult to ascertain, whether the injury extends into the abdomen, or not. An opinion, however, may usually be formed, by carefully examining the wound with one of the fingers, or a probe, after having put the patient, as exactly as possible, in the posture in which he was at the time of receiving the accident; by observing, if possible, the shape and dimensions of the instrument, with which the injury was done; how much of the weapon has entered the flesh; the direction in which it was pushed, by attending to the quantity of blood, which the patient has lost, the state of his pulse, &c. and, lastly, by observing whether there is any discharge of bile, fæces, or other fluids, known to be naturally contained in some of the abdominal viscera.

When the wound is sufficiently large to admit the finger, we may always ascertain whether the injury extends into the cavity of the abdomen, because the viscera may then be easily felt. There is only one chance of deception, and that arises from a possibility of the practitioner's mistaking the inside of the sheath of the rectus muscle for the

cavity of the peritoneum. When the examination is made with a probe, we should be particularly cautious, in forming a judgment; for, the parts are so soft and yielding, that a very little force will make the instrument pass a considerable way inward. Every examination of this kind should always be undertaken, if possible, when the patient is exactly in the same position, as he was at the time of receiving the wound.

Injections have been employed for ascertaining, whether wounds penetrate the cavity of the abdomen. This absurd experiment, however, has now been most justly exploded from practice. It is well known to the moderns, that the space termed the cavity of the abdomen, is, in fact, completely filled with the various viscera, and that a fluid would, in general, not so easily find its way into the bag of the peritoneum, as an unreflecting person might suppose. If the injection were propelled with much force, it would be quite as likely to insinuate itself into the cellular substance of the parietes of the abdomen, or, perhaps, into the sheath of the rectus muscle. The least tortuosity of the wound, or a piece of bowel, or omentum, lying against the internal orifice of the injury, would completely prevent an injection from passing into the abdomen.

When a considerable quantity of blood issues from a wound of the abdomen, we may pronounce, almost with certainty, that some large vessel, within its cavity, is injured. Excepting the epigastric artery, which runs in the forepart of the abdomen, along the inner surface of the rectus muscle, there is not one very considerable vessel, distributed to the muscles and integuments. At the same time, it is deserving of particular notice, that a very large artery may be opened in the abdomen, and, yet, not a drop of blood may be discharged from the external wound. A very large quantity may accumulate in this manner, even without there being any palpable swelling of the belly.

In such cases, the subsequent symptoms very quickly lead us to suspect what has happened. The patient complains of extreme debility and faintness; his pulse faulters; he has cold sweats; and, if the bleeding should not speedily cease, these symptoms are, in general, soon followed by death.

Sometimes, the first glimpse is enough to shew, that the wound extends into the cavity of the abdomen. The event is indicated by the escape of chyle, bilious matter, fæces, or other fluids, known to be contained in some of the viscera. The same information may also be obtained from seeing a considerable quantity of blood vomited up, or discharged by stool. The urine, however, may flow from a wound, which does not actually penetrate the abdomen, for the kidneys, ureter, and bladder may be said to be out of the abdomen, because they are really on the outside of the cavity of the peritoneum.

When no symptoms of the above description occur, when neither the finger, nor probe, can be introduced; when none of the fluids, known to be contained in the various receptacles in the abdomen, are emitted from the wound: when the pulse remains natural, and the pain is not excessive, there is reason to hope, that the wound has not injured parts of greater consequence, than the integuments, and muscles. *Encyclopédie Méthodique, Partie Chirurgicale.*

We have now taken a survey of such criteria, as are commonly noticed by surgical writers, for the purpose of instructing the reader how to discriminate a wound, which has penetrated the abdomen from one which has not. It is our next place to warn the practitioner, that too much solicitude to determine this point, is very frequently productive of serious harm. It may be set down, as an axiom in surgery, that *whenever the probing of a wound is not rendered necessary by some particular object in view, it may, in general, be judiciously omitted.* A narrow, oblique wound may enter the cavity of the abdomen, without there being any particular method of ascertaining, whether it has done so, or not. This, however, is of no practical importance; for, when there are no urgent symptoms, evincing the nature of the case, the treatment ought obviously to resemble that of a simple wound; and whether the wound is deep, or superficial, the antiphlogistic treatment is equally indicated.

The edges of a wound penetrating the abdomen, but, unattended with any obvious injury of the viscera, are to be brought together by sticking-plaster, just in the same way as common wounds. In this situation, sutures are more frequently proper, than in most others. Particular care is also to be taken to keep the bowels from protru-

ding by the application of a compress, and bandage. All the means of preventing inflammation are to be adopted, (see *Inflammation*) and quietude is, above all things, to be enjoined.

INFLAMMATORY CONSEQUENCES OF WOUNDS OF THE ABDOMEN.

Sometimes, notwithstanding the best treatment, alarming symptoms cannot be prevented. These are commonly, at first, of the inflammatory kind, consequently, repeated bleeding, and redoubled attention to every part of the antiphlogistic treatment, are indicated. If the inflammation should not be subdued by such measures, internal mortification and death may follow, or abscesses form in the abdomen.

SUPPURATION IN THE ABDOMEN IN CONSEQUENCE OF WOUNDS.

If the abscess were in any other part of the body, and did not readily point, the wisest practice would undoubtedly be to make an opening sufficient for the evacuation of the matter. But suppuration in the abdomen can seldom be ascertained with certainty, before the collection of matter has existed a good while; for, the situation of the abscess is so deep, that no fluctuation, nor swelling, becomes perceptible, until a considerable quantity of pus has accumulated. Besides, it would not be judicious to expose the patient to the hazard, which might arise from making an opening, into the abdomen, merely for the sake of giving vent to a small collection of matter.

Many, indeed almost all writers, impute a vast deal of the danger of wounds of the abdomen to the entrance of air into the cavity of the peritoneum, and they also adduce this as an argument against opening abscesses of the abdomen. In inculcating such opinions, however, they betray an inaccuracy of observation, which a very little reflection would have set right. Too much stress has long been laid on the introduction of air into the abdomen, as being a cause of inflammation. The fact is, that the cavity of the belly is always so completely occupied by the various viscera, that the whole inner surface of the peritoneum is constantly in close contact with them, and, consequently air cannot so easily diffuse itself from the vicinity of the wound, throughout the abdomen, as has been conceived. After tapping, in dropsical cases, we seldom see inflammation arise, though, air has, in this instance, quite as good an opportunity of entering the abdomen, as in any case of a wound. The peritoneum in animals has been inflated, without any inflammation being excited. In the human subject, it seems probable, that, if a wound were made in a vacuum, the breach of continuity itself would lead to inflammatory consequences. We have also to remark, that collections of matter in the abdomen are almost always completely circumscribed, and separated from the general cavity of the peritoneum, by the adhesion of the viscera to each other, and to the inside of the peritoneum.

It is, in general, a very good rule, in all cases of wounds of the abdomen, never to be officious about abscesses, which may take place, nor concerning such viscera, as we may suspect to be injured. It is quite time enough to interfere, when the urgency of the symptoms has confirmed our conjectures. A great deal of harm is frequently done, by handling and disturbing the wounded parts more than is necesrary, and it is well known, that wounds, which are at first attended with very alarming symptoms, frequently terminate in a favourable manner. Persons having been known to have swords passed completely through their bodies, without suffering afterwards any threatening symptom, or, indeed, any effects which would authorize one to conclude, that the viscera had been at all injured. We are aware, that severe inflammations may not end in suppuration, and we also know, that when pus has been formed, the fluid has been often absorbed again. Nothing then indicates the necessity for giving vent to purulent matter lodged in the abdomen, except the fluctuation and situation of the abscess be very distinct, and the quantity and pressure of the matter productive of inconveniences.

For making an opening, some writers recommend a trocar; others, a lancet. The matter must be very copious and distinct, to justify the sudden introduction of such an instrument as a trocar. In other cases, the surgeon should make a cautious puncture with a lancet.

PROTRUSION OF THE VISCERA.

Wounds, penetrating the abdomen, sometimes allow considerable portions of the bowels, or omentum, to protrude, and, though these viscera may not have received any injury, yet, their being displaced in this way is sometimes productive of fatal consequences.

The best mode of preventing such a catastrophe, is to return the viscera into the cavity of the abdomen, as speedily as possible. Almost all authors recommend fomenting the displaced parts, before attempting to reduce them; but, in giving this advice, they seem to forget, that, while time is lost in this preparation, the protruded bowels suffer much more harm from exposure, and other circumstances, than they can possibly receive good from any applications made to them. No kind of fomentation can be half so beneficial, as the natural warmth and moisture of the cavity of the abdomen. In order to facilitate the return of a protruded piece of intestine, or omentum. the abdominal muscles should be relaxed by placing the patient in a suitable posture, and the large intestines emptied by a glyster. In mentioning the last measure, it is not meant, that the surgeon should delay the attempt to reduce the part, until the glyster has operated. No—this means is only enumerated as one that may become serviceable, in case the surgeon cannot immediately accomplish the object in view.—The mesentery ought always to be reduced before the intestine; the intestine before the omentum; but, the last protruded portion of each of these parts ought to be the first one reduced.

It is only when the intestine and omentum are free from gangrene and mortification, that they are invariably to be returned into the cavity of the belly, without hesitation. Also, when the protruded parts are covered with sand, dust, or other extraneous matter, it is undoubtedly proper to make them as clean as possible, before putting them back into the abdomen. For this purpose, the parts should be tenderly washed with a little lukewarm milk and water.

The two index fingers are the most convenient for reducing the parts, and, it is a rule to keep the portion, first returned, from protruding again by one finger, until it has been followed by another portion, introduced by the other finger. The second piece is to be kept up, in the same way, by the finger used to return it; and so on, till the whole of the displaced parts have been put into their natural situation.

In attempting to reduce a piece of protruded intestine, the patient should be placed in the most favourable posture; the head and chest should be elevated, and the pelvis raised by pillows. Nothing can be more absurd, than the advice to have the thorax rather lower than the pelvis, in order that the weight of the viscera may tend to draw inward the protruded parts. This is another erroneous idea, arising from the ridiculous supposition, that a great part of the abdomen is actually an empty cavity. The relaxation of the abdominal muscles is a much more rational and useful object.—When this is properly attended to, and the wound is not exceedingly small, in relation to the bulk of the protruded viscera, the parts may generally be reduced by observing the above directions. But, in addition to what has been already stated, it is necessary to remark, that the pressure should be made in a straight direction into the abdomen; for, when made obliquely, towards the edges of the wound, the parts are liable to suffer contusion, without being reduced, and even to glide between the layers of the abdominal muscles, and become strangulated. When the wound is in the front of the abdomen, pressure made in this unskilful way, may easily make the viscera slip into the sheath of the rectus muscle, and cause the same perilous symptoms, as arise from an incarcerated hernia. (See *Hernia.*)

When the reduction seems complete, the surgeon should assure himself of it, by introducing his finger into the cavity of the abdomen, so as to feel, that the parties are all actually reduced, and suffer no constriction between the edges of the wound, and the viscera in the abdomen.

A difficulty of reduction may arise from the protruded intestine being distended with fæces, or air. In this circumstance, the contents of the gut may frequently be made to pass, by little and little, into that portion of the intestinal canal, which is within the abdomen. To accomplish this purpose, the surgeon must press the contents of the bowel towards the wound, and, if he succeeds in emptying the part, he will commonly experience equal suc-

cess in his next attempt to replace it in the abdomen.

Sometimes, such very considerable pieces of intestine are found protruded, through narrow wounds of the abdomen, that the reduction cannot be effected, without doing more violence to the bowel, than its delicate structure would bear. In this case, dilating the wound becomes indispensable. However, very frequently, when the reduction seems almost a matter of impossibility, on account of the smallness of the wound, relaxing the abdominal muscles, drawing a little more intestine out of the wound, and gently pressing the contents of the bowel, through the constriction into the abdomen, will render the protruding part sufficiently reducible, without any operation to enlarge the wound.

When such operation is unavoidable, the dilation should be made in a direction, which will not endanger the epigastric artery, and if possible, in the same line as the muscular fibres. It would be unpardonable to make a more extensive incision, than absolutely requisite, as herniæ are very much disposed to occur, wherever the peritoneum has been divided. The operation may be done with a curved bistoury and a director, much in the same way as is done in cases of strangulated ruptures. (See *Hernia.*)

Instead of enlarging wounds of the abdomen, it has been proposed to let out the air from the intestine, by making small punctures with the point of a needle, and thus lessen the volume of the protruded part sufficiently to render it easily reducible. As this expedient has been recommended by writers of some weight, the subject should not be passed over in silence, and without a caution to the reader, never to put any confidence in the method. The plan certainly facilitates the business of the operator; but this seems to be the only solitary reason in favour of the practice. Though some patients, so treated, may have recovered; yet, every person, who has the least knowledge of the animal economy, will easily comprehend, how even the smallest opening, made in parts, so irritable and prone to inflammation, as the bowels, must be attended with greater danger than would result from enlarging a wound of the skin and muscles. Besides the air may frequently be pressed out of the intestine in a safer way, as was before described. (See *Encyclopédie Methodique; Partie Chirurgicale.*)

When the protruded intestine is wounded, the opening is to be closed with a particular suture, before the part is returned into the abdomen. Of this subject, when we speak of wounds of the intestines.

Some of the exposed intestine may have mortified, before the arrival of surgical assistance. This event is exceedingly rare in cases of wounds, but, is not uncommon in those of strangulated herniæ. The treatment will be explained in the article *Hernia.*

When the protruded intestine is in a state of inflammation, its immediate reduction is, beyond all dispute, the means most likely to set every thing right. Even when the inflammation has risen to a vehement pitch, a timely reduction of the displaced part, and the employment of antiphlogistic means will often prevent gangrenous mischief. The dull, brown, dark red colour of the intestine, may induce the practitioner to suppose, either that the part is already mortified, or must inevitably become so, and, consequently, he may delay returning it into its natural situation. But, notwithstanding this suspicious colour of the intestine, its firmness will evince, that it is not in a state of gangrene. The ultimate recovery of a portion of intestine, so circumstanced, is always a matter of uncertainty; but the propriety of speedily replacing the part in its natural situation is a thing most certain. In case the bowel should mortify after being reduced; all hopes of the preservation of life are not to be abandoned, as we shall notice again in the subject of hernia, where every thing necessary to be known, concerning the mode of reducing protruded omentum, will also be found.

The protruded viscera having been reduced, the next object is to retain them in the abdomen, until the wound is completely healed. When the wound is small, this is a matter of no difficulty; in this instance, it is enough to put the patient in such a position, as shall relax the fibres in the wounded muscles, while the edges of the wound are maintained in contact with sticking-plaster, and supported, in this way, by a compress and bandage. Costiveness is to be removed by the mildest purgatives, such as the soda phosphorata and oleum ricini, or by laxative glys-

ters, which are still preferable. But in cases of extensive wounds, even when the treatment is conducted with all possible judgment, it is occasionally very difficult, and impossible, to hinder the protrusion of the bowels by common dressings, and a bandage. In this circumstance the edges of the wound must be sewed together by a particular suture, named *Gastroraphe*. (See this article). It is proper to remark, however, that, in modern times, this suture is very rarely employed, in comparison with what it was formerly, and, in the description of gastroraphe, some remarks will be offered, for the purpose of proving, that even the generality of large wounds of the abdomen do not require any suture whatsoever.

EXTRAVASATION IN THE ABDOMEN.

The usual consequence of a wound, which penetrates any of the parts, contained in the bag of the peritoneum, is an extravasation of some fluid among the adjacent viscera. This fluid may be undigested aliment, chyle, the succus pancreaticus, bile, urine, blood, &c. according to the nature of the injured part.

Richter has very ably explained, (*Anfangsgr der Wundarzn*) that there are three distinct, and successive, classes of bad symptoms, arising from the effusion of blood in the abdomen.

I. The first class is altogether owing to the loss of blood itself, and consists of paleness, weakness, sinking pulse, and swooning.

II. The second depends upon the presence of the blood in the cavity of the peritoneum, and consists of a swelling of the abdomen, and various inconveniences produced by the pressure of the extravasated blood on the viscera. When the quantity is small, the inconvenience will be so trivial, as not to excite notice.

III. The third is produced by the irritation of the blood in the abdomen, and consists of convulsions, febrile symptoms, pain, inflammation, hiccoughs, vomiting, suppuration, and abscesses, pointing externally.

Extravasated urine, bile, and the contents of the stomach, and intestines, produce a higher and more rapid degree of irritation, than is the consequence of effused blood.

But, whatever the nature of the extravasated fluid may be, the principal effects belong to the third class, and are all of the inflammatory kind, inducing the danger of suppuration and mortification. The irritation arising from the quality of the effused fluid, and the pressure, resulting from its quantity, are sufficient to account for the origin of such pernicious effects.

The symptoms caused by wounds of parts, contained in the abdomen, may either make their appearance immediately, or some time after the accident, and they are of two kinds, viz. *local* and *constitutional*. The ordinary constitutional ones are, convulsions, weakness, fever, vomiting, anxiety, oppressed respiration, &c. The local symptoms are such as pain and tumefaction.

When the symptoms appear soon after the occurrence of the wound, and, after a time, gradually diminish, or go off entirely, but, sooner or later, originate again, there is reason to consider their first origin, as the immediate effect of the injury; their second occurrence, as the effect of an extravasation.

This method of forming a decision, however, may sometimes lead to error. When urine and bile are extravasated, the symptoms of the extravasation arise very quickly, and often continue from their commencement extremely urgent, without the least abatement whatsoever. In these cases, the local pain, swelling, and fluctuation, frequently afford ample information concerning the nature of the accident. The fluctuation in particular is a very decisive criterion, when it precedes the pain. The escape of the extravasated fluid out of the external wound, sometimes conveys information to the practitioner.

Blood is more frequently extravasated in the abdomen, than any other fluid. Extra vasations of this kind, however, do not invariably happen, whenever vessels of not a very considerable size are wounded. The compact state of the abdominal viscera, in regard to each other, and their action on each other, oppose this effect. The action, alluded to, which depends on the abdominal muscles and diaphragm, is rendered very manifest by what happens, in consequence of operations for hernia attended with alteration of the intestines, or omentum. If these viscera should burst, or suppurate, after being reduced, the matter, which escapes from them, or the pus, which they secrete, is not lost in the abdo-

men; but is propelled towards the wound of the skin, and there makes its exit. The intestinal matter, effused from a mortified bowel, has been known to remain lodged the whole interval, between one time of dressing the wound and another, in consequence of the surgeon stopping up the external wound with a large tent. When the above mentioned action or pressure of the muscles, is not sufficient to keep the blood from making its escape from the vessels, still it may hinder it from becoming diffused among the convolutions of the viscera, and thus the extravasation is confined in one mass. The blood, effused and accumulated in this way, is commonly lodged at the inferior and anterior part of the abdomen, above the lateral part of the pubis, and by the side of one of the recti muscles. The weight of the blood may propel it into this situation, or, perhaps, there may be less resistance in this direction, than in any other. In opening the bodies of persons, who have died with such extravasations, things may put on a different aspect, and the blood seem to be promiscuously extravasated over every part of the abdomen. But when such bodies are examined with care it will be found, that the blood does not insinuate itself among the viscera, till the moment when the abdomen is opened, and the mass previously lies in a kind of pouch. This pouch is frequently circumscribed, and bounded by thick membranes, especially when the extravasation has been of some standing. (*Sabatier Médicine Opératoire.*)

It is of the highest consequence to a practical surgeon to remember, well, that all the parts contained in the abdomen are closely in contact with each other, and with the inner surface of the peritoneum. This is one grand reason, why extravasations are seldom so extensively diffused, as one might imagine; but commonly lie in one mass, as Sabatier and all the best moderns have noticed. The pressure of the elastic bowels, of the diaphragm, and abdominal muscles, not only frequently presents an obstacle to the diffusion of extravasated matter, but often serves to propel it towards the mouth of the wound. The records of surgery make mention of numerous instances, in which persons have been stabbed through the body, without any evil consequences. In such cases, the bowels have been supposed to have eluded the point of the weapon, and this may sometimes have been actually the fact; but, in many such examples, there can be no doubt, that the bowels have been punctured, and an extravasation of intestinal matter has been prevented by the opposite pressure of the adjacent viscera. Such resistance and pressure may, also, have occasionally obliged intestinal matter, or blood, actually extravasated, to pass through the wound of the bowel into its cavity, and thus be speedily removed. Certain it is, such copious evacuations of blood *per anum* have followed stabs of the abdomen, as could hardly proceed from the arteries of the intestines. This way of getting rid of an extravasation must be rare, however, compared with that by absorption.

The pouch, or cyst, including extravasated blood, or matter, as mentioned by Sabatier, is formed by the same process, which circumscribes the matter of abscesses. (See *Suppuration.*) It is in short, the adhesive inflammation. All the surfaces in contact with each other, and surrounding the extravasation, and track of the wound, generally soon become so intimately connected together by the adhesive inflammation, that the place, in which the extravasation is lodged, is a cavity entirely destitute of all communication with the cavity of the peritoneum. The track of the wound leads to the seat of the effused fluid, but, has no distinct opening into the general cavity of the abdomen. The rapidity with which the above adhesions form, is often very great, almost incredible.

It should be known, however, that extravasations are occasionally diffused in various degrees among the viscera, owing to the patient being subjected to a great deal of motion, or his having violent spasmodic contractions of the intestines, arising from the irritation of the extravasated matter. Urine and bile are more frequently dispersed to a great extent among the abdominal viscera, than blood. The latter fluid, indeed, must often coagulate; a circumstance, that must both tend to stop further hemorrhage and confine the extravasation in one mass.

TREATMENT OF EXTRAVASATION IN THE ABDOMEN.

1. *Blood.*

When the symptoms leave no doubt of there being a large quantity of blood extravasated in the abdomen; when the patient's complaints are of a very serious nature, and are evidently owing to the irritation and pressure of the blood on the surrounding viscera; and when a local swelling denotes the seat of the extravasation, there cannot be two opinions about the propriety of making an incision for its evacuation.

Surgeons, however, should recollect, that a small extravasation of blood may exist, without producing any very considerable irritation, provided no opening be made into the cyst, with which it becomes surrounded. On the contrary, when such cyst is opened, the air then having free access to the blood contained there, that part of the fluid, which cannot be discharged, is very apt to putrify, and becomes so irritating, as to excite inflammation of the surrounding parts.—Even though there may be an evident extravasation of blood, the bad symptoms are also sometimes entirely owing to the injury done to the parts within the abdomen, and neither to the pressure, nor the irritation of the effused blood.

Sometimes the accumulated blood, at first, neither irritates the adjacent parts by its quantity nor quality. An inflammation, however, of the parts surrounding the extravasation at length takes place. The tension, irritation, and pain, which, in the first instance arose from the wound itself, and subsided, seem now to be removed. When the extravasation is at the lower and anterior part of the abdomen, the patient experiences pain about the hypogastric region. He is also constipated, and, as he suffers great irritation of the bladder, he feels frequent propensities to make water, but cannot relieve himself. At last, a tumour makes its appearance, attended with a fluctuation, more or less distinct.

In this instance, it seems proper to give vent to the accumulated blood. If the fluid should be found coagulated, injections of warm water would facilitate its discharge. (*Sabatier Médicine Opératoire.*)

2. *Chyle and Feces.*

These are not so easily extravasated in the abdomen as blood, because they do not require so much resistance, on the outside of the stomach and intestines, to make them continue their natural rout through the alimentary canal, as blood requires to keep it in the vessels. Extravasations of this kind, however, sometimes happen, when the wounds are large, and the viscera contract in a spasmodic manner. Nothing is a better proof of the difficulty, with which chyle and fæces are extravasated, than the operation of an emetic, when the stomach is wounded and full of aliment. In this instance, if the resistance to the extravasation of the contents of the stomach were not considerable, they would be effused in the abdomen, instead of being vomited up. A peculiarity in wounds of the stomach and intestines is, that the opening, which allows their contents to escape, may also allow them to return into the wounded viscus.

In these cases, general means are the only ones, which can be employed; venesection, fomentations, low diet, perfect rest, &c. All solid food must be most strictly prohibited. The close state of the viscera may also be increased by applying a bandage round the body.

3. *Bile.*

Bile, on account of its great fluidity, is more easily extravasated extensively in the abdomen, than either blood, or the contents of the stomach and intestines. Besides, the gall bladder has the power of contracting itself so completely, as to expel the whole of its contents. Notwithstanding these circumstances, however, extravasations of this kind are exceedingly uncommon, doubtless, on account of the small size of the gall bladder, and its deep guarded situation, between the concave surface of the liver, and upper part of the transverse arch of the colon.

A case, in which the gall bladder was wounded, is related in the 3d vol. of the Edinb. Essays. The patient survived the accident a week. Before death, there was a rumbling noise in the abdomen, which became very tense. There were no stools, and very little urine was discharged, though purgatives, and glysters, and a good deal of liquid nourishment, were given. The patient never had one instant of sound sleep, but, was always restless, though anodynes were exhibited. There was

no appearance of fever, and the pulse was always natural, till the last day of the patient's life, when it became intermittent. The intestines were found, after death, very much distended, the gall bladder quite empty, and a large quantity of bile extravasated in the abdomen.

Sabatier met with an opportunity of observing the symptoms of an extravasation of bile, in consequence of a wound of the gall bladder. The patient's abdomen swelled very quickly; his respiration became difficult, and, he soon afterwards complained of tension and pain in the right hypochondrium. His pulse was small, frequent, and contracted; his extremities were cold, and his countenance very pale. The bleedings, which were practised the first day, gave him a little relief; but, the tension of the abdomen, and the difficulty of breathing, still continued. A third bleeding threw the patient into the lowest state of weakness, and he vomited up a greenish matter. On the third day, the belly was observed to be more prominent, and there was no doubt of an extravasation. M. Sabatier introduced a trocar, and gave vent to a green-blackish fluid, which had no smell, and was pure bile, which had escaped from a wound of the gall bladder. After the operation, the patient grew weaker and weaker, and died in a few hours. On opening the body, a large quantity of yellow bile was found between the peritoneum and intestines; but, it had not insinuated itself among the convolutions of the viscera. A thick gluten connected the bowels together, and they were prodigiously distended. The gall bladder was shrivelled and almost empty. Towards its fundus, there was a wound, about a line and a half long, corresponding to a similar wound in the peritoneum. The wound, which had occurred at the middle and lower part of the right hypochondrium, between the third and fourth false ribs, had glided from behind forward, and from above downward, between the cartilages of the ribs, until it reached the fundus of the gall bladder.

M. Sabatier seems to think, that wounds of the gall bladder are absolutely mortal, and that no operation can be of any avail. (*Médicine Opératoire.*)

4. *Urine.*

Urine being of a very fluid nature may, like the bile, be very easily extravasated in the abdomen, when the bladder is wounded at any part, which is connected with the peritoneum. If the urine, in this kind of case, be not drawn off with a catheter, so as to prevent this fluid issuing from the bladder, the patient soon perishes. There are many instances recorded of the bladder being injured even by gun shot wounds, which were not mortal. Such wounds, however, might only have injured the sides, or lower part of the bladder. But, in operating for the stone, above the pubis, the bladder has undoubtedly been occasionally cut at the part of the fundus, which is covered with the peritoneum. However, as the accident was known in the first instance, the right treatment was adopted, and such patients have recovered. (*Sabatier Médicine Opératoire.*)

WOUNDS OF THE INTESTINES.

The vomiting of blood, or discharge of it by stool, the escape of fetid air, or of intestinal matter, from the mouth of the wound; an empty collapsed state of a portion of bowel, protruded at the opening in the skin, are the common symptoms attending a wound of this kind. When the wound is situated in the protruded portion, it is obvious to the surgeon's eye; but, when situated deeply in the abdomen, the nature of the case cannot be known, till an extravasation takes place.

In the case of a wounded, or mortified, intestine, the surgeon may either endeavour to unite the breach of continuity in the bowel by a suture, try to establish an artificial anus, or only employ general means, and trust the rest to nature.

Next of the circumstances which ought to determine our choice. When the wounded part of the bowel is protruded, the suture is to be made use of, before the piece of intestine is reduced.

When the wound of the bowel is within the cavity of the abdomen, a suture is impracticable, and except general means to avert inflammation, nothing can be done.

The true object of applying a suture to a wounded intestine, is not to procure an union of the edges of the wound to each other, by making them touch at every point; nor is it designed to prevent the escape of air, and intestinal

matter, into the bag of the peritoneum. The thin moveable membranous edges of the bowel would render such aims quite fruitless, unless such numerous stitches were employed, as would rather create sloughing, than obtain an union of the wound. A breach of continuity in an intestine is never repaired by the growth of the opposite edges of the wound to each other. The inflammation, which regularly ensues, causes an adhesion of the adjacent viscera to the wounded portion of intestine, and thus the breach in it becomes closed. The only object of applying a suture to a wounded bowel is to confine the injured part closely behind the external wound, by means of the thread, in order that any extravasated matter may find its way outward, and not lodge in the abdomen.

The suture, however, is only useful, for this purpose, during the first two or three days, after which the wounded bowel is always securely fixed by the adhesive inflammation.

When the wounded bowel is far in the abdomen, the surgeon seldom knows at first what has happened, and, when the nature of the case is afterwards manifested by an extravasation, it would be impossible to get at the injured part of the bowel, on account of the adhesions, which always very soon follow. But, even if the surgeon knew, to a certainty, in the first instance, that one of the bowels was wounded, no suture could be applied, without considerably enlarging the external wound, searching for the injured bowel, and drawing it out of the cavity of the abdomen. In this way a wound, which might previously have been curable, would very probably be rendered fatal.

When the extravasation, a few days after the accident, shows the nature of the case, a suture can be of no use whatever, as the adhesive inflammation has already fixed the part in its situation, and the space, in which the extravasation lies, is completely separated from the general cavity of the abdomen, by the surrounding adhesions.

When the bowel is not protruded, and the opening in it is situated closely behind the wound in the peritoneum, a suture is not requisite, for the contents of the gut not passing onward, will be discharged from the outer wound, and not be diffused among the viscera, if care be taken to keep the external wound open. There is no danger of the wounded bowel changing its situation, and becoming distant from the wound in the peritoneum, for the situation which it now occupies, is its natural one. Nothing, but violent motions, or exertions, could cause so unfavourable an occurrence, and, these should always be avoided. The adhesions, which take place in the course of a day or two, at length render it impossible for the bowel to shift its situation.

But, when the wounded part of the intestinal canal is protruded, no enlargement of the outer wound is requisite to be able to apply a suture, nor is there the least doubt concerning the nature of the case. The object of this suture, is, as has been already described, to prevent the wound of the bowel from becoming very distant from the external wound, after the part has been put back into the abdomen, and thus to diminish the chance of an extravasation among the viscera. The wound of the bowel, in this kind of case, is to be sewed up, the part reduced, and the ends of the ligatures left hanging out of the external wound, and, by their means, the injured intestine is to be confined near the aperture in the peritoneum.

When the whole intestine is not nearly cut through, a single stitch is usually sufficient, and this can create but little irritation. A fine round needle, threaded with silk, is the most proper for the purpose.

Sometimes, only one end of the divided gut protrudes at the wound, and, the other lies concealed in the cavity of the abdomen. If the hidden continuation of the intestinal canal, cannot be found without enlarging the wound, it may be questioned, whether the urgency of the case does not justify this practice. If the upper end should happen to be the one concealed in the abdomen, almost certain death must result from its continuance there; if it be the lower one, and no attempt be made to find it, the patient can only survive with the loathsome affliction of an artificial anus.

When the protruded intestine is mortified, which must be a very rare occurrence in cases of wounds, the surgeon's conduct should be the same as in a mortified enterocele. (See *Hernia.*)

With regard to the constitutional treatment, in wounds of the intestines, the principal indication is to prevent a dangerous degree of inflammation.

Hence the antiphlogistic treatment is highly indispensable. Let not the surgeon be deterred from putting it in execution by the apparent debility of the patient, his small concentrated pulse, and the coldness of his extremities, symptoms, common in acute inflammation of the bowels, and, in fact, themselves indicating the propriety of repeated venesection. Wounds of the small intestines are attended with more vehement inflammation, than those of the large ones. All flatulent, stimulating, and solid food, is to be prohibited. The bowels are to be daily emptied with glysters, by which means, no matter will be allowed to accumulate in the intestinal canal, so as to create irritation and distention.

When excementitious matter is discharged from the outer wound, it is highly necessary to clean and dress it very frequently, Gentle pressure should also be made, with the fingers, at the circumference of the wound, at each time of applying the dressings, for the purpose of promoting the escape of any extravasated matter. For the same reason, the patient should always lie, if convenient, in a posture that will render the external opening a depending one.

The threads of the suture may be safely removed on the fifth, or sixth day, as the adhesions render them useless, and they must be regarded in the light of irritating, extraneous substances. After this period, the surgeon need not be afraid to let the outer wound heal up; for the adhesive inflammation, all around the course of the wound, will now prevent any extravasated matter from being diffused among the viscera. If the case should end well, the intestine generally undergoes a diminution in its diameter at the place where the wound was situated. When this contraction is inconsiderable, the patient occasionally experiences colic pains at the part, especially after eating such food, as tends to produce flatulence. As these pains usually go entirely off after a certain time, and no inconvenience whatsoever remains, the intestine may possibly regain its wonted capacity again. A more considerable constriction of the above sort has been known to have occasioned a fatal miserere. Even the intestine itself has been known to burst in this situation, after its contents had accumulated behind the contracted part. Patients, who have recovered from the wounds of the intestines, should ever afterwards be particularly careful not to swallow any hard substances, or indigestible, flatulent food.

In some instances, intestinal matter continues to be discharged from the outer wound, either in part, or entirely, so that either a fistula, or an artificial anus is the consequence. A fistula is more apt to follow, when an intestine has been injured by a ball, has been quite cut through, or has mortified. But, numerous cases have evinced, that this is not invariably the consequence, and that a perfect cure has frequently followed each of these occurrences.

When an intestine is completely cut through, or when its whole calibre has mortified, and the lower portion of the canal lies inaccessibly concealed in the abdomen, there is a necessity for promoting the formation of an artificial anus. For this purpose, the extremity of the intestine is to be attached, with a fine suture, to the edges of the outer wound. To distinguish the upper end of the intestine from the lower one, some recommend giving the patient some milk to drink, and to wait a little, to see whether the fluid issues from the mouth of the gut. In the mean while, they content themselves with applying fomentation. If the upper end of the intestines should be in the abdomen, it certainly seems justifiable, when the accident is quite recent, to dilate the outer wound sufficiently to see, whether the part is near enough to be got at. If the surgeon should succeed in this object, the two ends of the bowel ought to be sewed together, as above directed.

In gun-shot wounds of the abdomen, the treatment is limited to the employment of general means. Consult *Richter's Anfangsgr.* *Encyclopédie Méthodique.* and *J. Bell on Wounds.*

[We cannot account for the omission of a reference to Mr. Hunter's invaluable work on this subject.]

ABSCESS. This term signifies a tumour containing pus. Authors differ about the original derivation of the word. The most common opinion is, that it comes from the Latin *abscedo, to depart*, because parts, which were before contiguous, become separated, or depart from each other.

Abscesses are divided into two principal kinds, viz. *acute* and *chronic*. For

every thing, relative to the former, see *Suppuration*; and, for information, concerning the latter, refer to *Lumbar Abscess*. The *Mammary Abscess* is a distinct article.

ACETUM. *Vinegar*. (From *aceto*, to be acid.) Vinegar is an article of very considerable use in surgery. Mixed with farinaceous substances, it is frequently applied to sprained joints, and, in conjunction with alcohol and water, it makes an eligible lotion for inflammations of the surface of the body. Vinegar has acquired reputation at the Gloucester Infirmary, for quickening the exfoliation of dead bone, which may be owing to its property of dissolving the phosphate of lime. The excellent effects of vinegar, when immediately applied to burns and scalds, have been taken particular notice of by Mr. Cleghorn, a brewer in Edinburgh, who communicated his sentiments to Mr. Hunter. (See *Med. Facts and Observations, Vol. II.*) *See Article Burns.*

ACHILLES, *Tendon of*. So called, because as fable reports, Thetis, the mother of Achilles, held him, by that part, when she dipped him in the river Styx, to make him invulnerable. It signifies that great and powerful tendon, which is formed by the junction of the gastroenemius and soleus muscles, and which extends along the posterior part of the tibia, from the calf to the heel. When this tendon is unfortunately cut, or ruptured, as it may be, in consequence of a violent exertion, or spasm of the muscles, of which it is a continuation, the use of the leg is immediately lost, and unless the part be afterwards successfully united, the patient must remain a cripple for life.

The ancient surgeons seem not to have been well acquainted with the rupture of the tendo Achillis, which they probably might mistake for a sprain, or some other complaint. In cases, in which this part had been cut, they recommended approximating the separated portions, and maintaining them in contact by means of a suture.

When the ruptured tendo Achillis, was afterwards better understood, the plan just mentioned, was even adopted in this case, the integuments having been previously divided, for the purpose of bringing the tendon into view. But, there is no excuse for having recourse to this painful proceeding. (*Encyclopédie Méthodique, Partie Chirurgicale.*)

The superficial situation of the tendo Achillis, always renders the diagnosis of its rupture exceedingly obvious, and the accident can only become at all difficult to detect, when there is a considerable degree of swelling, which is very rare. When the tendon has been cut, the division of the skin allows the accident to be seen. When the tendon has been ruptured, the patient hears a sound, like that of the smack of a whip, at the moment of the occurrence. In whatever way the tendon has been divided, there is a sudden incapacity, or, at least, an extreme difficulty, either of standing or walking. Hence the patient falls down, and cannot get up again. Besides these symptoms there is a very palpable depression, between the ends of the tendon, which depression is increased when the foot is bent, and diminished, or even quite removed, when the foot is extended.

The patient can spontaneously bend his foot, none of the flexor muscles, being interested. The power of extending the foot is still possible, as the peronei muscles, the tibialis posticus, and long flexors, remain perfect, and may perform this motion. (*Œuvres Chirurgicales de Desault par Bichat.*)

The indications are to bring the ends of the divided part together, and to keep them so, until they have become firmly united. The first object is easily fulfilled by putting the foot in a state of complete extension; the second, namely, that of keeping the ends of the tendon in contact, is more difficult.

In order to have a right comprehension of the indications, we should consider what keeps the ends of the tendon from being in contact. The flexion of the foot has this effect on the lower portion; the contraction of the gastroenemius, and soleus on the upper one. The indications then are to put the foot in an unalterable state of extension, and to counteract the action of the above muscles.

The action of the muscles may be opposed: 1. By keeping these powers in a continual state of relaxation. For this purpose, the leg must be kept half bent upon the thigh. 2. By applying methodical pressure to the muscles; methodical, because it is to operate on the fleshy portion of the muscles, and

not on the tendon, the ends of which being depressed by it, would be separated from each other, and, instead of growing together, would unite to the adjacent parts. The pressure should also operate so as to prevent the ends of the tendon from inclining either to the right or left.

This kind of pressure, which the bandage ought to make, seems to have escaped the attention of all authors. Who cannot see, however, that the action of the muscles being by this means resisted, the upper end of the tendon will not have such a tendency to be drawn upward, and separated from the lower one? (*Œuvres Chirurgicales de Desault par Bichat.*)

The famous Petit seems entitled to the honour of having first devised the plan of treating the ruptured, or divided tendo Achillis, by keeping the leg and foot in a particular posture, with the aid of an apparatus. Seeing that the extension of the foot brought the ends of the tendon into contact, it occurred to him that such extension should be maintained during the whole of the treatment, in order to bring about a permanent union. This happy idea, the simplicity of which should have rendered it obvious to all practitioners, once having originated, became the common basis, on which have been founded all the numerous methods of cure, which have been since recommended. (*Desault par Bichat.*)

The celebrated Dr. Alexander Monro, professor of anatomy at Edinburgh, happened to rupture his tendo Achillis. When the accident took place, he heard a loud crack, as if he had suddenly broke a nut with his heel, and he experienced a sensation, as if the heel of his shoe had made a hole in the floor. This sensation, he says, has also been observed by others, though some have complained of a smart stroke, like what would be produced by a stone or cane. Immediately suspecting what had happened, the doctor extended his left foot, to which the occurrence had taken place, as strongly as he could with his right hand, while with the left, he pressed the muscles of the calf downward, so as to bring the ends of the broken tendon as near together as possible. In this position he sat, until two surgeons came to his assistance. They applied compresses, and a bent board to the upper part of the foot, and forepart of the leg, both which they kept, as nearly as possible, in a straight line, by a tight bandage, made with a long roller. But, as this mode of dressing soon became very uneasy, it was changed for the following one. A foot-sock, or slipper, was made of double quilted ticking, from the heel of which a belt or strap projected, of sufficient length to come up over the calf of the leg. A strong piece, of the same materials, was prepared of sufficient breadth to surround the calf, and this was fastened with lacings. On the back part of this was a buckle, through which the strap of the foot-sock was passed, so that the foot could be extended, and the calf brought down at pleasure. The leg and foot were wrapt up in soft flannel, fumigated with benzoin, and the bandage was kept on day and night, the belt made tighter, when the doctor was about to go to sleep, and loosened when he was awake, and on his guard. For a fortnight, he did not move his foot and leg at all, but, was conveyed in a chair on castors from one part of the room to another. After this, he began to move the ankle-joint, but in such a gentle manner as not to give any pain. The degree of motion was gradually increased, as the tendon became capable of bearing it, care being taken to stop, when the motion began to create uneasiness. The affected limb was moved in this way, for half an hour at a time. In a few days, the hollow, between the separated ends of the tendon, became imperceptible, though the part continued soft much longer. It became, however, gradually thicker and harder until a knot was at last formed in it, apparently of a cartilaginous nature. Though this was at first as large as a middling plumb, and gradually became softer and smaller, yet it did not disappear entirely. Having occasion to go out six weeks after the accident, the doctor put on a pair of shoes, with heels two inches high, and contrived a steel machine to keep his foot in the proper position. This machine, however, he afterwards changed for another, made of the same materials as the former. It was not till five months after the accident, that he thought proper to lay aside all assistance, and to put the strength of the tendon to a trial. (See *Monro's works*, *p.* 661.)

It seems unnecessary to enumerate the various plans, devised since the time of Petit. Suffice it to state, that

both in a wound and rupture of the tendo Achillis, the ancient method of using a suture, for keeping the ends of the tendon in contact, is now quite exploded, and position of the limb is the grand agent, by which the cure is now universally accomplished. The following was Desault's method, which, though it was expressly designed to fulfil all the above mentioned indications, may not after all be a more valuable practical plan, than the one adopted by Doctor Monro. After the ends of the tendon had been brought into contact, by moderate flexion of the knee, and complete extension of the foot, Desault used to fill up the hollows, on each side of the tendon with soft lint and compresses. The roller, applied to the limb, made as much pressure on the compresses, as on the tendon, and hence this part could not be depressed too much against the subjacent parts. Desault next took a compress, about two inches broad, and long enough to reach from the toes to the middle of the thigh, and placed it under the foot, over the back of the leg, and lower part of the thigh. He then began to apply a few circles of a roller round the end of the foot, so as to fix the lower extremity of the longitudinal compress. After covering the whole foot with the roller, he used to make the bandage describe the figure of 8, passing it under the foot, and across the place where the tendon was ruptured, and the method was finished by encircling the limb upward, with the roller, as far as the upper end of the longitudinal compress. (*Desault par Bichat.*)

Certainly this plan seems to answer every object, and may be worthy of being adopted in this country. The continued pressure on the muscles of the calf, by which their action is materially resisted, is too much disregarded by the generality of English surgeons. Consult *Monro's Works*, *Encyclopedie Méthodique*; *Œuvres Chir. de Desault.*

ACHORES, (from αχωρις, bran.) The scald head, so called from the branny scales thrown off it. (See *Tinea Capitis.*)

ACIDUM NITROSUM. Dr. Rollo, Mr. Cruikshank, Dr. Beddoes, Mr. Blair and many others have tried this acid, as a substitute for quicksilver in cure of the lues venerea. The practice began with Mr. Scott, a surgeon in Bengal, who is said to have caught the idea from Dr. Girtanner, who suggested, that the efficacy of the various preparations of quicksilver might arise from the oxygen, which they contained.

A multitude of cases have been brought forward in favour of nitric acid, as an antisyphilitic, but, there are also some others adduced, which seem very decidedly to controvert its claims to that character. It should be carefully remembered, that it is the *nitric* acid, not the *nitrous*, which seems to deserve a further trial in syphilitic cases.

The common way of giving the nitric acid, at first, is to mix ʒj with a pint of distilled water, the mixture being sweetened with simple syrup. This quantity is to be drunk, at different times, in the course of 24 hours, through a small glass tube, which is used to keep the teeth from being injured. If no inconvenience is felt, the dose of the acid may be increased to uiss, ʒij, and even, in certain cases, to ʒiij.

The acid is said to increase the appetite, and secretion of urine; to cause more or less thirst, a white tongue, sizy blood, and an increase in the actions of the whole system, but nothing like mercurial salivation is produced. It does not agree, however, equally well with all constitutions.

The nitric acid is beneficial both in the *primary* and *secondary* symptoms of the venereal disease; more so, however, in the former. But, in the latter, even mercury itself frequently fails, and proves hurtful, so that the nitric acid suffers no disparagement from this fact. A change is said to be produced on the disease, by the acid, in six or eight days, and a cure very often in little more than a fortnight.

The oxygenated muriate of pot-ash, which contains an immense quantity of oxygen, is said by Mr. Cruikshank, to be more efficacious, than the nitric acid in relieving venereal symptoms.

ACROMION, (from ακρον the top, and ωμος the shoulder.) The process of the scapula, articulated with the external end of the clavicle, and formed by the anterior and superior projecting part of the spine of the scapula. It is liable to be broken. (See *Fracture.*)

ACUTENACULUM, (from *acus*, a needle, and *teneo*, to hold.) Heister so denominates the port aiguille. It is a handle to a needle, to make it penetrate the flesh more easily.

ÆGYLOPS, (from αιξ, a goat, and ωψ,

an eye.) A disease, so named from the supposition that goats were very subject to it. The term means a sore just under the inner angle of the eye.

The best modern surgeons seem to consider the ægylops, only as a stage of the fistula lachrymalis. Mr. Pott remarks, when the skin covering the lachrymal sac has been for some time inflamed, or subject to frequently returning inflammations, it most commonly happens, that the puncta lachrymalia are affected by it, and the fluid, not having an opportunity of passing off by them, distends the inflamed skin, so that, at last, it becomes sloughy, and bursts externally. This is that state of the disease, which is called perfect *aigylops*, or *ægylops*. *Pott on Fistula Lachrymalis.*

Ægylops was a very common term with the old surgical writers, who certainly did not suspect, that obstruction in the lachrymal parts of the eye, is so frequently the cause of the sore, as it really is. The skin over the lachrymal sac must undoubtedly be, like that in every other situation, not exempt from inflammation and abscesses; but, we do not find, that sores, unconnected with disease of the lachrymal sac, are so frequent, as to merit a distinct appellation. The term, ægylops is therefore going more and more into disuse, every day.

ÆRUGO, prepared verdigrease is by some used as an application to incipient chancres. Its acting as a caustic, and completely destroying the diseased surface at once, seems to offer a chance of preventing the absorption of the venereal matter, and, consequently, of doing away the necessity of making the patient undergo the salivation. However, it is perhaps never safe to rely solely upon this mode of treatment, without exhibiting mercury, in some form, or other.

Whenever the plan is tried, and it is certainly a very rational one, as long as the chancre is very small and recent, it is better to employ the argentum nitratum, which is a more active caustic, and for this reason, more sure to destroy the whole surface of the sore.

AGARIC. A species of fungus, growing on the oak, and much celebrated formerly for its efficacy in stopping bleeding. (See *Hemorrhage.*)

ALBUGO, (from *albus*, white.) A white opacity of the cornea, not of a superficial kind, but affecting the very substance of this membrane. This disease is very similar to the leucoma, with which it will be considered. (See *Leucoma.*)

ALNUS, (the Alder Tree.) The leaves, when cut in small pieces, and applied to the breast, as warm as can be borne, are much praised by professor Murray, of Gottingen, for their efficacy in discussing the milk of women, who do not suckle.

ALPHONSIN is the name of an instrument for extracting balls. It is so called from the name of its inventor Alphonso Ferrier, a Neapolitan physician. It consists of three branches, which separate from each other by their elasticity, but are capable of being closed by means of a tube, in which they are included.

ALUM. (An Arabic word.) Alum, either in its simple state, or deprived of its water of crystallization, by being burnt, has long been used in surgery. The ingenious author of the Pharmacopoeia Chirurgica remarks, that unless for external use, as a dry powder, the virtues of alum are not improved by exposure to fire. Ten grains of alum made into a bolus with conserve of roses, are given thrice a day at Guy's Hospital, in such cases as demand powerful tonic, or astringent remedies. In a relaxed state of the urinary passages, or want of power of the sphincter vesicæ, small doses of alum have been found of service.

It is also recommended by Dr. Percival, to counteract the poison of lead. Burnt alum is a mild caustic, and is a principal ingredient in most styptic powders.

AMAUROSIS, (from αμαυροω to obscure) *Gutta Serena.* This is a disease of the eye, attended with a diminution, or total loss of the sight, and arising from a paralytic affection of the retina and optic nerve.

The symptoms of amaurosis are noted for being very irregular. In many cases, the pupil is very much dilated, immoveable, and of its natural black colour. Sometimes, however, in the most complete and incurable cases, the pupil is of its natural size, and even capable of very free motion. Two, or three remarkable instances of the latter fact were lately shown to me by Mr. Albert, surgeon of the York Hospital; and I have seen many other cases of the same kind in St. Bartholomew's Hospital. The patients, alluded to,

had most of them not the least power of distinguishing the difference, between total darkness, and the vivid light of the sun, or a candle placed just before the eye. In some cases of amaurosis, the pupil has a dull, glassy, or horny appearance. Sometimes, its colour is greenish. Occasionally, it seems whitish and opaque, so as to be liable to be mistaken for an incipient cataract. The white appearance of the pupil generally arises from light being reflected from the retina, in consequence of this membrane having lost its natural transparency. Richter mentions a degree of strabismus, as the only symptom, excepting the loss of sight, as invariably attendant on amaurosis. (*Anfangsgr. der Wandarzn.*)

The blindness, produced by the gutta serena, is generally preceded by an imaginary appearance of numerous insects, or substances like pieces of cobwebs, interposing themselves between objects and the eye. The origin of a cataract, on the other hand, is usually attended with a simple cloudiness of vision. Some remarks on the complication of a cataract with the gutta serena, will be found in the article *Cataract*. *Nyctalops* and *Hemeralopia* are considered as varieties of amaurosis. (See *those words*.)

Professor Scarpa has given so very excellent an account of the prognosis and treatment of the present disease, that we cannot enrich this work more than by the insertion of his chief remarks. Some of his doctrines, founded on the humoral pathology, we have omitted, as hypothetical.

Amaurosis is *perfect* or *imperfect*; *inveterate*, or *recent*; *continued*, or *periodical*.

The *perfect, inveterate amaurosis*, attended with organic injury of the substance, constituting the immediate organ of sight, is a disease absolutely incurable. The *imperfect, recent, amaurosis*, particularly that which is *periodical*, is commonly curable; for, it is mostly sympathetic with the state of the stomach and primæ viæ, or dependent on causes, which though they affect the immediate organ of sight, are capable of being dispersed, without leaving any vestige of impaired organization in the optic nerve, or retina.

When amaurosis has prevailed several years, in persons of advanced age, whose eyesight has been weak from their youth; when it has come on slowly, at first with a morbid irritability of the retina, and then with a gradual diminution of sense in this part, till total blindness was the consequence; when the pupil is motionless, not circular, and not much dilated; when it is widened in such a degree, that the iris seems, as if it were wanting, and the margin of this opening is irregular and jagged; and, when the bottom of the eye, independently of any opacity of the crystalline lens, presents an unusual paleness, like that of horn, sometimes partaking of green, and reflected from the thickened retina, the disease may be generally set down, as incurable. Cases may be deemed irremediable which are attended with pain all over the head, and a continual sensation of tightness in the eyeball, which are preceded by a violent, protracted excitement of the nervous system, and then by general debility and langour of the constitution, as after masturbation, premature venery, and hard drinking. There is no remedy for cases, connected with epileptic fits, or frequent spasmodic hemicrania; nor for such as are the consequence of violent, long-continued, internal ophthalmia. Cases are incurable, also, when produced by violent concussion of the head, direct blows on the globe of the eye, or a violent contusion, or other injury of the supra-orbitary nerve, and this, whether the disease take place immediately after the blow, or some weeks subsequently to the healing of the wound of the eyebrow. Amaurosis is also incurable, when occasioned by foreign bodies in the eyeball, lues venera, or exostoses about the orbit. Lastly, amaurosis is absolutely irremediable, when conjoined with a manifest change in the figure and dimensions of the eyeball.

On the contrary, all cases of imperfect, recent amaurosis, whether the blindness be total, or partial, are mostly curable, when not produced by causes, capable of contusing or destroying the organic structure of the optic nerve, and retina. This is especially true, when the retina is in some degree sensible to the impression of light. Recent, sudden cases, in which the pupil is not excessively dilated, and its disk remains regular, while the bottom of the eye is of a deep black colour; cases, unaccompanied by any acute, continual pain in the head and eyebrow, or any sense of constriction in

the globe of the eye itself; cases, which originate from violent anger, deep sorrow, fright, excessive fulness of the stomach, a foul state of this viscus, general plethora, or the same partial affection of the head, suppression of the menses, habitual bleedings from the nose, piles, &c. great loss of blood, nervous debility, not too inveterate, and in young subjects, are all, generally speaking, curable. Amaurosis is also, for the most part, remediable, when produced by convulsions, or the efforts of difficult parturition; when it arises during the course, or towards the termination of acute, or intermittent fevers; and when periodical, coming on at intervals, such as every day, every three days, every month, &c.

The accurate observers, Schmucker and Richter, have found, that the curable imperfect amaurosis commonly depends on some disease, or irritation, existing in the gastric system, and, in some instances, complicated with general nervous debility, in which the eyes participate. Hence, the chief indication, in the majority of cases, is to free the stomach and primæ viæ from all irritating matter, to strengthen the gastric organs, promote digestion, and reanimate the nervous system in general, and the nerves of the eye in particular.

Emetics and internal resolvents answer the first purpose, and tartar emetic should be preferred to every pharmaceutical preparation. When afterwards administered, in small repeated doses, it also acts as a resolvent remedy, which operation may be rendered stronger by joining it with gummy, saponaceous substances.

Dissolve three grains of the antimonium tartarizatum, for an adult, in six ounces of water, and give a spoonful of this solution, every half hour, until nausea and copious vomiting are produced. The next day exhibit some resolvent powders, consisting of an ounce of cream of tartar, and one grain of tartar emetic, divided into six equal parts. The patient must take one of these in the morning, another four hours afterwards, and a third in the evening, for eight or ten days in succession. This remedy will create a little nausea, a few more alvine evacuations, than usual, and, perhaps, in the course of a few days, vomiting. If the patient, during the use of these resolvent powders, should make vain efforts to vomit, complain of bitterness in his mouth, loss of appetite, and no renovation of sight, the emetic, as at first directed, is to be prescribed again. This is to be repeated a third, and fourth time, should the morbid state of the gastric system, the bitter taste in the mouth, the tension of the hypochondria, the acid eructations, and the inclination to vomit, make it necessary. The first emetic often produces only an evacuation of an aqueous fluid, blended with a little mucus; but, if it be repeated, a few days after the resolvent powders have been administered, it then occasions a discharge of a considerable quantity of a yellow, greenish, matter, to the infinite relief of the stomach, head, and eyes.

The stomach having been thus emptied, Schmucker's* or Richter's,† resolvent pills are to be ordered.

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*℞ Gum. Sagapen.
Galban. } an. ʒj.
Sap. Venet.
Rhei optim. ʒiss.
Tart. Emet. gr. xvi.
Suc. liquerit ʒj fiant pilulæ gran. quinque.

Three of these pills to be taken every morning and evening for a month, or six weeks.

†℞ Gum. Ammoniac.
Ass. fœtid.
Sap. Venet. } an ʒij.
Rad. Valer. s. p.
Summit. Arnicæ.
Tart. Emet. gr. xviij. fiant pilulæ gran. quinque.

Six to be taken thrice a day for several weeks.

The pills are here directed to be made larger, than Schmucker and Richter order, that the number in one dose may be diminished. To prescribe 15 pills three times a day would seem absurd to the generality of patients in this country.

The following are the usual effects. The patient, after having vomited copiously, experiences a general calm, and an easiness not felt before. Sometimes, he begins to distinguish the outlines of objects the very day, on which he takes the emetic; at other times, he does not reap this benefit till the fifth, seventh, or tenth day; and, in some instances, not before some weeks have elapsed, after the exhibition of the emetic, and the uninterrupted use of the resolvent powders and pills. When the patient begins to recover his sight, the dilated state of the pupil diminishes; the iris contracts more on being exposed to the vivid light of a candle; and, in proportion as the power of seeing things increases, the contractions and moveableness of the pupil augments. On the whole, the cure is very seldom completed in less than a month, during which time the employment of such remedies, as are calculated to revive the languid action of the nerves of the eye, must not be neglected.

When the above plan has rectified the state of the stomach, and partly effected the restoration of the sight, such remedies must be employed, as strengthen the digestive organs, and excite the vigour of the nervous system in general, and of the nerves of the eye in particular. A powder is to be prescribed, composed of an ounce of bark, and half an ounce of valerian, divided into six equal parts, one of which is to be taken in the morning, another in the evening, in any convenient vehicle, for, at least, five, or six weeks. During this time, the patient's nourishment must consist of tender succulent meat, and wholesome broths, with a moderate quantity of wine, and proper exercise in a salubrious air. To excite the action of the nerves of the eye, the vapour of the aqua ammoniæ puræ, properly directed against the eye, is of the greatest service. This remedy is applied by holding a small vessel, containing it, sufficiently near the eye to make this organ feel a smarting, occasioned by the very penetrating vapours, with which it is enveloped, and which cause a copious secretion of tears, and a redness, in less than half an hour after the beginning of the applications. It is now proper to stop, and repeat the application, three or four hours afterwards. The plan must be thus followed up till the incomplete amaurosis is quite cured. The ammoniacal vapours should be used as soon as the stomach has been freed from all irritating matter, and they should not be discontinued, till long after the eye has been cured.

The operation of these vapours may be aided by other external stimulants, applied to such other parts of the body, as have a great deal of sympathy with the eyes. Of this kind, are blisters to the nape of the neck; friction on the eyebrow with the anodyne liquor; the irritation of the nerves of the nostrils by sternutative powders, like that composed of two grains of turbith mineral, and a scruple of powdered betony leaves; and lastly, a stream of electricity. The latter has been proposed, as one of the principal means of curing amaurosis; but, experience has shown, that electricity only merits confidence, as a secondary remedy, and Mr. Hey, one of its most zealous advocates, confesses, that it only succeeds in cases of recent amaurosis, and, usually, not in these, unless it be combined with proper internal medicines, among which resolvents are the chief. (*Med. Obs. and Inq. Vol. 5. p.* 26.)

Many might suppose bark to be a specific for the imperfect periodical amaurosis. This, however, is not the case. Bark, which is efficacious in intermittent fevers, and other periodical diseases, far from curing the periodical amaurosis, seems to exasperate it, rendering its return more frequent, and of longer duration, than before. On the other hand, this disease is most commonly cured, in a very short time, by exhibiting first emetics, then internal resolvents, and, lastly, corroborants, even bark, which was before useless and hurtful.

The above plan of curing the recent imperfect amaurosis succeeds in the majority of cases, when the disease is only sympathetic, or dependent on the morbid state of the gastric system.—But, there are cases, in the formation of which many other causes operate, besides the most frequent one already stated. These demand the employment of particular curative means, in addition to those, which have been already described. Such is, for example, the imperfect amaurosis, which occurs suddenly, in consequence of the body being excessively heated, or ex-

posure to the sun, or violent anger, in plethoric subjects. This case requires, in particular, general and topical evacuations of blood, and the application of cold washes to the eyes and whole head. An emetic should next be given, and afterwards, a purge of the kali tartarisatum, or small repeated doses of the tartar emetic, Schmucker relates, that, by means of bleeding and an emetic, he has oftentimes restored the eyesight of soldiers, who had lost it in making forced marches, with very heavy burdens. In amaurosis, suddenly occasioned by violent anger, an emetic is the more strongly indicated after bleeding, as the blindness, thus arising, is always attended with a bitter taste in the mouth, tension of the hypochondria, and continual nausea.—Richter gives an account of a clergyman, who became completely blind, after being in a furious passion, and whose eyesight was restored the very next day, by means of an emetic, which was given with a view of relieving some obvious marks of bilious disorder in the stomach.

In the recent imperfect amaurosis, arising from a sudden suppression of the menses, the principal indication, before administering an emetic, is evidently that of reexciting, the evacuation of blood from the uterus, by applying leeches to the labia pudendi, and bathing the feet in warm water. Then give the emetic, and afterwards the resolvent pills. If these means fail in establishing the menstrual discharge, great confidence may be placed in a stream of electricity, conducted from the loins across the pelvis in every direction, and thence repeatedly to the thighs and feet. We should not despair at want of success at first, as the plan frequently succeeds after a trial of several weeks.

Cases, arising from the stoppage of an habitual copious bleeding from piles, require the application of leeches and fomentations to the hemorrhoidal veins. Then exhibit an emetic, and afterwards the resolvent pills.

The treatment of the imperfect amaurosis, from fevers badly treated, deep sorrow, great loss of blood, intense study, and forced exertions of the eyes on very minute, or brilliant objects, consists also in removing all irritation from the stomach, and afterwards strengthening the nervous system in general, and the nerves of the eye in particular. In the case originating from fevers, the emetic and resolvent pills are to be given; then bark, steel medicines, and bitters; while the vapours of the aqua ammoniæ puræ are applied to the eye itself.

When the disorder seems to proceed from grief, or fright, the stomach and intestines are to be emptied by means of tartar emetic, and the resolvent pills; and the cure is to be completed by giving bark and valerian together; by applying the vapour of the aqua ammoniæ puræ to the eye; ordering nourishing easily digestible food; diverting the patient's mind, and fixing it on agreeable objects, and recommending moderate exercise. The amaurosis from fright is said to require a longer perseverance in such a plan, than the case from sorrow.

The incomplete amaurosis from general nervous debility, copious hemorrhage, convulsions ab inanitione, and long continued intense study, especially, by candle light, is less a case of real amaurosis, than a weakness of sight from a fatigued state of the nerves, especially of those constituting the immediate organ of sight. When this complaint is recent, in a young subject, it may be cured, or diminished by emptying the alimentary canal with small repeated doses of rhubarb, and then giving tonic cordial remedies. At the same time, the patient must abstain from every thing, that has a tendency to weaken the nervous system, and, consequently, the eyesight. After emptying the stomach, prescribe the decoction of bark with valerian, or the infusion of quassia, with the addition of a few drops of the æther vitriolicum to each dose, with nourishing, easily digestible food. The aromatic spirituous vapours (mentioned in the art. Ophthalmy) may then be topically applied; or if these should prove ineffectual, the vapour of the aqua ammoniæ puræ. The patient must take exercise on foot, horseback, or in a carriage, in a wholesome, dry air, in warm weather, and take advantage of sea bathing. He must avoid all thoughts of care, and refrain from fixing his eyes on minute shining objects. In proportion as the energy of the nervous system returns, and the constitution is strengthened, the sight is restored. In order to preserve, and

improve this useful sense, the patient must adopt, above all things, every measure, calculated to maintain the tone of the stomach, and moderate the impression of light on the retina. This object can easily be attained by always wearing flat green glasses before the eyes, in a vivid light.

(*Saggio di Osservazioni e d'esperienze sulle principali malattie degli occhi di Antonio Scarpa. Venezia*, 1802.)

Mr. Ware has written in favor of the efficacy of electricity and a mercurial snuff, in cases of gutta serena. The snuff is compounded of ten grains of turbith mineral, (*hydrargyrus sulphuratus*) well mixed, with about a dram of the pulvis sternutatorium, glycirrhiza, or common sugar. A small pinch of snuff, taken up the nose, is found to stimulate it very considerably—sometimes exciting sneezing, but, in general, producing a very large discharge of mucus.

Mr. Ware has observed, that the pupil has been generally dilated, in the cases benefited by electricity. He notices, however, that there are many instances in which a contraction of the pupil is the only change, which takes place, in the appearance of the eye. In this sort of case, the impairment of sight is usually preceded by severe pain, and the original cause may be an internal ophthalmy of long continuance. The crystalline is sometimes visibly opaque. Here electricity has been found useful; but, Mr. Ware states, that, in these instances, the sublimate has proved superiorly and more certainly efficacious, and, consequently, he prefers it to all external applications whatever. He recommends 1-fourth of a grain, as a quantity proper for a common dose, and says, that it agrees best with the stomach when first dissolved, as Van Swieten directs, in half an ounce of brandy, and taken in a basin of sago or gruel. For young patients the dose must be diminished in proportion to their youth. The medicine is to be continued, as uninterruptedly as the constitution will allow, for a month, six weeks, or even longer.

Electricity is said to have proved more useful, in case of amaurosis, originating from lightning, than when the disease has arisen from any other cause. Mr. Ware relates a very interesting instance of the success of electricity, in a case, which came on very suddenly, after great pain in the teeth, and a swelling of the face, had gone off. The disorder came on more suddenly; the temporary blindness was more entire; the eyelids were more affected, and the cure more speedy, than in the instances related by Mr. Hey in the 5th vol. of the Med. Obs. and Inq. (*Chirurgical Observations relative to the Eye, by James Ware. Vol.* 1.)

Scarpa has set down gutta serena, from wounds of the eyebrow, as incurable. This opinion is not correct, for, the first case related by Mr. Hey arose from this cause, and was cured by giving every night the following dose: *R. Calomel*, pp. *Camphor* ā ā *gr.* iij. *Conserv. Cynosb.* q. s. *probe misceant et f. Bolus*, in conjunction with electricity. The lady, however, had been previously bled twice, had taken some nervous medicines, and had had a blister between the shoulders. The patient was first set upon a stool with glass feet, and had sparks drawn from the eyes, and parts surrounding the orbits, especially, where the superciliary, and infraorbitary branches of the fifth pair of nerves spread themselves. After this operation had been continued half an hour, she was made to receive, for an equal time, slight shocks through the affected parts. In a few days sight began to return, and in less than three months it was quite restored.—In another case, one grain of calomel, and two of camphor, given every night, and the employment of electricity, effected a cure. The disease had come on gradually, without any previous accident, or pains in the head. The patient a boy nine years old.

There are several other very interesting cases of amaurosis related by Mr. Hey, all of which make electricity appear a most efficacious remedy, though it is true, as Scarpa observes, that, in most of these instances, internal medicines, were also given, and bleeding occasionally practised. Mr. Hey attributes the benefit chiefly to the electricity, because, in two of his cases, no medicines were used, yet the progress of the amendments seemed to be as speedy in them, as in the rest, and, in two instances, a degree of sight was obtained by the first application of electricity.

Mr. Hey makes particular mention of an obliquity of sight, as invariably attendant on amaurosis. It was most

remarkable in those, who had totally lost the sight of either eye, for, in them, the most oblique rays of light seemed to make the first sensible impression upon the retina; and in proportion as that nervous coat regained its sensibility, the sight became more direct and natural. (*Med. Obs. and Inq. vol. 5*).

Many of the causes of amaurosis are of such a nature, as to render the disease totally incurable. Bonetus, in his *Sepulchretum Anatomicum lib.* 1. *sect.* 18. has given us several such cases: after death, the blindness in one was found to be occasioned by an encysted tumour weighing fourteen drams, situated in the substance of the cerebrum, and pressing on the optic nerves near their organ. In a second, the blindness was produced by a cyst, containing water, and lodged on the optic nerves, where they unite. In a third, it arose from a caries of the os frontis, and a consequent alteration in the figure of the optic foramina. In a fourth, the cause of the disease was, a malformation of the optic nerves themselves. In some of the instances, in which no apparent alteration can be discovered in the optic nerve, Mr. Ware conjectures, whether a dilatation of the anterior portion of the circulus arteriosus may not be a cause of the affection. The circulus arteriosus is an arterial circle, surrounding the sella turcica, formed by the carotid arteries on each aide, branches passing from them to meet each other before, and other branches passing backwards, to meet branches from the basilary artery behind. The anterior part of the circulus arteriosus lies directly over, crosses, and is in contact, with the optic nerves, just in the same way as the anterior branches lie over the optic nerves, the posterior ones lie over the nervi motores oculorum. Hence Mr. Ware attempts to refer the amaurosis itself, and the paralytic affection of the eyelids, and muscles of the eye, sometimes attendant on the complaint, to a dilatation of the anterior and posterior branches of the circulus arteriosus. Dr. Baillie has noticed, in his Morbid Anatomy, the frequently diseased state of the trunk, or the small branches of the carotid arteries on the side of the sella turcica, and he says the same sort of diseased structure is also found in the basilary artery and its branches.

The most valuable information, concerning amaurosis, is to be met with in *Medical Observations and Inquiries. Vermischte Chirurgische Schriften von J. L. Schmucker. Band* 2. *Berlin. Edit.* 2. 1786. *Remarks on Ophthalmy, &c. by James Ware. Inquiry into the causes preventing success in the extraction of the Cataract, &c. by the same. Osservazioni sulle Malattie degli Occhi di A. Scarpa. Venez.* 1802. *Hey's Practical Observations in Surgery.*

AMBE, (αμβη, the edge of a rock, from αμβαινω, to ascend) an old chirurgical machine for reducing dislocations of the shoulder, and so called, because its extremity projects, like the prominence of a rock. Its invention is imputed to Hippocrates. The ambe is the most ancient mechanical contrivance for the above purpose; but, not at present employed. Indeed, it is scarcely to be met with in the richest cabinets of surgical apparatus. It is composed of a piece of wood, rising vertically from a pedestal, which is fixed. With the vertical piece is articulated after the manner of a hinge, an horizontal piece, with a gutter formed in it, in which the luxated limb is laid, and secured with leather strings. The patient places himself on one side of the machine; his arm is extended in the gutter, and secured; the angle, formed by the union of the ascending piece, and by the horizontal branch, is lodged in the armpit, and then the horizontal branch is depressed. In this way extension is made, whilst the vertical part makes counter extension, and its superior part tends to force the head of the humerus into its cavity. But, there is nothing to fix the scapula, and the compression made by the superior portion of the vertical piece of the machine, tends to force the head of the humerus into its cavity, before it is disengaged by the extension. (*Boyer on Diseases of the Bones, Vol.* 2.)

AMBLYOPIA, (from αμβλυς, dull, and ωψ, the eye). Hippocrates means by this word, in his Aph. 31. Sect. 3. the dimness of sight, to which old people are subject. Paulus, Actuarius, and the best modern writers, seem to think, that amblyopia means the same thing as the incomplete amaurosis. (*Encyclopèdie Méthodique; Partie Chirurgicale.*).

AMPUTATION, (from *amputo*, to cut off.) This term signifies the oper-

ation of cutting off a limb, or other part of the body, as the breast, penis, &c.

Such an operation frequently becomes indispensably proper on the principle of sacrificing a branch, as it were, for the sake of taking the only rational chance of saving the trunk itself.

The amputation of the large limbs, was practised anciently under many disadvantages. The ignorance of the old surgeons, in regard to the method of stopping hemorrhage, made many patients die, who had had courage to submit to the operation. These practitioners were unacquainted with the mode of healing the wound by the first intention; and their instruments were as awkward and clumsy, as their dressings were irritating and improper.

The best modern practitioners have materially simplified all operations.—This object has been greatly promoted, by diminishing the number, and improving the construction, of instruments, and by abandoning the use of a multitude of external applications, most of which were useless, or hurtful.

But, much improved as amputation has been, no one can dissemble, that it is an operation at once terrible to bear, dreadful to behold, dangerous in its consequences, and leaves the patient for ever afterwards in a mutilated state. Hence, it is the surgeon's duty never to have recourse to so severe a proceeding, without a perfect and well-grounded conviction of the necessity for so doing.

Though we seldom see the operation adroitly executed, its performance is by no means difficult, and the reason of the knife being so badly handled in this part of surgery, may generally be imputed to carelessness, slovenly habits, and fear and confusion on the part of the operator. There are several egregious faults in the method of amputating, which even many hospital surgeons in this metropolis are guilty of; but, these we shall find, when we criticise them, are, for the most part, very avoidable, without any particular share of unusual dexterity. The real difficulty is to ascertain with precision the cases which demand the operation; those in which it may be dispensed with, and to know the exact periods at which it should be practised. These are considerations requiring the most profound attention, and the brightest talents. For such reasons we shall first take a view of the circumstances under which the best modern surgeons deem amputation necessary. However, it may be proper to observe, that in each of the articles, relative to the particular diseases and injuries which ever render amputation indispensable, additional information will be offered.

1. *Compound Fractures.*

In a compound fracture the necessity for amputation is not always proportioned to the seriousness of the accident, but, also, frequently depends on other circumstances. For example, in the field, and on board of ship, it is not always in the surgeon's power to pay such assiduous attention as the cases demand, nor to procure for the patient the proper degree of rest and stillness. In the field there is frequently a necessity for transporting the wounded from one place to another.—In these circumstances it is proper to have immediate recourse to amputation, in all recent cases of bad compound fractures, the appearances of which are such as necessarily excite apprehension of the consequences.—Doubtless, there are many cases, in which it would not be proper to adopt this practice, even under the most unfavourable circumstances of the above description. So, when a compound fracture occurs, in which the soft parts have not been considerably injured; in which the bones have been broken in such a direction that they can be easily set, and kept in their proper position, and in which there is only one bone broken, amputation would be unnecessary and cruel. But, when the limb has been considerably injured, and the bones have been so broken that they cannot be kept in a proper position, after being reduced, we may make it a general rule to amputate, under the circumstances above alluded to.

The bad air in hospitals and large cities, which is always so detrimental to wounds, is another consideration which may render amputation adviseable.

But, if in camps, on board of ships, in large cities and hospitals, it is prudent for the surgeon to conform to the above rule, it is not so in other situations. When the patient can be put in a commodious place, whence it will not

be necessary to remove him; when he can be left perfectly quiet, with good air and the aid of skilful surgeons; there are not many cases in which patients, enjoying all these advantages, must of necessity submit to amputation. However, if the bones, muscles, and other soft parts, should be so bruised and mangled, that there is no hope of the limb ever being able to perform its functions again, we should not hesitate about performing amputation. An injury, which would, by its inevitable consequences, put the patient's life into the most imminent peril, may often be converted by amputation into one of the most simple nature, and easy of cure. (*Encyclopédie Méthodique, Partie Chirurgicale.*)

In compound fractures there are three points of time in which amputation may become proper. The first of these is immediately, or as soon as may be, after the receipt of the injury. The second is, when the bones continue for a great length of time without any disposition to unite, and the discharge from the wound has been so long, and is so large, that the patient's strength fails, and general symptoms foreboding dissolution come on. The third is, when a mortification has taken such complete possession of the soft parts of the inferior part of the limb, quite down to the bone, that upon the separation of such parts, the bone or bones shall be left bare in the interspace.

The first and second of these are matters of very serious consideration. The third hardly requires any.

When a compound fracture is caused by the passage of a very heavy body over a limb; such, for instance, as the broad wheel of a waggon, or loaded cart, or by the fall of a very ponderous body on it, or by a cannon shot, or by any other means so violent as to break the bones into many fragments, and so to tear, bruise, and wound, the soft parts, that there shall be good reason to fear that there will not be vessels sufficient to carry on the circulation with the parts below the fracture, it becomes a matter of the most serious consideration, whether an attempt to save such a limb, will not occasion loss of life. This consideration must be before any degree of inflammation has seized the part, and, therefore, must be immediately after the accident. When inflammation, irritation, and tension have taken place, and when the air, admitted freely into the cellular membrane, has begun to exert its pernicious influence, it is too late; an operation, then, instead of being beneficial, would prove destructive.

The necessity of immediate or very early decision, in this case, makes this a very delicate part of practice; for, however pressing the case may seem to the surgeon, it will not, in general appear in the same light to the patient, to the relations, or to bye-standers. They will be inclined to regard the proposition as arising from ignorance, or an inclination to save trouble, or a desire to operate; and it will often require more firmness on the part of the practitioner, and more resignation and confidence on the part of the patient, than is generally met with, to submit to such a severe operation, in such a seeming hurry, and upon so little apparent deliberation; and yet it often happens, that the suffering this point of time to pass, decides the patient's fate.

The necessity of early decision arises from the quick tendency to mortification, which ensues in the injured limb, and too often ends in the patient's death. That this is no exaggeration, melancholy and frequent experience evinces, even in those whose constitutions previous to the accident, were in good order; but much more in those who have been heated by violent exercise, or labour, or liquor, or who have led very debauched and intemperate lives, or who have habits naturally inflammable and irritable. This is often the case when the fracture happens to the middle part of the bones, but is much more likely to happen, when any of the large joints are concerned. In many of these cases, a determination for or against amputation, is really a determination for or against the patient's existence.

That it would have been possible to have saved some limbs which have been cut off, no man will pretend to say; but, this does not render the practice injudicious. Do not the majority of those who get into the above hazardous condition, and on whom amputation is not performed, perish, in consequence of their wounds? Have not many lives been preserved by amputation, which, from the same circumstances, would otherwise most probably have been lost?

Pressing and urgent as the state of a compound fracture may be, at this first

point of time, still it will be a matter of choice, whether the limb shall be removed or not; but, at the second period, the operation must be submitted to, or the patient must die.

The most unpromising appearances at first, do not necessarily, or constantly end unfortunately. Sometimes, after the most threatening first symptoms, after considerable length of time, great discharges of matter, and large exfoliations of bone, success shall ultimately be obtained, and the patient shall recover his health and the use of his limb.

But sometimes, after the most judicious treatment through every stage of the disease; after the united efforts of physic and surgery, the sore, instead of granulating kindly, and contracting daily to a smaller size, shall remain as large as at first, with a tawny, spongy surface, discharging a large quantity of thin sanies, instead of a small one of good matter; the fractured ends of the bones, instead of tending to exfoliate, or to unite, will remain as perfectly loose and disunited as at first, while the patient shall lose his sleep, his appetite, and his strength; a hectic fever, with a quick, small, hard pulse, profuse sweats, and colliquative purging, contributing at the same time to bring him to the brink of the grave, notwithstanding every kind of assistance, in these circumstances, if amputation be not performed, what else can rescue the patient from destruction?

The third and last period is a matter which does not require much consideration. Too often the inflammation consequent upon the injury, instead of producing abscess and suppuration, tends to gangrene and mortification, the progress of which is often so rapid, as to destroy the patient in a very short space of time, constituting that very sort of case, in which amputation should have been immediately performed. But, sometimes even this dreadful malady is, by the help of art, put a stop to, but not until it has totally destroyed all the surrounding muscles, tendons, and membranes, quite down to the bone, which, upon the separation of the mortified parts, is left quite bare, and a circulation between the parts above and those below, is by this totally cut off. In this instance, whether the surgeon saw through the bare bone, or leave the separation to be effected by nature, the patient must lose his limb. (See *Pott on Amputation.*)

There is yet another circumstance which may render amputation necessary, in cases of compound fractures, and this is, when such copious hemorrhages occur, as cannot be stopped by any other means. These bleedings proceed from arteries which have been lacerated by the ends of the broken bone, or some other cause, at the moment of the accident. (*Encyclopédie Méthodique; Partie Chirurgicale.*)

2. *Extensive contused and lacerated Wounds.*

These form the second class of general cases requiring amputation. Wounds without fracture, are not often so bad as to require this operation. When a limb, however, has been contused and lacerated, in such a degree, that all its principal blood vessels are injured, and there is no hope of a continuance of the circulation, the immediate removal of the member should be recommended, whether the bones be injured or not. Also, since no effort on the part of the surgeon can preserve a limb so injured, and such wounds are more likely to mortify than any others, the sooner the operation is undertaken the better.

In these cases, as in those of compound fractures, though amputation may not be necessary at first, it may become so afterwards. The foregoing observations, relative to the second period of compound fractures, are equally applicable to wounds, unattended with injury of the bones. Sometimes hemorrhages occur, which we cannot restrain; or a rapid mortification comes on; or such a copious suppuration, as the system cannot bear any longer. (*Encyclopédie Méthodique; Partie Chirurgicale.*)

3. *Cases in which Part of a Limb has been carried away by a Cannon Ball.*

When part of a limb has been torn off by a cannon ball, or any other cause capable of producing a similar effect, the end of the stump from which the part has been separated, should be removed with a cutting instrument.

This is an instance in which many surgeons dispute the necessity of amputation. They urge as a reason, that the limb being already removed, it is

better to endeavour to cure the wound as speedily as possible, than to increase the patient's sufferings and danger, by making him submit to amputation. It must be remembered, however, that the bones are generally shattered, and reduced into numerous fragments; the muscles and tendons are unequally divided, and their ends torn and contused. All allow it is absolutely necessary to extract the splinters of bone, and cut away the irregular extremities of the tendons and muscles, which operations would require a longer time than amputation itself. Besides, we should recollect, that by making the incision above the injured part, so as to be enabled to cover the bone with flesh and integuments, perfectly free from injury, the extent of the wound is so diminished, that the healing can be accomplished in one third of the time which would otherwise be requisite. A much firmer cicatrix is also thus obtained. Such reflections must convince us, that amputation here holds forth very great advantages. It cannot increase the patient's danger, and, as for the momentary augmentation of pain which he suffers, he is amply compensated by all the benefits resulting from the operation. (*Encyclopédie Méthodique; Partie Chirurgicale.*) See *Gunshot Wounds.*

4. *Mortification.*

Mortification is another cause, which, when advanced to a certain degree, renders amputation indispensably proper. We have noticed that bad compound fractures, and wounds, often terminate in the death of the injured limb. Such surgeons as, at all events, have been determined to oppose the performance of amputation, have pretended that this operation is totally useless in the present instance. They assert, that when the mortification is only in a slight degree, it may be cured, and that when it has advanced to a considerable extent, the patient will persish, whether amputation be performed or not. But this way of viewing things is so contrary to facts, and the experience of every impartial practitioner, that we shall make no attempt to refute the assertions. Though we allow that it would be very bad practice, every time the slightest appearance of gangrene occurred; yet, when the mischief has increased in such a degree, that all, or the greater portion of the soft parts are gangrenous, as is too frequently the case, there exists no remedy for this state; or, at least, none with which we are acquainted, and amputation is absolutely necessary.

Practitioners have entertained very opposite opinions, concerning the period when one should operate in cases of mortification. Some pretend, that whenever the disorder presents itself, and especially when it is the effect of external violence, we should amputate immediately after the mortification has decidedly begun to form, and while the mischief is in a spreading state. Others believe, that the operation should never be undertaken, before the progress of the disorder has stopped, even not till the dead parts have begun to separate from the living ones.

The advocates for speedy performance of amputation, declare that the further progress of the mortification may be stopped, and the life of the patient preserved, by cutting above the parts affected. Experience, however, has shown such practice to be highly dangerous, and not deserving of confidence. Whatever pains may be taken in the operation, only to divide sound parts, there is no certainty of succeeding in this object, and the most skilful practitioner may be deceived. The skin may appear to be perfectly sound and free from inflammation, while the muscles which it covers, and the parts immediately surrounding the bone, may actually be in a gangrenous state. But, even when the soft parts are found free from apparent distemper, on making the incision, still, if the operator should not have waited till the mortification had ceased to spread, the stump will almost always be attacked by gangrene. Surgeons, who have had opportunities of frequently seeing wounds which have a tendency to mortify, entertain the latter opinion. Such was the sentiment of Pott, who says, that he has often seen the experiment made, of amputating a limb in which gangrene had begun to show itself, but never saw it succeed, and it invariably hastened the patient's death.

The operation may be postponed, however too long. Mr. Samuel Sharp, in particular, recommended too much delay, advising the operation never to be done till the natural separation of the mortified parts had considerably advanced. Mr. Sharp was a surgeon of

immense experience, and his authority carries with it the greatest weight. But, perhaps, he was too zealous in his opposition to the practice, the peril of which he had so often beheld. When the mortification has ceased spreading, there is no occasion for further delay. We now obtain, just as certainly, all the benefits of the operation, and get rid of a mass of putridity, the presence of which may become highly pernicious, should the absorbents take up any of the matter into the circulation. However, this danger would not be so considerable as that which would arise from too precipitate an operation; and, it is better to defer amputation a little more than is absolutely requisite, than to run any risk of doing it, before being certain that the parts have lost their tendency to gangrene.

Whatever may be the particular cause of the mortification, it makes no alteration in the above doctrines; the practice should always be the same. Though it has been thought that a distinction should be made, between cases in which mortification is the effect of an internal cause, and those in which it is the consequence of an external one; yet, no practical advantage can be deduced from this discrimination. In no cases ought the operation to be performed before the period above specified, and in all it may be undertaken, as soon as there is a positive cessation in the progress of the disorder. (*Encyclopédie Méthodique; Partie Chirurgicale.*) See *Mortification.*

5 *White-Swellings.*

Scrophulous joints, with diseased bones, and distempered ligaments, is another case, in which amputation may become absolutely necessary. There is one circumstance attending this complaint which often renders it particularly unpleasant, which is, that the subjects are most frequently young children, so as to be incapable of determining for themselves, which inflicts a very distressing task on their nearest relations. All the efforts of physic and surgery often prove absolutely ineffectual, not only to cure, but even to retard this most terrible malady. Notwithstanding many cases admit of cure, there are numerous others which do not so. The disease often begins in the very inmost recesses of the cellular texture of the heads of the bones, forming the large articulations, such as the hip, knee, ankle, and elbow; the bones become diseased in a manner, which we shall explain in the article (*Articulation,*) sometimes with great pain and symptomatic fever; sometimes with very little of either, at least in the beginning. The cartilages covering the ends of these bones, and designed for the mobility of the joints, are totally destroyed; the epiphyses in young subjects are either partially, or totally, separated from the said bones; the ligaments of the joints are so thickened, and spoiled by the distemper, as to lose all natural appearance, and become quite unfit for all the purposes for which they were intended; the parts appointed for the secretion of the synovia, become distempered in like manner; all these together furnish a large quantity of stinking sanious matter, which is discharged either through artificial openings, made for the purpose, or through small ulcerated ones. These openings commonly lead to bones which are diseased through their whole texture. When the disease has got into this state, the constant pain, irritation, and discharge, bring on hectic symptoms of the most destructive kind, such as total loss of appetite, rest, and strength, profuse night sweats, and as profuse purgings, which foil all the efforts of medicine, and bring the patient to the brink of destruction.

It is an incontestible truth, that unless amputation be performed, a patient thus situated must perish; and it is equally true, that numbers, in the same circumstances, have, by submitting to the operation, recovered vigorous health. (See *Pott on Amputation.*)

It is a fact highly important to be known, that, in these cases, amputation is attended with more success, when performed late, than when undertaken at an early period, before the disease has made great advances. This is particularly fortunate, as it affords time for employing such remedies as are at all likely to check the progress of the disorder. (*Encyclopédie Méthodique.*) See *Articulation—White-swelling.*

6. *Exostoses.*

We shall here content ourselves with merely mentioning, that this disease

may render amputation necessary, when it is impracticable to remove the bony swelling in the manner we shall explain in the article *Exostosis*, and the tumour becomes hurtful to the health, or insupportable, on account of its weight, or other circumstances.

7. *Caries and Necrosis.*

Another distemper, productive of the necessity of amputation, is a caries of a whole bone or bones, forming a limb. A caries is here meant, not merely possessing the surface of such bones, but the whole internal substance, and that from end to end. Bones become carious from a variety of causes, such as struma, lues venerea, deep-seated abscesses, pressure, &c. and such carious bones, properly treated, often exfoliate and cast off their dead parts. But, when the whole substance of the bone becomes diseased, from end to end, no means will avail. The use of the scalper, the raspatory, and the rugine, for the removal of the diseased surface of bones; of the trephine, for perforating into the internal texture of carious bones, and of exfoliating applications, will not succeed, and, unless the whole bone be removed by amputation, the patient will die. Mr. Pott's refutation of M. Bilguer, who asserts that amputation is not requisite in these instances, is a masterly and most convincing production.

Admitting, that internal and external remedies may so alter and correct even the carious part of a bone, as to render it capable of parting with the rest, and becoming sound, yet, occasionally there is not time for such experiments, and even in very young subjects, the whole habit is, by the rotten bone so poisoned and spoiled, that the worst kind of hectic fever will ensue, in spite of bark and every other specific, in spite of drying, burning, rasping, and boring, and, in a very short space of time, destroy the patient, unless restored by amputation. (See *Caries and Necrosis.*) (*Pott on Amputation.*)

3. *Cancerous and other inveterate Diseases, such as the Fungus Hæmatodes.*

Cancerous, inveterate diseases, and ulcers, on limbs, sometimes render amputation a matter of necessity. In treating of cancer, we shall remark, that little or no confidence should be placed either in internal or any kind of topical remedies, and that there is nothing, except the total separation of the part affected, upon which any rational hopes of cure can be built. Cancer is not frequently seen in the extremities. Every man of experience, however, must occasionally have seen, in this situation, if not actually cancer, diseases quite as intractable, and which cannot be cured except by removing the affected part. This may often be accomplished without cutting off the whole limb. But, when the disease has spread beyond certain bounds, amputation, above the part affected, is the only thing to which recourse can be had with any hope of success. Sometimes even amputation itself cannot effect a cure, when the operation has been delayed too long. It has succeeded, however, when the disease has reappeared, after a cure had been seemingly achieved by the excision of the diseased parts.

Besides cancerous, there are other ulcers, which may render amputation indispensable. Thus, when an extensive ulcer, of any sort whatsoever, is evidently impairing the health; when, instead of yielding to remedies, it becomes larger and more inveterate; when, in short, it puts life in imminent danger; amputation should be advised. For further information refer to *Cancer*, *Fungus Hæmatodes*, *&c.*

9. *Various Tumours.*

That there are numerous swellings, which destroy the texture of the limbs, render such members useless, afflict the patient with dreadful sufferings, and bring him into the most debilitated state, no man of observation can fail to have seen. When such tumours can neither be discussed, nor cut out with safety, amputation of the limb is the only resource.

Mr. Pott has particularly described a tumour affecting the leg, for which the operation is sometimes requisite. It has its seat in the middle of the calf of the leg, or rather more towards its upper part, under the gastroenemius and soleus muscles. It begins by a small, hard, deep seated swelling, sometimes very painful, sometimes but little so, and only hindering the patient's exercises. It does not alter the natur-

al colour of the skin, at least until it has attained a considerable size. It enlarges gradually, does not soften as it enlarges, but continues through the greatest part of it incompressibly hard, and, when it is got to a large size, it seems to contain a fluid, which may be felt towards the bottom, or resting, as it were, on the back part of the bones. If an opening be made for the discharge of this fluid, it must be made very deep, and through a strangely distempered mass. This fluid is generally small in quantity, and consists of a sanies mixed with grumous blood; the discharge of it produces very little diminution of the tumour, and very high symptoms of irritation and inflammation come on, and advancing with great rapidity, and most exquisite pain, very soon destroy the patient, either by the fever, which is high, and unremitting; or by a mortification of the whole leg. If amputation has not been performed, and the patient dies, after the tumour has been freely opened, the mortified and putrid state of the parts prevents all satisfactory examination; but, if the limb was removed, without any previous operation, and (which Mr. Pott, in his experience, found to be the only way of preserving the patient's life) the posterior tibial artery, will be found to be enlarged, distempered, and burst; the muscles of the calf to have been converted into a strangely morbid mass; and the posterior part of both the tibia and fibula more or less carious. (*Pott on Amputation.*)

It seems only necessary to adduce another species of tumour to illustrate the necessity of amputation. The following case is related by Mr. Abernethy. A woman was admitted into St. Bartholomew's Hospital with a hard tumour in the ham. It was about four inches in length, and three in breadth. She had also a tumour in front of the thigh, a little above the patella, of lesser size and hardness. The tumour in the ham, by its pressure on the nerves and vessels, had greatly benumbed the sensibility, and obstructed the circulation of the leg, so that it was very odematous. As it appeared impossible to remove this tumour, and as its origins and connexions were unknown, amputation was resolved on. On examining the amputated limb, the tumour in the ham could only be divided with a saw. Several slices were taken out of it by this means, and appeared to consist of a coagulable and vascular substance, in the interstices of which a great deal of bony matter was deposited. The remainder of the tumour was macerated, and dried, and it appeared to be formed of an irregular and compact deposition of the earth of bone. The tumour on the front of the thigh, was of the same nature as that of the ham, but containing so little lime that it could be cut with a knife. The thigh bone was not at all diseased, which is mentioned, because when bony matter is deposited in a limb, it generally arises from the disease of a bone. (*Surgical Observations.* 1804.)

Before the late facts and improvements, relative to the treatment of aneurisms, these cases, on the extremities, were generally set down as requiring amputation. Even Mr. Pott wrote in recommendation of such practice, and his observations on this subject are among the few parts of his writings, which the enlargement of surgical knowledge, since his time, has rendered objectionable.

We shall conclude these remarks on the causes requiring amputation, with advising surgeons never to undertake this serious operation, without consulting the opinions of other professional men, when their advice can be obtained.

General Remarks on Amputation.

Before the invention of the tourniquet, the operation was attended with so much danger, that very few surgeons ventured to undertake it, and even since the above instrument became known, a long time elapsed before one half of the patients were saved on whom amputation had been executed. At present, perhaps, not more than one individual out of twenty loses his life after the operation, even taking into the account all those on whom it is practised in hospitals. In private practice, where one can pay greater attention to various important circumstances, which relate to amputation, the proportion of deaths must be still less.

The different parts of the operation, which deserve particular attention, are, the choice of the place where to amputate; the measures for guarding against bleeding during the operation; the division of the integuments, muscles, and bones, which is to be ac-

complished in such a manner, as to be able afterwards to cover the whole surface of the stump with skin; tying the arteries, which should be done without including the nerves, or any other adjacent part; placing the integuments in a proper position after the operation; and, finally, the subsequent treatment of the wound.

The ancients contented themselves, before making the incision, to have the skin forcibly drawn upward by an assistant; they next divided, by one sweep of the knife, the integuments and flesh down to the bone, and, afterwards sawed the bone on a level with the soft parts, which were drawn upward. It appears, however, that the views of Celsus extended further than those of most of his cotemporaries, and followers, even almost down to modern times. After cutting the muscles down to the bone, he says, that the flesh should be reflected, and detached underneath with a scalpel, in order to denude a portion of the bone, he says, which is then to be sawn as near as possible to the healthy flesh, which remains adherent. He states that, when this plan is pursued, the skin around the wound will be so loose, that it can almost be made to cover the extremity of the bone. It is to be lamented, that this advice, inculcated by Celsus, should not have been comprehended, or that it should have been so neglected, as to stand in need, as it were, of a new discoverer, and that a suggestion of such importance should have remained so long useless. But, the fact is, hemorrhage formerly rendered amputation so dangerous, that the ancient surgeons could not devote much attention to any thing else in the operation, and the practitioners amputated so seldom, that we read in Albucasis, that he positively refused to cut off a person's hand, lest a fatal hemorrhage should ensue, and the patient did it himself, and recovered.

Cheselden is regarded as the surgeon, who revived Celsus's method, in proposing to divide the soft parts *by a double incision*, that is by cutting the skin and cellular substances first, and then, by dividing the muscles, down to the bone, on a level with the edge of the skin. In this manner the bone could be sawn higher up, and its end could be more completely covered with skin. The wound, however, always continued very large, so that after the amputation of a thigh, three, four, and often five or six months, elapsed before the stump was healed. After all, this had a disadvantageous form, being commonly pyramidal, by reason of the projection of the bone beyond the soft parts. A new ulcer was also frequently produced, by an exfoliation of this part of the bone, long after the patient had been deemed quite cured.

To hinder the stump from assuming this pyramidal, or sugar-loaf shape, a circular bandage was employed, which acted by supporting the skin and muscles, and preventing their retraction. This bandage, when properly applied, from the upper part of the limb downward, fulfilled in a certain measure the end proposed, but, never answered well enough to make the wound heal in a reasonable time. Mr. Sharp proposed bringing the edges of the skin together with sutures; but, the pain and other inconveniences of this method were such, that it was never extensively adopted, and Mr. Sharp himself ultimately abandoned it. It is to be regretted, that a very excellent modern surgeon, Mr. Hey, should have spoken rather in favour of the use of sutures, in bringing together the edges of the wound after amputation. (*Practical Observations in Surgery, p.* 517.)

It appears, from the above account, that our ancestors failed in their endeavours to amputate, so as to shorten the time required for healing the wound, and give the stump a flat, smooth surface. Hence, several surgeons, about forty years ago, endeavoured to revive the method of amputating with a flap, which was practised above a century ago by Lowdham, an Englishman, and was afterwards brought into notice again, at different periods by M. M. Verduin, Sabourin, Vermale, and La Faye. The plan consisted in preserving a large portion of the muscles and integuments, below the place, where the division of the bone was made, in order to put this flap over the stump, and retain it in this position by a suitable mode of dressing, until an union was accomplished. The operation will be explained hereafter.

The most zealous hopes were always placed in this method, which, to the advantage of defending the end of the stump by a sort of thick fleshy cushion, added that of covering it with perfect-

ly sound skin. But, notwithstanding the exertion of many able men to bring the flap operation to perfection, it has always sunk into disuse. Some surgeons of the present day, however, have not been deterred from further trials to improve the method, while others have endeavoured to perfect the method of amputating with a circular incision. The labours of both the former and latter have not been useless, and, in both ways, by covering the stump with sound skin, the part has often been healed by the first intention, except just where the ligatures of the vessels were situated.

MR. ALANSON'S MODE OF AMPUTATING.

This gentleman begins his *Practical Observations on Amputation*, with exposing how useless and inconvenient it was to apply a circular band round the limb, with a view of directing the track of the knife, and giving steadiness to the parts, as was commonly done, before his publication issued from the press.

As soon as the tourniquet is applied, let an assistant grasp the limb circularly with both his hands, and firmly draw the skin and muscles upward. The operator must then fix his eye upon the proper part, where he is to begin his operation, and he will now make the circular incision through the skin, and adipose membrane, with considerable facility and dispatch, as the knife will pass much quicker, in consequence of the tense state in which the parts are supported. The operator not being confined to cut in the exact line of the tape, he can also execute this part of the operation, in half the time, which is required in the mode usually practised. The division of the skin being the most painful part of incisions in general, it should always be done as quickly as possible. By drawing up, and supporting the skin and muscles, as here directed, we more fully attain the grand object of preserving as much skin and muscular substance, as will afterwards form a good cushion upon the extremity of the bone.

After the incision, through the integuments, let the assistant still continue a steady support of the parts, then separate the cellular and ligamentous attachments with the point of your knife, till as much skin is drawn up, as will with the united assistance of the particular division of the muscles hereafter recommended, fully cover the whole surface of the wound.

Although a speedy cure may be produced, by covering the wound with skin and adipose membrane only, yet the after consequences are of very material importance in the thigh amputation, and hence the following mode deserves attention, as the parts thus divided, form a thicker cushion over the bone, are much better adapted to immediate contact, union, and the formation of a stump with a regular surface. Hence, after the advised separation of the cellular and ligamentous attachments to the necessary extent, instead of applying the knife close to the edge of the integuments, and dividing the muscles in a circular perpendicular manner down to the bone, proceed as follows. We will suppose you are operating upon the thigh, and standing on the outside of the limb. Apply the edge of your knife, under the edge of the supported integuments, upon the inner edge of the vastes internus muscle, and cut obliquely through that and the adjacent muscles, upwards as to the limb, and down to the bone, so as to lay it bare, about three or four fingers' breadth higher, than is usually done, by the common perpendicular circular incision. Now draw the knife towards you, then its point rests upon the bone, and keeping the edge in the same oblique line, already pointed out by the former incision, the rest of the muscles are to be divided in that direction all round the limb, the point of the knife being in contact with, and revolving round the bone through the whole of the division.

The speedy execution of the above directed incision, will be much expedited, by one assistant continuing a firm and steady elevation of the parts, and another attending to preserve the skin from being wounded, as the knife goes through the muscles, at the under part of the limb. Many practitioners next proceed to deprive the bone of its periosteum to a considerable extent, above and below the part, where the saw is to pass, and this they do so minutely, as to consume a considerable time in its execution. This step not only creates unnecessary delay, but, as the periosteum serves to support the vessels in their passage to the bone, is al-

so apt to produce exfoliations, above the part where the bone is to be divided with the saw. Instead of this practice, first apply the retractor, as advised by Gooch and Bromfield, then denude the bone at the part, where you intend the saw to pass, and you will now saw it off higher than is usually practised, which, is a material object in preventing a projection of the bone, and forming a small cicatrix.

A stump, formed in the thigh, agreeably to the foregoing plan, if you bring the parts gently forward after the operation, and then view the surface of the wound, may be said to resemble, in some degree, a conical cavity, the apex of which is the extremity of the bone; and the parts thus divided, are obviously the best calculated to prevent a sugar-loaf stump.

The part, where the bone is to be laid bare, whether two, three, or four fingers' breadth higher than the edge of the retracted integuments; or, in other words, the quantity of muscular substance to be taken out, in making the double incision, must be regulated by considering the length of the limb, and the quantity of skin that has been previously saved by dividing the membranous attachments. The quantity of skin saved, and muscular substance taken out, must be in such an exact proportion to each other, as that by a removal of both, the whole surface of the wound will afterwards be easily covered, and the limb not more shortened, than is necessary to obtain this end.

After the removal of the limb, let each bleeding artery be gently drawn out with the tenaculum, and tied with a common slender ligature, as naked as possible. When the large vessels are tied, the tourniquet should immediately be slackened, and the wound well cleaned, to detect any vessel, that might otherwise lie concealed with its orifice blocked up by coagulated blood; and before the wound is dressed, its whole surface should be examined with the greatest accuracy, by which Mr. Alanson has frequently observed a pulsation, where no hemorrhage previously appeared and turned out a small clot of blood from within the orifice of a considerable artery. Particular attention, is well bestowed in making every vessel secure, that is likely to bleed on the attack of the symptomatic fever; for besides the fatigue and pain, to which such an accident immediately exposes the patient, the desired union of the wound is also considerably interrupted. The whole surface of the wound must always be well cleaned with a sponge and warm water, as any coagulated blood would be a considerable obstruction to a quick union of the parts.

Let the skin and muscles be now gently brought forwards; fix the flannel circular roller round the body, and carry it, two or three times rather tight round the upper part of the thigh, as at this point, it is intended to form a sufficient basis, that materially adds to the support of the skin and muscles. Then carry it forwards in a circular direction, to the extremity of the stump, not so tight as to press rudely or forcibly, but so as to give an easy support to the parts.

You are now to place the skin and muscles over the bone, in such a direction, that the wound shall appear only as a line across the face of the stump, with the angles at each side, from which points, the ligatures are to be left out, as their vicinity to either angle directs. The skin is easily secured in this posture by long slips of linen, or lint, about two fingers in breadth, spread with cerate, or any cooling ointment. If the skin do not easily meet, strips of sticking plaster are best. These are to be applied from below upwards, across the face of the stump, and over them a soft tow pledget and compress of linen; the whole to be retained with the many-tailed bandage, with two tails to come from below upwards to retain the dressings upon the face of the stump.

Mr. Alanson thinks it very injudicious to raise the end of the stump far from the surface of the bed with pillows, as the posterior muscles become drawn upward by so doing. It is best to raise the stump about half a hand's breadth from the surface of the bed, by which the muscles are put in an easy relaxed position. The many-tailed bandage is much more convenient than the woollen cap, frequently used to support the dressings, though this seems well calculated to answer that purpose; but, if not put on with particular care, the skin is liable to be drawn backwards from the face of the stump, nor can the wound be dressed, without first lifting up the stump to remove the cap.

Mr. Hey thinks the place of incision

through the muscles, the height to which the skin must be retracted, and the place, where the bone must be sawn above the first incision, might all be reduced to determinate measures. A few experiments would enable you to determine precisely, in any limb of given circumference, how many inches the skin must be retracted, &c. and these might be measured by an assistant, if he had little bits of straw, or wood, marked for this purpose. The determination of the proper quantity of skin to be saved will be much assisted by reflecting that the diameter of a circle is a trifle more than one-third of its circumference; but, to call it one-third will be sufficiently exact for our purpose. Hence, if we perform the flap operation, upon a limb, the circumference of which is nine inches, the flap required to cover this wound must be somewhat more than three inches long; and by the same rule, the quantity of integuments necessary to be preserved to cover a stump of given circumference in any limb operated upon without the flap, is easily determined.

If the limb be large, the division of the cellular and membranous attachment must be extended in proportion. In emaciated limbs, little more than the oblique turn of the knife to lay bare the bone sufficiently high, will be necessary for the preservation of as much skin, &c. as will cover the wounded surface, and, when practicable, the preference should always be given to the latter mode.

Mr. Alanson used to operate with a double-edged knife, rather smaller, than a common amputation one, than which it is more handy; and being more rounded at the point, than the straight-edged knife, it completes the division of the attachments, and the oblique section of the muscles, more speedily; and, in the whole operation, it is an advantage, that either edge will cut by the slightest turn of the hand. (See *Alanson's Practical Observations on Amputation*).

AMPUTATION OF THE THIGH, AS PRACTISED BY THE BEST MODERN SURGEONS.

The thigh ought always to be amputated as low as the disease will allow. The patient is to be placed on a firm table, with his back properly supported by pillows, and assistants, who are also to hold his hands, and keep him from moving too much during the operation. The ankle of the sound limb is to be fastened by means of a garter, to the nearest leg of the table.

The next thing is the application of the tourniquet. (For a description of this instrument see *Tourniquet*). The pad should be placed exactly over the femoral artery, in as high a situation, as can conveniently be done. When the thigh is to be amputated very far up, it is perhaps better to let an assistant compress the femoral artery in the groin, by any commodious instrument, having a round blunt end, calculated for making direct pressure on the vessel, without injuring the integuments. Were the patient, however, very weak, and unable to bear loss of blood, as there might, in this way, be some bleeding, by reason the anastomoses with the branches of the internal iliac artery, it would be better to employ the tourniquet, if possible. Whether the right, or left thigh is to be removed, it is customary for the operator to stand on the patient's right side. The great advantage of this situation seems to be, that the surgeon's left hand can be thus more conveniently, and quickly brought into use, than if he were always to stand on the same side, as the limb he is about to amputate. This seems to be the only assignable reason for this habit; for, when the left thigh is to be amputated, it is certainly some inconvenience to have the right limb, between the operator, and the one that is to be removed. But, perhaps, this is less inconvenient than not having the left hand next the wound.

An assistant, firmly grasping the thigh with both hands, is to draw upwards the skin and muscles, while the surgeon makes a circular incision as quickly as possible through the integuments down to the muscles. When the thigh is bulky, the large amputating knife will be found the best. Before beginning this first cut, the arm is to be carried under the limb, till the knife reaches almost round to the same side on which the operator stands.—With one sweep, penetrating to the fascia, the knife is then to be brought round to the point, where it first touched the skin. Thus the wound is more regularly made, than by cutting first on one side, then the other, and the

patient is saved some degree of pain, in consequence of the uninterrupted quickness, with which the incision is made.

The cellular substance, connecting the skin, immediately above this wound with the fascia, is next to be divided all round the limb, till as much skin can be drawn back, as will afterwards conjointly with the muscles, cut in a mode described in the foregoing account of Mr. Alanson's plan, cover the end of the stump with the utmost facility. The detached skin is to be turned up, in order to be out of the way, at the time of cutting the muscles, and sawing the bone. Here it seems useless to repeat the explanation of the division of the muscles as practised by Mr. Alanson, and still adhered to by the generality of surgeons.

M. Louis, a French surgeon of extraordinary talents, endeavoured to introduce into practice the plan of dividing the loose muscles first, and lastly those, which are closely connected with the bone. This eminent man took notice, that the muscles of the thigh became retracted in an unequal degree, after being divided. Those which are superficial, and extended along the limb, more or less obliquely, without being attached to the bone, were drawn up with greater force, and in a greater degree, than others, which are deeply situated, in some measure, parallel to the axis of the femur, and fixed to this bone throughout their whole length. The retraction begins the very instant, when the muscles are cut, and is not completed till a short time has elapsed. Hence, the effect should be promoted, and be as perfect as possible, before the bone is sawn. M. Louis was always desirous of letting the muscles contract as far as they could in the amputation of the thigh, and, for this reason, he was rather averse to using the tourniquet, as the circular pressure of this instrument counteracted, in some measure, what he wished to take place, and hence he even advised making pressure on the artery by means of an assistant.

Actuated by such principles, M. Louis practised a double incision, different from either Cheselden's, or Alanson's method. By the first wound, he cut, at the same time, both the integuments and the loose superficial muscles; by the second, he divided those muscles, which are deep, and closely adherent to the femur. On the first, deep, circular, cut being completed, M. Louis used to remove a band which was placed round the limb, above the track of the knife. This was taken off, in order to allow the divided muscles to become retracted without any impediment, He next cut the deep adherent muscles, on a level with the surfaces of those loose ones, which had been divided by the first incision, and which had now attained their utmost state of retraction. In this way, he could evidently saw the bone very high up, and the painful dissection of the skin from the muscles was avoided. M. Louis was conscious, that there was more necessity for saving muscles than skin; he knew, that when an incision is made at once down to the bone, the retraction of the divided muscles always left the edge of the skin projecting a considerable way beyond them. Hence he deemed the plan of first saving a portion of skin, by dissecting it from the muscles, and turning it up, quite unnecessary. The impartial reader, who takes the trouble to read the remarks on amputation, published by this greatest of the French surgeons in the *Mem. de l'Acad. de Chirurg.* will at once be impressed with the force and perspicuity of the matter and with the evident propriety of the practice inculcated. It gives me pleasure to remark, that many excellent surgeons, whom I have seen operate, do not exactly follow Mr. Alanson's plan of cutting in an oblique manner at once down to the bone, after the integuments have been cut, detached, and reflected; but, so far adopt the principles of M. Louis, as to divide the loose muscles first, immediately after saving the necessary quantity of skin, and, lastly, those which are intimately attached to the bone throughout their whole extent. This is certainly a better mode of operating, than to follow precisely Mr. Alanson's directions—Candour, however, obliges me to confess, that the attempt to divide the loose muscles first, and then the more fixed ones, is very apt to make an unskilful surgeon cut the whole, or a great part, of the same muscle through more than once; a fault in modern practice, which, as far as my judgment extends, deserves reprobation, as much as any proceeding that can be in-

stanced. To say how unnecessary it is to divide any muscle more than once is as needless as to remind the reader of its doubling the agony of a very severe operation. (*First Lines of the Practice of Surgery.*)

Having cut all the fibres on every side, down to the bone, a piece of linen, somewhat broader than the diameter of the wound, should be torn at one end, along its middle part, to the extent of about eight or ten inches. This is called a retractor, and is applied by placing the exposed part of the bone in the slit, and drawing the ends of the linen upward on each side of the stump. In this manner, the retractor will obviously keep every part of the surface of the wound out of the way of the saw. I have seen this instrument do so much mischief, in consequence of the operator neglecting to use the retractor, that my conscience obliges me to censure such surgeons, as are in the habit of employing the saw, without defending the soft parts by this simple contrivance. Some have rejected the use of the retractor, because they have seen it get under the teeth of the saw, and obstruct the action of the instrument; but, this very circumstance adduced against the retractor, is, when considered, the strongest one that could possibly be brought forward in its favour, as the surface of the wound, itself, and particularly the edges of the skin, would, in all probability, suffer the same fate as the linen, by getting under the teeth of the saw, if no retractor were employed, in attempting to saw the bone high up, as closely as possible to the soft parts.— I think no one can urge any but the most frivolous objections to the use of the retractor, and I know that many who have been with myself eyewitnesses of the mischief frequently done by the saw in amputations, are deeply impressed with an aversion to the neglect of this bandage. I have often seen the soft parts adroitly divided, and I have in these same instances, seen the operators, directly afterwards, lose all the praise which every one was ready to bestow, by their actually sawing through one half of the ends of the muscles together with the bone. Men who have had fortitude not to utter a sigh, nor to let a groan be heard, in the previous sufferings, have now had their involuntary cries extorted from them by unnecessary, unjustifiable torture. But, besides defending the surface of the stump from the teeth of the saw, the retractor will undoubtedly enable the operator to saw the bone higher up than he otherwise could do.

Another proceeding, which seems fit for reprobation, and which, indeed, Mr. Alanson very properly condemned, is the practice of scraping up the periosteum with the knife, as far as the muscles will allow. Nothing seems more probable than that this may be the cause of the exfoliations which occasionally happen after amputations.— At all events, it is a superfluous, useless measure, as a sharp saw, such as ought to be employed, will never be impeded by so slender a membrane as the periosteum. All that the operator ought to do, is to take care to cut completely down to the bone, all round its circumference. Thus a circular division of the periosteum will be made, and upon this precise situation the saw should be placed. (*First Lines of the Practice of Surgery.*)

But, in no part of the operation of an amputation do operators in general display more awkwardness, than in sawing the bone, though perhaps not of that pernicious sort as the errors already noticed. At the time of sawing the bone, much depends upon the assistant who holds the limb. If he should elevate the lower portion of the thigh bone too much, the saw becomes so pinched that it cannot be worked. On the other hand, should he allow the weight of the leg to operate too much, the thigh bone will break before it is nearly sawn through, and its ends will be splintered. It is one of the most common remarks of such persons, as are in the habit of frequently seeing amputations, that the part of these operations, which a plain carpenter would do well, foils the skill of a consummate surgeon, and few operators acquit themselves well in using the saw. Many of them begin the action of this instrument, by moving it in a direction contrary to the inclination of its teeth. Many, seemingly through confusion, endeavour to shorten this part of the operation, by making short, very rapid, and most convulsive strokes, with the saw. Almost all operators fall into the error of bearing too heavily on the instrument. That operator will saw best who makes the first stroke of the saw by applying its heel to the bone, and drawing the in-

strument across the part, towards himself; this makes a slight groove in the bone, which serves very materially to steady the future operations of the instrument; who makes long, regular sweeps with the saw, rather slowly than quickly, rather lightly than heavily. But, there is often a fault in the construction of the saw itself, which impedes its action, quite independently of any fault on the part of the surgeon himself. I allude to not having the edge of the instrument a little broader than its blade. When the saw is well made, the teeth always make plenty of space for the rest of the instrument to move in.

If the bone should happen to break before the sawing is finished, the sharp-pointed, projecting spiculæ thus occasioned, must be removed by means of a strong, cutting sort of forceps, termed *bone nippers*.

After the removal of the limb, the femoral artery is to be immediately taken hold of with a pair of forceps, and tied, taking care to leave the accompanying branches of the anterior crural nerve out of the ligature. None of the surrounding flesh ought to be tied, though the ligature should undoubtedly be placed round the artery, just where this vessel emerges from its lateral connections. Mr. Hey has been accustomed to tie the femoral artery twice, leaving a small space between the ligatures, and this method has been constantly used in the Leeds Infirmary. Some reasons against this plan will be found in the article (*Hemorrhage*). The other arteries are usually taken up with a tenaculum.—After tying as many vessels as require it, one half of each ligature is to be cut off near the knot on the surface of the stump. One portion is quite sufficient for withdrawing the ligature when this becomes loose, and the other being only an extraneous body, and productive of irritation and suppuration, should never be allowed to remain. Mr. Alanson directs the ends of the ligatures to be left hanging out at the two extremities of the wound, according as their nearness may point out as best. But when a ligature is situated in the centre of the wound, it is best to bring it out between the strips of adhesive plaster, at the nearest part of the surface; otherwise its running across one half the wound to get at either angle, would create a great deal of unnecessary irritation and suppuration.

Sometimes, the sawn surface of the bone itself bleeds rather profusely.—When this happens, it is an excellent plan, which I have often seen Mr. Ramsden and others adopt with the greatest success, to hold a compress of lint over the end of the bone, during the time requisite for securing the rest of the vessels. At the end of the period, the compress may generally be taken away, as the bleeding from the bone will have entirely ceased. As Monro remarks, the surgeon ought not to content himself with tying only such vessels, as he observes throwing out blood, while the patient is faint with pain; he should endeavour to rouse him from that faintish state by a cordial, and then wiping off the coagulated blood with a sponge, wet in warm water, he should examine narrowly all the surface of the stump, otherwise he may expect to be obliged by a fresh hemorrhage to undo all the dressings, (*On Amputation of the Larger Extremities, p. 475. Monro's Works*).

In the account of Mr. Alanson's plan, we have explained how the wound is to be brought together with strips of sticking plaster. Over these, and the ends of the ligatures, it is best to place some pieces of lint, spread with the unguentum spermatis ceti, to keep them from sticking, which becomes an exceedingly troublesome circumstance, when the dressings are to be removed. I am decidedly averse to the general plan of loading the stump with a large mass of plasters, pledgets, compresses, flannels, &c. I see no reason, why the strips of adhesive plaster, and a pledget of simple ointment, should not suffice, when supported by two cross bandages, and a common linen roller, applied in a circular way, round the limb, from above downward. The first turn of the roller, indeed, should be fixed round the pelvis. The two cross bandages, often called the Malta-cross, are to be put over the end of the stump, one in each diameter.

I am completely of opinion with Mr. Alanson, that the elastic woollen cap, commonly placed over all the bandages and dressings, if not put on with a great deal of care, has a tendency to push the skin backward from the extremities of the stump, and as it must also heat the part very much, its em-

ployment ought apparently to be discontinued.

If possible, the dressings should never be removed before the fourth day, not reckoning the one on which the amputation was performed. Monro set down the fifth, sixth, or seventh day, as generally soon enough for this purpose. He allows, however, that, if the smell of the wound should become offensive, the outer dressings may be removed sooner. Even when the dressings are to be taken away, it will frequently be found useful not to remove one strip of plaster; but, the stump must be made clean, and any discharge present washed away. (*Monro*).

At the end of five or six days, the surgeon may begin to try, in a very gentle manner, whether any of the ligatures are loose. However, he should not use the smallest force, nor persist if the trial should create pain. One would hardly try, whether the ligature on the main artery is loose, before the eighth or ninth day.

Though, in the above account, we have directed the edges of the wound, after the amputation of the thigh, to be brought together in such a way, that the wound shall appear as a line across the face of the stump, yet there are instances in which the bone seems most easily and conveniently covered, by making the line of the wound in a perpendicular direction. Mr. Alanson objected to the latter mode, asserting, that the cicatrix afterwards became situated immediately over the end of the bone, the pressure of which was very likely to make the part ulcerate. However, in St. Bartholomew's Hospital, a thigh was lately amputated by Mr. Harvey, and the edges of the stump were brought together in the perpendicular direction, yet according to all accounts, a better stump could not have been made. In a case, in which I assisted Mr. Ramsden at Christ's Hospital, when an attempt was made to put up the wound in the common manner, the bone seemed to make considerable pressure against the skin which did not happen, when the line of the wound was made in the other direction, which of course was immediately adopted. Mr. Hey has noticed this subject as follows: the integuments and muscles may be brought into contact by pressing either the anterior and posterior parts, or the sides of the thigh, together. The former method, by the gradual retraction of the posterior muscles, causes the integuments of the anterior part of the stump to cover more completely the extremity of the bone. The latter method causes the integuments and muscles to meet each other the more readily, and, therefore it is to be preferred, when the quantity of soft parts preserved is somewhat deficient. (*Practical Observations on Surgery, p.* 516.)

HEMORRHAGE AFTER AMPUTATION.

Bleeding, after the operation, is of two kinds, in regard to the time, when it occurs. The first takes place within twenty-four hours after the operation. Hence, an assistant should always be left with the patient, with directions carefully and repeatedly to look at the stump, and if any bleeding should arise, to apply the tourniquet, until further aid is obtained. In case no assistant can be spared for this purpose, as must frequently happen in country practice, the tourniquet should always be left slackly round the limb, and the nurse, or patient himself, directed to turn the screw of the instrument, in order to tighten it in case of need. A slack tourniquet left round the limb, after amputation, cannot do harm, and its not having been ready in this way, has cost many patients their lives, as I have known instances of.

This kind of hemorrhage has often been known to arise from the pressure of a tight bandage round the stump. As Monro observes, the circular turns of the bandage, when tight, must stop the return of blood in the cutaneous veins, and by making thus a greater resistance to the blood in the arteries, which anastomose with them, occasion the contracting power of the heart and arteries to dilate, and force more blood into their other branches; but, these being cut in the amputation will pour out their blood, and so an hemorrhage is brought on. Making much pressure round a stump is highly deserving of reprobation, and whenever there is an universal oozing of blood, be sure, that the circulation in the superficial veins is not impeded by the tightness of the bandage.

If the bleeding should not be from an artery of consequence, the application of linen, dipped in the cold saturnine lotion, will sometimes check it, and the disagreeable necessity for removing the

dressings and opening the wound, may thus be avoided.

But it often happens, that the wound must he opened, and the bleeding vessel tied. This is a very painful proceeding to the patient, and when the dressings have been applied some hours, so that the stump has had time to inflame, nothing can exceed the suffering to which the patient is subjected. Here we see the prudence of being very careful to tie every suspicious vessel in the first instance.

The second sort of hemorrhage, after amputation, arises from ulceration of the large arteries, and may occur a month after the operation, when the ligatures are all away, and the patient seems nearly well.

Two such cases are related by Mr. Bromfield (Vol. 1. p. 307.) This kind of bleeding is less common than formerly, now the plan of covering the stump with sound skin is adopted. When the bleeding vessel is large, there is no chance of putting the patient out of danger, except by cutting down to the vessel, and tying it. The trunk of the vessel can sometimes be more conveniently tied, than the bleeding branch itself.

Mr. Hey makes mention of a particular sort of hemorrhage, after the operation; "I have seen (says he) a few instances of the integuments becoming so contracted after the operation, as to compress the veins just above the extremity of the stump, and bring on after some hours copious hemorrhage. When it has appeared clear to me, that the hemorrhage was venous, I have made a division of the integuments, on one side of the thigh, sufficient to remove the stricture, and this method has immediately suppressed the hemorrhage." (p. 518.) I shall make another extract from this interesting author on the present subject.

"When we are under the necessity of amputating a limb, that has suffered great contusion, though the operation is performed upon a part apparently sound, the wound sometimes becomes sloughy and ill conditioned. No good granulations arise to cover the extremities of the arteries; but the ligatures cut through these vessels, or becoming loose, cease to make a sufficient pressure upon them, and hence repeated hemorrhages ensue. This is a dangerous state for a patient; for, if the vessels are taken up afresh with the needle, the hemorrhage will now and then return in the course of two, or three days. In such cases, the application of dry sponge, cut transversely, as directed by Mr. White (*Cases in Surgery*) has been found singularly useful, and has saved the life of the patient. But, a constant pressure must be kept upon the pieces of sponge, by the fingers of a succession of assistants, till granulations begin to rise upon the stump, and the prospect of future hemorrhage disappears. This method is of the greatest importance after amputation on the thigh, or leg, where the great vessels are deeply seated. In the arm, above the elbow, where the vessels are more superficial, the great artery may be taken up, with a portion of muscular flesh, above the surface of the stump, by making first an incision through the integuments. My colleague, Mr. Logan, has done this twice within the last year, with complete success, when repeated ligatures, applied in the usual way, had failed."

"In the morbid sloughy state of the stump, above mentioned, the application of lint, soaked in a liquid, composed of equal quantities of lemon juice and rectified spirit of wine, has been found very advantageous, and has caused it to put on soon a healthy aspect." (p. 510, 520.)

SPASMS OF THE STUMP.

Spasmodic contractions of the muscles of the stump is another very afflicting occurrence. Such spasms put the patient to the greatest agony, and, in some cases, increase so much as to affect the whole body, and even occasion death. But, this unfortunate affection, which was rather frequent after amputations performed in the ancient manner, is infinitely less so, after the modern improved plans of operating, tying the vessels, and dressing the wound. When such spasms, however, do occur, the stump must be kept from starting, by fastening it to the pillow and bedding, on which it lies, and opium, and camphorated medicines, are to be liberally exhibited. (*Encyclopédie Méthodique, Partie Chirurgicale. Latta's Surgery, Vol. 3, &c.*)

AMPUTATION BELOW THE KNEE.

In treating of amputation of the thigh, we have remarked, that as much of the limb as possible should be preserved. The longer it is after operation, the

stronger and more useful will it be found. But when the leg is to be amputated, authors have set it down, as almost an invariable rule, that the operation is to be performed a little way below the knee, even though the disease, for which the limb is removed, may be situated in the foot, or ankle, and would allow the operation to be done much further down. The common practice is to make the incision through the integuments, just low enough to enable the operator to saw the bones, about four inches below the lowest part of the patella. This degree of lowness is necessary, in order not to deprive the stump of that power of motion, which arises from the flexor tendons of the leg continuing undivided. It is alleged also, as a reason for this mode of proceeding, that it is quite sufficient to preserve a few inches of the leg, in order to afford the body a proper surface of support, in walking with a wooden leg; whereas if a larger portion were saved, the superfluous part would be a great inconvenience both in walking, and sitting down, without being of the smallest utility, in any respect whatever.

The tourniquet should be applied to the femoral artery, about two-thirds of the way down the thigh, just before the vessel perforates the tendon of the triceps muscle. This place is much more convenient than the ham. The patient is to be placed upon a firm table, as in the amputation of the thigh, and the leg being properly held by one assistant, while the integuments are drawn upward by another, the surgeon, with one quick stroke of the knife, is to make a circular incision through the integuments all round the limb. Some recommend the operator to stand on the inside of the leg, in order that he may be able to saw both bones at once. No reflections could ever make me perceive, that any real advantage ought strictly to be imputed to this plan. Many suppose this method diminishes the chance of the fibula being splintered, by this bone being completely divided rather before the tibia. But, splintering the bones arises from the assistant depressing the limb too much, or else not supporting it enough. It would be difficult to explain, why the tibia, in this plan, should not be splintered, instead of the fibula, when a certain thickness of it has been sawn through, if the assistant should be guilty of the mismanagement.

Having made a circular cut through the integuments, the next object is to preserve skin enough to cover the front of the tibia, and the part of the stump, corresponding to the situation of the tibialis anticus, extensor longus pollicis pedis, and other muscles between the tibia and fibula, and those covering the latter bone. Throughout this extent, there are no bulky muscles, which can be made very serviceable in covering the end of the stump, and consequently, the operator must take care to preserve sufficient skin in this situation, by dissecting it from the parts beneath, and turning it up.

On the back part of the leg, on the contrary, the skin should never be detached from the large gastrocnemius muscle, which, with the soleus, will here form a sufficient mass for covering the stump. Hence, as soon as the skin has been separated in front, and on the outside of the leg, the surgeon is to place the edge of the knife in the division of the integuments behind, and cut directly through the muscles of the calf, from the inner edge of the tibia quite across the fibula, supposing the operator to be on the patient's left side. Then the flap formed by the integuments, and muscles of the calf, is to be held back by one of the assistants, while the surgeon completes the division of the rest of the muscles, together with that of the interosseus ligament, by means of the catling, a kind of long, narrow, double-edged knife.

It is of great consequence that the knee should be bent, when the gastrocnemius and soleus are to be divided, as these muscles will then be cut through much lower down, than they would be, if the leg were extended, so as to put them in a state of tension.

In amputating below the knee, very particular care must be taken to cut every fasciculus of muscular fibres, before using the saw. Every part, except the bones, being divided, the soft parts are next to be protected from the teeth of the saw, by a linen retractor, made with two slits to receive the two bones.

On the leg, there are only three principal arteries, requiring ligatures, viz. the anterior, and posterior tibial, and the peroneal, arteries.

Whether the above plan of amputating the leg so high up, when the foot,

or ankle, is the part diseased, or injured, be on the whole most advantageous, I cannot presume to determine. There are certainly many clever men who condemn the practice, and though we see it pursued by the best surgeons in this metropolis, yet, we may safely assert, that the matter requires further consideration. If it were a decided point, that the common custom of bending the knee, for the sake of bearing the weight of the body on its anterior part, were the only one admissible, after amputation of the leg, there could be no doubt of the propriety of performing the operation a little way below the knee, in preference to any other situation. But since there have been numerous instances of persons walking very securely with machines, which allow them to make use of the knee, and are more pleasing to the eye, on account of their perfect resemblance to a natural limb; and since also, the operation at the lower part of the leg, is more easy of performance, and safer, than when done high up; some very eminent surgeons have thought that it ought always to be done near the ankle, when possible, instead of near the knee.

Mr. White of Manchester, in a paper dated 1769, (*Med. Obs. and Inq. Vol.* 4.) informs us, he took the hint to amputate a little above the ankle, from seeing a case, in which this had been done by a simple incision, with such success, that the patient could walk extremely well, though with a machine, that was very badly constructed. After this Mr. White began to operate above the ankle with the double incision; and he invented a machine much better calculated for the patient to walk upon.

In 1773 Mr. Bromfield published his *Chirurgical Cases and Observations*, wherein he mentions his having begun about the year 1740 to amputate above the ankle, in a case of gangrene of this part of the leg. The patient walked so well, with the aid of a very simple machine, both along a level surface, and in going up and down stairs, that it was difficult to perceive he had lost his foot. Mr. Bromfield was persuaded, however, to give up this practice, until he learnt, in 1754, that a Mr. Wright had thrice amputated in this way with success, when he again had recourse to it without the least unpleasant consequences.

The operation just above the ankle is less painful, because there is not so much substance to be divided, as in the calf. There is also more facility in covering the bone entirely with skin. The wound would generally require less time to heal; its smaller size, and the greater exactness, with which its opposite edges can be brought into contact, are circumstances, which would fully warrant this conclusion, even were the sentiments of experienced men totally out of the question.

The advantage of amputating a little below the knee, is that pressure on walking with a wooden leg, is entirely confined to the front of the limb, and the cicatrix itself is subjected to no sort of irritation whatever. After amputating at the ankle, the pressure in walking operates directly on the cicatrix; but, if the mechanical contrivances for walking are now brought to such perfection, that such pressure does no harm, the operation should not be abandoned on this account.

AMPUTATION WITH A FLAP.

This was first proposed by Loudham, an English surgeon, and published by Jacob Young, in 1679, in his *Currus Triumphalis ex Terebinth.* It was successfully practised by several others; but soon fell into disrepute, probably in consequence of the rude measure adopted for stopping the hemorrhage, and the badness of the treatment of the stump, by which causes, pain, inflammation, and extensive suppuration must have been produced.

We have already spoken of the flap operation having been done by White and Bromfield above the ankle. In the year 1765, Sylvester O'Halloran, an eminent surgeon, of Limerick in Ireland, published a revival of the flap-amputation, upon a plan entirely new. However, his fault consisted in not putting the flap in contact with the wound, till after inflammation had subsided, about the twelfth day.

Messrs. Alanson and Lucas conjectured, that the cure might be rendered more safe, easy, and expeditious, by applying the flap, with a view of uniting it by the first intention.

The following case explains Mr. Alanson's flap-operation. The disease was in the left leg, the patient, therefore, lay on his right side, upon a table of a convenient height, so as to turn the part to be first cut fully into view. The intended line, where the knife was to pass in forming the flap, had been previously

marked out with ink. A longitudinal incision was made with a common scalpel, about the middle of the side of the leg; first on the outside, then on the inside, and across the tendo Achillis; hence, the intended flap was formed, first by incisions through the skin and adipose membrane, and then completed, by pushing a catling through the muscular parts in the upper incised point, and afterwards carrying it out below, in the direction of the line already mentioned. Thus the whole flap was completed. The flap was thick, containing the whole substance of the tendo Achillis. The usual double incision was made; the retractor applied to defend the soft parts; and the bone divided, as high as possible, with the saw.

The flap was placed in contact with the naked stump, and retained there, at first by three superficial stitches, between which adhesive plasters were used. Notwithstanding the patient caught an infectious fever, a few days afterwards, the stump healed in three weeks, except half an inch at the inner angle, where the principal vent had been. In another week, the wound was reduced to a spongy substance, about the size of a split pea. This being touched with caustic healed in a few days. The man was soon able to use an artificial leg, with which he walked remarkably well. He went several voyages to sea, and did his business with great activity. He bore the pressure of the machine totally upon the end of the stump, and was not troubled with the least excoriation or soreness.

In the next instance, in which Mr. Alanson operated, he formed the flap by pushing a double edged knife through the leg, and, passing it downwards and then outwards, in a line, first marked out for the direction of the knife. In this way, the flap was made more quickly. (*Alanson on Amputation.*)

The leg should be completely extended during the operation; and kept in that posture, till the wound is perfectly healed.

We shall next notice Mr. Hey's method. This gentleman is satisfied, that very near the ankle, is not the most proper place for this kind of amputation.

Some cases occurring, in which from a scrophulous habit, the wound at the stump would not heal completely, nor remain healed, Mr. Hey determined to try, whether amputation in a more muscular part would not secure a complete healing, and give the patient an opportunity of resting his knee on the common wooden leg, or using a socket, as he might find most convenient. Mr. Hey now prefers this method, and has reduced it to certain measures.

It has been customary, at the Leeds Infirmary, to make the length of the flap equal to one-third of the circumference of the leg. This was determined by the eye of the operator, who usually pushed the catling through the leg, near the posterior part of the fibula. Mr. Hey, finding the flap was not always of the proper breadth began to determine this by measure, and now operates as follows: to ascertain the place where the bones are to be sawn, together with the length and breadth of the flap, he draws upon the limb five lines, three circular, and two longitudinal ones. He first measures the length of the leg from the highest part of the tibia to the middle of the inferior protuberance of the fibula. At the mid-point, between the knee and ankle, he makes the first or highest circular mark upon the leg. There the bones are to be sawn. Here Mr. Hey also measures the circumference of the leg, and thence determines the length and breadth of the flap, each of which is to be equal to one-third of the circumference. In measuring the circumference of the limb Mr. Hey employs a piece of marked tape, or ribbon, and places one end of it on the front edge of the tibia. Supposing the circumference to be twelve inches, he makes a dot in the circular mark on each side of the leg, four inches from the anterior edge of the tibia. These dots must, of course, be four inches apart behind. From each of these dots Mr. Hey draws a straight line downwards, four inches in length, and parallel to the front edge of the tibia. These lines shew the direction, which the catling is to take in making the flap. At the termination of these lines, Mr. Hey makes a second mark round the limb, to shew the place where the flap is to end. Lastly, a third circular mark is to be made an inch below the upper one, for the purpose of directing the circular cut through the integuments, in front of the limb. The catling, for making the flap, should be longer than those commonly employed in amputations. Mr. Hey uses one which is se-

ven inches long in the blade, and blunt at the back, to avoid making any longitudinal wound of the arteries, which is very difficult to close with a ligature and, for the same reason, he pushes the catling through the leg a little below the place where such muscles are to be divided, as are not included in the flap. The limb being nearly horizontal, and the fibula upward, he pushes the catling through the leg, where the dot was made, and carries it downward along the longitudinal mark, till it approaches the lowest circular mark, a little below which the instrument is brought out. The flap being held back, Mr. Hey divides the integuments on the front of the limb along the course of the second circular mark. The muscles not included in the flap, are then divided a little below the place where the bones are to be sawn. No great quantity of these muscles can be saved, nor is it necessary, as the flap contains a sufficient portion of the gastrocnemius and soleus muscles to make a cushion for the end of the bones. After sawing the bones, Mr. Hey advises a little of the end of the tendon of the gastrocnemius to be cut off, as it is apt to project beyond the skin, when the flap is put down; and he recommends the large crural nerve, when found on the inner surface of the flap, to be dissected out, lest it should suffer compression.

As strips of adhesive plaster cause great pressure on the end of the stump, Mr. Hey prefers using sutures for keeping the flap applied. Small strips of court plaster are to be put between the ligatures. The sutures may be cut out on the eighth day, and the flap supported by plasters.

Mr. Charles Bell describes another sort of flap-amputation. The operation is not to be done so low, as there will not be a sufficiency of muscle to cover the end of the bones. An oblique cut is to be made with the large amputating knife, upward, through the skin of the back part of the leg. The assistant is to draw up the skin, and the knife is to be again applied to the upper margin of the wound, and carried obliquely upward till it reaches the bones. The knife, without being withdrawn, is next to be carried, in a circular direction, over the tibia and fascia, covering the tibialis anticus, until it meets the angle of the first incision on the outside of the limb. The surgeon is then to pierce the interoscous membrane, &c. The sawing being completed, and the arteries secured, the flap is to be laid down, and the integuments of the two sides of the wound will be found to meet. (See *Bell's Operative Surgery, Vol.* 1.)

The flap-amputation is certainly more painful than the common method, and, though it has had very able men for its patrons, it is questionable, whether it is productive of the smallest advantage. Nor is there any necessity for adopting this kind of operation, though you may choose to amputate near the ankle. Mr. Lucas (*Med. Obs. and Inq. Vol.* 5.) does indeed endeavour to prove, that the stump will not bear the pressure of a machine for walking unless a flap be preserved. However, as the author of the article *Amputation*, in the *Encyclop. Méthod.* remarks, if care be taken to save the muscle, a machine for walking may be worn as conveniently as if a flap had been made.

The flap-amputation of the thigh is now quite abandoned by all the best surgeons in this country, and no description of it seems necessary. Foreign surgeons, however, seem not to have entirely rejected this way of operating. We read in Desault's works, by Bichat, that the former was in the habit of adopting this kind of amputation; but, it is a justice due to the eminent M. Sabatier, to state his disapprobation of the practice. (*Médicine Opératoire, Tome* 3. *p.* 257.)

AMPUTATION OF THE ARM.

The structure of the arm is very analogous to that of the thigh; like the latter, it contains only one bone, round which the muscles are arranged. The interior ones are attached to the os brachii, while the more superficial ones extend along the limb, without being at all adherent. The first consist of the brachialis internus, and the two short heads of the triceps; the second, of the biceps, and long head of the triceps. Hence, amputation is here to be done in the same way as in the thigh, unless when we are necessitated to amputate very high up, above the insertion of the deltoid muscle.

The patient being properly seated, the arm is to be raised from the side, and, if the disease will allow it, into a horizontal position. The surgeon is to stand on the outside of the limb, apply the tourniquet as high as possible, and to have the skin and muscles made

tense, which he is about to divide, by the hands of an assistant. The soft parts are next to be divided, as much of the limb being preserved as possible. The bone is to be sawn with the usual precautions, and the bleeding stopped in the usual way. The stump is then to be dressed, and the patient put to bed, with the wound a little elevated from the surface of the bedding

If the disease should require the arm to be taken off at its upper part, there would be no room for the application of the tourniquet. A compress might then be put in the axilla, and compressed by any strong bystander. With a straight bistoury the surgeon is now to make a transverse incision down to the bone, a little above the lower extremity of the deltoid muscle. Two other longitudinal incisions, made along the front and back edge of this muscle, would form a flap, which must be detached and reflected. Lastly, the rest of the soft parts of the limb are to be divided by a circular cut, made on a level with the base of the flap. (*Sabatier Médicine Opératoire, Tome* 3. *p.* 242—243).

With regard to placing a compress on the artery in the axilla, as advised by Sabatier, this is not so eligible, as making pressure on the artery, as it passes over the first rib, and of which method we shall speak when we treat of amputation at the shoulder.

AMPUTATION OF THE FOREARM.

The wisest maxim, with respect to the place for making the incision, is to cut off as little of the limb as possible. The forearm is to be held by two assistants, one of whom is to take hold of the elbow, the other of the wrist. The tourniquet is to be applied to the lower part of the arm, and the assistant, holding the elbow, should draw up the integuments, so as to make them tense. The circular incision is then to be made down to the fascia; from this as much skin is to be detached, reflected, and saved as is necessary for covering the ends of the bones, and the muscles are to be cut on a level with the reflected skin, at the same time directing the knife obliquely upward. As many of them are deeply situated between the two bones of the forearm, too much attention cannot be paid to dividing all of them, with a double edged knife introduced between the radius and ulna.

The soft parts are to be protected from the saw by a linen retractor. It is generally recommended to saw the two bones together, for which purpose the forearm should be placed in the utmost state of pronation. In any other position, the ulna is situated almost directly under the radius.

The ulnar, radial, and two interosseous arteries, are those, which usually require a ligature.

AMPUTATION OF THE HIP-JOINT.

The French Academy of Surgery proposed the following question in 1756, as the grand prize subject. *In the case, in which amputation at the hip joint should appear to be the only resource for saving the patient's life, to determine whether this operation ought to be practised, and what would be the best way of performing it?* No satisfactory memoirs having been presented, the same subject was proposed in 1759. The approbation of the academy was now conferred on a paper, in which the possibility of amputating at the hip joint was established. The cases demanding the operation are also determined by Barbet, the author. If, for instance, a cannon ball, or any other violently contusing cause, should have carried off or crushed the thigh, so as only to leave a few parts to be cut to make the separation complete, we ought not to hesitate about doing it. A sphacelus, extending to the circumference of the joint, and destroying the greatest part of the surrounding flesh, might render the operation equally necessary and easy. (See *Sabatier, Tome* 3. *p.* 271, *&c.*) Cases are adduced of the limb being taken off by the surgeon completing the separation of the dead parts with a knife. However, this cannot be considered as amputation at the hip joint. Dividing a few dead fibres was a thing of no importance, in regard to the likelihood of its creating any bad symptoms. The proceeding, in fact, seems to have no analogy at all to the bloody operation of taking the thigh bone out of the socket. I cannot conceive any case in which the circumstances, however perilous, would be at all improved by this operation. The following are Mr. Pott's sentiments: "M. Bilguer, and M. Tissot, are the only people whom I have met with, or heard of, in the profession, who speak of an amputation in the joint

of the hip, as an advisable thing, or as being preferable to the same operation in the thigh;" After a quotation or two, he continues; "that amputation in the joint of the hip is not an impracticable operation (although it be a dreadful one) I very well know, I cannot say, that I have ever done it, but I have seen it done, and am now very sure I shall never do it, unless it be on a dead body. The parallel, which is drawn between this operation and that in the shoulder will not hold. In the latter it sometimes happens, that the caries is confined to the head of the os humeri, and that the scapula is perfectly sound and unaffected. In the case of a carious hip joint, this never is the fact; the acetabulum ischii, and parts about, are always, more or less in the same state, or at least in a distempered one, and so indeed most frequently are the parts within the pelvis, a circumstance this of the greatest consequence; for the power of performing the operation beyond the seat of the disease, and, consequently, totally removing all the distempered parts is the very decisive circumstance in favour of amputation every where, but, in the hip, where (to say nothing of the horridness of the operation itself) the hemorrhage, from a multiplicity of vessels, some of which are of considerable size, and the immense discharge which a sore of such dimensions must furnish, the distempered state of the parts which cannot by the operation be removed, will render it ineffectual, bold and bloody as it must be." (*Pott on Amputation.*)

AMPUTATION OF THE SHOULDER JOINT.

The first description of this is to be found in *Le Dran's Observations.* His father, it seems, undertook the operation, in a case of caries conjoined with exostosis, which affection reached from the middle to the neck of the humerus. He began with rendering himself master of the bleeding, by introducing a straight needle, armed with a strong ligature, doubled several times. This passed from the front to the back part of the arm, as closely to the axilla and bone as possible. The ligature, including the vessels, the flesh surrounding them, and the skin covering them, was tightened over a compress. Le Dran with a straight narrow knife, made a transverse incision through the skin and deltoid muscle down to the joint, and through the ligament surrounding the head of the humerus. An assistant raised the arm, and dislocated the head of the bone from the cavity of the scapula. This allowed the knife to be passed with ease between the bone and the flesh. Le Dran then introduced the knife downward, keeping its edge continually somewhat inclined towards the bone. In this manner, he gradually cut through all the parts, as far as a little below the ligature. As there was a large flap, Le Dran made a second ligature with a curved needle, which ligature included a great deal of flesh, the redundant portion of which was cut off together with the first ligature, which had become useless. The cure was completed in about ten weeks. Le Dran (the son) does not state, that the operation was a new one, and it appears, from the *Recherches Critiques sur l'origine, &c. de la Chirurgie en France,* and from La Faye's notes on Dionis, that it had been previously practised by Morand the father.

Garengeot thought a curved needle, with sharp edges, would be better for making the first ligature, and that the wound need not be so large, if the incision were to begin two or three finger breadths from the acromion, and made so as to form two flaps, the lower one of which would correspond to the axilla, and might be brought into contact with the other, after the second ligature was applied.

La Faye extended the improvements further. After placing the patient in a chair, and bringing the arm into a horizontal position, he made, with a common bistoury a transverse incision into the deltoid muscle down to the bone, four finger breadths below the acromion. Two other incisions, one in front, the other behind, descended perpendicularly to this first, and made a large flap of the figure of a trapezium, which was detached and turned up towards the top of the shoulder. The two heads of the biceps, the tendons of the supraspinatus, infraspinatus, teres minor and subscapularis, and the capsular ligament, are next divided. The head of the humerus could now be easily dislocated, when the assistant, who held the lower part of the limb, made the bone describe the motion of a lever upward. La Faye next carried his incisions downward, along the inner part the arm, until he was able to feel the

vessels, which he tied as near the axilla as possible. Then he completed the separation of the limb, one finger breadth lower down. All remaining to be done, was to bring down the flap over the glenoid cavity, and dress the wound.

The advantages of this plan are obvious. As only one ligature is applied, the patient is saved a great deal of pain; the flap, which is connected with the acromion, is more easily applied and kept on the stump, than the one, which Garengeot recommended to be made, at the lower part of the axilla. Lastly, any discharge can readily find vent downward.

Mr. Samuel Sharp recommended the following plan. The patient's arm being held horizontal, make an incision through the membrana adiposa, from the upper part of the shoulder across the pectoral muscle, down to the armpit, then turning the knife with its edge upwards, divide that muscle and part of the deltoid, all which may be done without danger of wounding the great vessels, which will become exposed by these openings. If they be not, cut still more of the deltoid muscle, and carry the arm backward.—Then with a strong ligature, having tied the artery and vein, pursue the circular incision through the joint, and carefully divide the vessels at a considerable distance below the ligature; the other small vessels are to be stopped, as in other cases,"

"In doing this operation, regard should be had to the saving as much skin as possible, and to the situation of the processus acromion, which, projecting considerably beyond the joint, an unwary operator would be apt to cut open." (*Operations of Surgery.*)

Bromfield's plan consisted in first exposing the axillary vessels, by dividing the integuments in the axilla.—These vessels he detached, and tied. Then having cut the capsular ligament with scissars, he finished the operation on Mr. Sharp's plan.

At length, P. H. Dahl, in 1760, published at Goettingen, a Latin dissertation on amputation at the shoulder, in which publication he proposes making one's self master of the blood, before the operation, by a tourniquet, the pad of which pressed on the subclavian artery under the clavicle. This enabled the operator to dispense with tying the vessels in the first instance. Camper had observed, that if we push the scapula backward, and press the axillary artery with the finger between the clavicle coracoid process, and great pectoral muscle, the pulse at the wrist instantly stops.

Dahl's tourniquet was obviously constructed, in consequence of what Camper had observed, and it consists of a curved, elastic plate of steel, the length of which may be readily imagined.—A pad is attached to the shortest end of this plate, and is made capable of projecting further by means of a screw. The instrument is applied by making it embrace the shoulder from behind forward, while the pad presses on the hollow under the clavicle, between the margins of the deltoid and pectoral muscles. The long extremity of the steel plate, which descends behind the shoulder, is to be fixed to the body by a sort of belt. The pad is then to be depressed, until the pulsation of the axillary artery is stopped.

Further experiments have proved, however, that this tourniquet may be dispensed with, and the flow of blood in the axillary artery commanded, by properly compressing this vessel with a pad, at the place where it emerges from between the scaleni muscles, above the middle part of the clavicle. Thus the artery becomes pressed between the pad and the first rib, across which it runs. This method, which is as simple as possible, is preferable to that, which requires a tourniquet that is so seldom at hand.

Amputation at the shoulder has been in some degree superseded by a preferable operation, even in cases in which it would formerly have been deemed quite indispensable, such as considerable gunshot fractures of the head of the humerus; a caries of the substance of this part, &c. Boucher, in *Tom. 2. Mem. de l'Acad. de Chir.* shews, that considerable wounds, extending into the shoulder joint, were capable of being successfully treated, by extracting the pieces of bone, which had been separated by violence. Instances are also recorded, in which, when the head and neck of the humerus had been totally disunited from the body of that bone, a cure was accomplished by making such incisions as allowed the portions of bone, now become extraneous bodies, to be taken away. Mr White of Manchester, proceeded further, and ventured to make

a deep incision at the upper part of the arm, to dislocate the head of the humerus, which he knew was carious, and, pushing it through the wound, took it off with a saw. The patient recovered in four months.

Bent, of Newcastle, has inserted a similar case in the 64th Vol. of the Philosophical Transactions. White made only one incision, from the vicinity of the acromion down to the middle of the arm. Bent, not being able to get at the head of the bone, through the wound, which he had made from the clavicle to the attachment of the pectoral muscle, detached a portion of the deltoid, where it is connected with the clavicle, and another part, where it is adherent to the humerus. Sabatier has proposed making two cuts at the upper part of the arm, which meet below like the letter V. extirpating the flap, dividing the inner head of the biceps, and capsular ligament; dislocating the head of the bone, and sawing it off. (*Médicine Opératoir. Tom.* 3.)

AMPUTATION OF THE HEADS OF BONES.

In a letter, dated 1782, and addressed to Mr. Pott, Mr. Park, surgeon of the Liverpool Hospital, made the proposal of totally extirpating many diseased joints, by which the limbs might be preserved, with such a share of the motions which nature originally allotted as to be considerably more useful than any invention which art has hitherto been able to substitute.

Mr. Park's scheme, in short, was to entirely remove the extremities of all the bones, which form the joints, with the whole, or as much as possible, of the capsular ligament; and to obtain a cure by means of callus, or by uniting the femur and tibia, when the operation was done on the knee; and the humerus, radius, and ulna, when done on the elbow; so as to have no moveable articulation in those situations.

To determine whether the popliteal vessels could be avoided without much difficulty in the excision of the knee, Mr. Park made an experiment on the dead subject. An incision was made, beginning about two inches above the upper end of the patella, and extending about as far below its lower part. Another one was made across this at right angles, immediately above the patella down to the bone, and nearly half round the limb, the leg being in an extended state. The lower angles formed by these incisions were raised so as to lay bare the capsular ligament; the patella was then taken out; the upper angles were raised, so as fairly to denude the head of the femur, and to allow a small catling to be passed across the posterior flat part of the bone, immediately above the condyles, care being taken to keep one of the flat sides of the point of the instrument quite close to the bone, all the way. The catling being withdrawn, an elastic spatula was introduced in its place, to guard the soft parts, while the femur was sawn. The head of the bone thus separated, was carefully dissected out; the head of the tibia was then with ease turned out, and sawn off, and as much as possible of the capsular ligament dissected away, leaving only the posterior part covering the vessel, which on examination had been in very little danger of being wounded.

The next attempt was on the elbow, a simple longitudinal incision was made from about two inches above, to the same distance below, the point of the olecranon. The integuments having been raised, an attempt was made to divide the lateral ligaments, and dislocate the joint; but, this being found difficult, the olecranon was sawn off, after which the joint could be easily dislocated, without any transverse incision, the lower extremity of the os humeri sawn off, and afterwards the heads of the radius and ulna. This appeared an easy work; but, Mr. Park conceives the case will be different in a diseased state of the parts, and that a crucial incision would be requisite, as well as dividing the humerus, above the condyles, in the way done with respect to the thigh bone.

Mr. Park first operated, July 2, 1781, on a strong, robust, sailor, aged 33, who had a diseased knee, of ten years' standing. The man's sufferings were daily increasing, and his health declining. Mr. Park, in the operation, wished to avoid making the transverse incision, thinking that after removing the patella, he could effect his object by the longitudinal one; but, it was found that the difference between a healthy and diseased state of parts, deceived him in this expectation. Hence the idea was relinquished, and the transverse incision made. The opera-

tion was finished exactly as the one on the dead subject related above. The quantity of bone removed was a very little more than two inches of the femur, and rather more than one inch of the tibia. The only artery divided was one on the front of the knee, and it ceased to bleed before the operation was concluded, but the ends of the bones bled very freely. To keep the redundant integuments from falling inwards, and keep the edges of the wounds in tolerable contact, a few sutures were used. The dressings were light and superficial, and the limb was put in a tin case, sufficiently long to receive the whole of it, from the ankle to the insertion of the gluteus muscle.

We shall not follow Mr. Park throughout the whole treatment. Suffice it to remark, that the case gave him a great deal of trouble, and that it was attended with many embarrassing circumstances, arising chiefly from the difficulty of keeping the limb in a fixed position, the great depth of the wound, and the abscesses and sinuses, which formed in the part. On the other hand, however, the first symptoms were not at all dangerous. But, the patient was obliged to keep his bed nine or ten weeks, and it was many months more before the cure was complete. The man afterwards went to sea, and did his duty very well, so useful was his limb to him.

Since the publication of the letter addressed to Mr. Pott, another excision of the knee has been done by Mr. Park. This operation was performed on the 22d of June, but the event was unsuccessful, as the patient lingered till the 13th of October, and then died.

About the same time that Mr. Park made his proposal, P. F. Moreau, a French surgeon, wrote in favour of a similar method. It only seems necessary to notice here the difference in Moreau's plan of operating, from that adopted by our countryman. Moreau, the son, who has published the account, observes that the multiplicity of flaps is unnecessary, as two answer every purpose; and he deems Mr. Park's direction to remove the olecranon, if this be free from caries, at least useless. Moreau, junior, operated on the elbow as follows: he plunged a dissecting scalpel in upon the sharp edge, or spine of the inner condyle of the os humeri, about two inches above its tuberosity; and, directed by the spine, he carried the incision down to the joint. He did the same on the other side, and then laid the two wounds into one, by a transverse incision, which divided the skin and the tendon of the triceps, immediately above the olecranon. The flap was dissected from the bone, and held up out of the way, by an assistant.

The flesh which adhered to the front of the bone, above the condyles, was now separated, care being taken to guide the point of the instrument with the fore-finger of the left hand, and, when the handle of a scalpel could be passed through between the flesh and the bone, M. Moreau allowed it to remain there, and sawed the bone through upon it. The removal of the piece of bone was next finished, by detaching it from all its adhesions. The removal of the heads of the radius and ulna, remaining to be done, was more difficult, and the first flap being insufficient, it became necessary to make another. The lateral incision, at the outer side of the arm, was extended downwards, along the external border of the upper part of the radius. The head of the radius was separated from the surrounding part; its connexion with the ulna destroyed, and a strap of linen was introduced between the bones, to keep the flesh out of the way of the saw. The radius was sawn through, near the insertion of the biceps, which was fortunately preserved. Some remaining medullary cells, filled with pus, were removed with a gouge. The ulna was next exposed, by extending the lateral incision on the inner side of the arm. Thus another flap was made, and detached from the back part of the fore arm, and that part of the bone which it was wished to remove. The bone, separated from every thing that adhered to it, and a strap of linen being put round it to protect the flesh, about an inch and a half of it was sawn off, measuring from the tip of the olecranon, downwards. A few diseased medullary cells were taken away with the gouge. Two or three vessels were tied, and the flaps were brought together with sutures. In a fortnight this man became so well, that he was allowed to go wherever he pleased, with his arm supported in a case. The arm was at first powerless, but it slowly regained its strength, and the man could ultimately thrash corn and hold the plough with it, &c.

Seven months after another operation, performed in the same way as the preceding one, by Moreau the father, the patient was completely cured and two years after this period, the flexion of the forearm on the arm, was very distinct. In another case, only one longitudinal incision, and a transverse one, were made, the flap of course was triangular. The patient got well in six weeks, and in three months more joined his regiment.

In all Moreau's cases, the flexion and extension of the forearm were preserved, which circumstance no doubt depended very much on the insertion of the biceps not being destroyed. After the excision of the knee, however, the bones grew together.

Moreau, junior's, method of operating differed from his father's, in having the patient in a recumbent, instead of a sitting, posture, and in sawing the os humeri before it was dislocated.

In a knee case, Moreau the father operated as follows:—He made a longitudinal incision on each side of the thigh, between the vasti and the flexors of the leg, down to the bone. These incisions began about two inches above the condyles of the femur, and were carried down along the sides of the joint till they reached the tibia. They were united by a transverse cut, which passed below the patella, down to the bone.

The flap was raised; the patella was attached to it, but being diseased, was dissected out. The limb was then bent to bring the condyles of the femur into view. As it was desired to cut them from the body of the bone, before dislocating them, every thing adhering to them behind, where they joined the body of the bone, was separated, and, at that place, the fore-finger of the left hand was passed through, in order to press back the flesh from the bone, and on that the saw was used. The knee having been bent, Moreau drew the cut piece towards him, and easily detached it from the flesh and ligaments.

The head of the tibia was laid bare by an incision, nearly eighteen lines long, made on the spine of that bone. The first lateral incision on the outer side of the knee, was extended nearly as far down on the head of the fibula. Thus were obtained one flap, which adhered to the flesh filling up the interosseous space, and another triangular flap, formed of the skin, covering the inner surface of the tibia, which bone was of necessity exposed, before the saw could be applied.

Upon raising the outer flap, the head of the fibula came into view, and, after being separated from its attachments, was cut off with a small saw. The inner flap was then raised, and the tibia having been separated from the muscles behind, its head was sawn off.

It does not appear necessary to insert in this work the account of cutting out the ankle joint; an operation which will never be extensively adopted; nor shall I add any thing more concerning the mode of removing, in a similar way, the shoulder joint. In treating of amputation in this situation I have already said enough, and whoever wishes for further information, respecting this practice, must refer to Dr. Jeffray's Work, entitled "*Cases of the Excision of Carious Joints.*" This publication contains all that is known on the subject. Dr. Jeffray has recommended a particular, and, indeed, a very ingenious saw for facilitating the above operation. The saw alluded to is constructed with joints, like the chain of a watch, so as to allow itself to be drawn through behind a bone, by a crooked needle, like a thread, and to cut the bone from behind forward, without injuring the soft parts. An instrument of this kind was executed in London, by Mr. Richards, who was assisted in making it by his nephew, the present Mr. Richards, of Brick-lane. In placing the saw under a bone, its cutting edge is to be turned away from the flesh. Handles are afterwards hooked on the instrument.

In my treatise on the diseases of the joints, which was honoured with the premium for 1806, by the College of Surgeons in London, I have made the following remarks on the excision of large joints. "My sentiment has been already stated, with regard to the time when every hope of curing a diseased joint ought to be abandoned, I have stated, that the approach of dissolution, in other words, the sunk state of the system can be the only solid reason for amputation, that, as long as the patient's strength is not subdued by the irritation of the local disease, humanity dictates the propriety of persevering in an attempt to save

the affected limb, &c. Will a patient, greatly reduced by hectic symptoms, be able to recover from so bold and bloody an operation, as the dissection of the whole of the knee-joint out of the limb? If some few should escape, with life and limb preserved, would the bulk of persons, treated in this manner, have the same good fortune? I cannot admit that the extirpation of the whole of so large an articulation as the knee, can be compared with the operation of amputation, in point of simplicity and safety. However, it is not on the difficulty of practising the former, that I would found my objections; for I believe, that any man possessing a tolerable knowledge of the anatomy of the leg, might contrive to achieve the business." "The grounds on which I shall at present withhold my approbation from the attempt to cut out large joints, are the following: 1. The great length of time which the healing of the wound requires. Whoever peruses the case of Hector M'-Caghen, will find that the operation was performed on the 2d of July, 1781, and that it was February 28th of the following year, before all the abscesses and sores were healed. This space of time is very nearly eight months! Mr. Park describes the patient as a strong, robust sailor, and gives no further particulars of the state of his constitution, than that his health was declining. I entertain little doubt, that if the excision of the knee had been performed in that state of the health, in which amputation becomes truly indispensable, this man would not have survived the illness arising from the operation. The only other case in which Mr. Park extirpated the knee, ended fatally. In the instance related by Moreau, there seemed, indeed, to be considerable debility. This patient escaped the first dangers consequent to so severe an operation; and, *after three months' confinement*, the patient was in such a state that *Moreau expected he would be able to walk upon crutches in another month or six weeks!* The young man in the mean time was attacked by an epidemic dysentery, and died. 2. Even supposing the excision of the knee to be followed with all possible success, is the advantage of having a mutilated, shortened, stiff limb, in lieu of a wooden leg, sufficiently great to induce any man to submit to an operation, beyond doubt infinitely more dangerous than amputation? I think not." (*See my Treatise on the Diseases of the Joints*, p. 138.)

AMPUTATION OF THE FINGERS AND TOES, AND PART OF THE FOOT.

Mr. Samuel Sharp observes, that the amputation of the fingers and toes is better performed in their articulation, than by any of the other methods. For this purpose a straight knife must be used, and the incision of the skin be made not exactly upon the joint, but a little more towards the extremity of the finger, that more of it may be preserved for the easier healing afterwards. It will also facilitate the separation in the joint, when you cut the finger from the metacarpal bone, to make two longitudinal incisions on each side of it first.

It may happen that the bones of the toes, and part only of the metatarsal bones, are carious, in which case the leg need not be cut off, but only so much of the foot as is disordered. A small spring saw is here better than a large one. When this operation is performed, the heel and the remainder of the foot will be of great service, and the wound heal up safely, as Mr. Sharp has once seen.—(*Operations of Surgery.*)

In amputating the fingers and toes, the operation is greatly facilitated by cutting into the joint when it is bent. Having made an opening into the back part of the capsule, one of the lateral ligaments may easily be cut, after which nothing keeps the head of the bone from being turned out, when the surgeon has only to cut through the rest of the ligamentous and tendinous parts.

Some recommend making a small semicircular flap of skin to cover the bone; but this is quite unnecessary, if care be taken to draw the skin a little up, and to cut where Mr. Sharp directs.

Mr. Hey describes a new mode of removing the metatarsal bones, which on repeated trial has fully answered his expectations. Mr. Hey makes a mark across the upper part of the foot, to denote where the metatarsal bones are joined to those of the tarsus. About half an inch from this mark, nearer the toes, he makes a transverse incision, through the integuments and

muscles covering the metatarsal bones. From each extremity of this cut, he makes an incision along the inner and outer side of the foot to the toes: he removes all the toes from the metatarsal bones, and then separates the integuments and muscles, forming the sole of the foot, from the inferior part of the metatarsal bones, keeping the edge of the knife as near the bones as possible, in order to expedite the operation, and preserve as much muscular flesh in the flap as can be saved. He then separates the four smaller metatarsal bones, at their junction with the tarsus, and divides, with a saw, the projecting part of the first cuneiform bone, which supports the great toe. The arteries being tied, Mr. Hey applies the flap, which had formed the sole of the foot, to the integuments, which remain at the upper part, and keeps them in contact with sutures. The cicatrix being situated at the top of the foot, is in no danger of being hurt, while the place where the toes were situated is covered with such strong skin, viz. what previously formed the sole of the foot, that it cannot be injured by any moderate violence. (See *Practical Observations in Surgery. p.* 385, *&c.*)

It is certainly very often quite unnecessary to remove the whole foot, when the metatarsal bones are carious, and every other part of the leg is sound. The remainder of the foot is of immense service in walking, as the use of the ankle is not destroyed. Mr. Hey very judiciously recommends dissecting out the metatarsal bone of the great toe, when diseased, from the cuneiform bone, instead of sawing it. The latter plan cannot be easily accomplished, without removing part of the integuments and muscles, and making a transverse, as well as a longitudinal, incision. These disagreeable things may be avoided by following Mr. Hey's method.

The metatarsal bone of the little toe may be removed in a similar way.

It is very awkward to saw the metatarsal, and metacarpal bones, and, when the middle ones are to be divided, is indeed hardly practicable, without injuring the soft parts. I am, therefore, of opinion with Mr. C. Bell, that, instead of a formal amputation, it is better to extract the diseased bones from the foot, or hand, as, indeed, Mr. Hey is in the habit of doing.

The following sources of instruction, on the subject of amputation, are particularly entitled to notice: *Celsus de Re Medica. Sharp's Treatise on the Operations. Sharp's Critical Inquiry. Traité des Operations de Chirurgie par A. Bertrandi. Heister's Surgery. Le Dran's Operations. B. Bell's Surgery Vol.* 5. *Bilguer's Dissertation on Amputation. Bromfield's Chirurgical Observations. O'Halloran's Treatise on Gangrene, &c. with a new Method of Amputation. Alanson's Practical Observations on Amputation.* The remarks of M. Louis in the *Mem. de l'Acad. Royale de Chirurgie. Pott on Amputation. White's Cases. Sabatier's Médicine Opératoire. Hey's Practical Observations in Surgery. Young's Currus Triumphalis ex Terebinthina. Cases of the Excision of Carious Joints by Park and Moreau, published by Dr. Jeffray. Encyclopédie Méthodique; Partie Chirurgicale. Rees's Cyclopædia; Art. Amputation. Vermischte Chirurgische Schriften von J. L. Schmucker; Band.* 1. *Operative Surgery by C. Bell.*

AMYGDALÆ. The tonsils, so termed from their resemblance to almonds.

AMYLUM. Starch. The word is derived from α neg. and μυλη, a mill, because starch was formerly made of corn, without being ground in a mill. Powdered starch is sometimes used as an external application to erysipelas; but, chiefly, in glysters, when the neck of the bladder is affected with spasm. The following is the formula used at St. Bartholomew's Hospital, ℞ Mucilaginis Amyli. Aquæ distillatæ, sing. ℥ij Tinct. Opii guttas quadraginta: Misce.

ANASARCA, (from, ανα through, and σαρξ, flesh). A dropsical disease, in which an aqueous fluid is extensively diffused in the general cellular texture of the body. When less extensive, the complaint is termed, *œdema*, which then becomes a surgical case, unless entirely dependent on constitutional causes.

ANASTOMOSIS, (from ανα, through, and στομα, a mouth). *Inosculatio.* Anatomists and surgeons imply, by this term, the communications of the blood vessels with each other, or their running and opening into each other, by which the continuance of a free circulation of the blood is greatly ensured. The immense importance of this part of our structure, in all cases in which

the main artery, or, vein of a limb, is rendered impervious, is particularly conspicuous in aneurisms. (See *Aneurism.*)

ANCHYLOPS, (from αγχι, near, and ωψ the eye). Same as Ægylops.

ANCHYLOSIS, (from αγκυλος, crooked). This denotes intimate union of two bones, which were naturally connected by a moveable kind of joint. All joints originally designed for motion, may become anchylosed, that is, the heads of the bones, forming them, may become so consolidated together, that no degree of motion whatever can take place. Bernhard Connor (*De stupendo ossium coalitu*) describes an instance of a general anchylosis of all the bones of the human body. A still more curious fact is mentioned in the *Hist. of the Acad. of Sciences*, 1716, of a child 23 months old, affected with an universal anchylosis. In the advanced periods of life, anchylosis more readily occurs, than in the earlier parts of it. The author of the article *anchylosis* in the *Encyclopédie Méthodique*, mentions his having preserved a specimen, in which the femur is so anchylosed with the tibia and patella, that both the compact and spongy substance of these bones appears to be common to them all, without the least perceptible line of separation between them. In old subjects, the same kind of union is commonly observable between the vertebræ, and between these and the heads of the ribs.

The greater, or lesser degree of immobility, has caused anchylosis to be distinguished into the *true* and *false*. In the true anchylosis, the bones have grown together so completely, that not the smallest degree of motion can take place, and the case is positively incurable. The position, in which the joint has become thus inalterably anchylosed, makes a material difference in the inconvenience resulting from the occurrence. The false anchylosis is that, in which the bones have not completely grown together, so that their motion is only diminished, not destroyed. The true anchylosis is sometimes termed *complete;* the false *incomplete.*

In young subjects in particular, anchylosis is seldom an original affection, but generally the consequence of some other one. It very often occurs after fractures, in the vicinity of joints; after sprains, and dislocations with a great deal of contusion; and after white swellings and abscesses in joints. Aneurisms, other swellings and abscesses on the outside of a joint, may also induce anchylosis. In short, every thing which keeps a joint long motionless, may give rise to the affection, which is generally the more complete the longer such causes have operated.

When a bone is fractured near a joint, the limb is kept motionless by the apparatus, during the whole time requisite for uniting the bones. The subsequent inflammation also extends to the articulation, and attacks the ligaments and surrounding parts. Sometimes, these only become more thickened and rigid; on other occasions, the inflammation produces a mutual adhesion of the articular surfaces. Hence fractures so situated, are more serious than when they occur at the middle part of a bone. But, it is to be noticed, that all fractures leave, after their cure, a certain degree of stiffness in the adjacent joints; but, this arises from the inactivity, in which the muscles and articular surfaces have been, and may generally be cured by gradually exercising, and increasing the motion of the limb.

The position of an anchylosed limb is a thing of great importance. When abscesses form near the joints of the fingers, and the tendons mortify, the fingers should be bent, that they may anchylose in that position, which renders the hand much more useful, than if the fingers were permanently extended. The knee, on the contrary, should always be kept as straight as possible, when there is danger of anchylosis. The same plan is to be pursued, when the head of the thigh bone is dislocated in consequence of a diseased hip. When the elbow cannot be prevented from becoming anchylosed, the joint should always be kept bent. No attempt should ever be made to *cure*, though every possible exertion should often be made to *prevent*, a true anchylosis. The attempt to prevent, however, is not always proper, for many diseases of joints may be said to terminate, when anchylosis occurs.

When the false, or incomplete anchylosis is apprehended, measures should be taken to avert it. The limb is to be moved as much as the state of the soft parts will allow. Boyer remarks, that this precaution is much more necessary in affections of the ginglymoid articulations, than of the orbicular ones, on account of the tendency of the former to

become anchylosed, by reason of the great extent of their surfaces, the number of their ligaments, and the naturally limited degree of their motion.

The exercise of the joint promotes the secretion of the synoria, and the grating, first perceived in consequence of the deficiency of this fluid, soon ceases. A certain caution is necessary in moving the limb: too violent motion might create pain, swelling, and inflammation, and even caries of the heads of the bones. It is by proportioning it to the state of the limb, and increasing its extent daily, as the soft parts yield and grow supple, that good effects can be derived from it. (See *Boyer Mal. des Os. Tom.* 2.) The use of embrocations, and pumping cold water on the joint, every morning, have great power in removing the stiffness of a limb remaining after the cure of fractures, dislocations, &c.

Unreduced dislocations are not always followed by anchylosis. Nature often forms a new joint, especially in persons of the lower order, who are obliged to move their limbs a great deal, in order to obtain a livelihood. The surrounding cellular substance becomes condensed, so as to form, around the head of the luxated bone, a membrane, serving the purpose of a capsular ligament. The muscles, at first impeded in their action, become so habituated to their new state, that they resume their functions. This is particularly the case with bones which move in every direction, and have round heads; but, in ginglymoid joints, the heads of the bones are only imperfectly dislocated, and the motion is greatly restrained by the extent of surface; while some of the numerous ligaments are only sprained, not ruptured. These causes promote the occurrence of anchylosis.

Anchylosis may follow contusions of the joints, and such shocks, as the articular surface experience in leaping, or falling on the feet, from great heights. This is more likely to happen, when the inflammatory symptoms, resulting from such violence, have not been properly counteracted by bleeding, and other general remedies. Sprains, which violently twist the joints, very often, on this account, cause an anchylosis, especially, when the inflammation has long hindered such joints from being at all moved.

When diseases of joints end in a complete anchylosis, the occurrence is to be looked upon, as a very favourable one. In fact, it is as much a means of cure, as the formation of callus is for the union of broken bones. The disease of the vertebræ, described by Pott, is cured, as soon as the bones anchylose, nor can the patient be considered well, before this event has taken place. See on this subject *l'Encyclopédie Méthodique; Partie Chirurgicale. Boyer sur les Mal. des Os. Tom.* 2.)

ANEURISM, (from ἀνευρύνω, to dilate.) When any part of an artery has the appearance of being dilated, the swelling is commonly named a *true*, or *genuine aneurism*. In such cases, the artery either seems only enlarged at a small part of its track, and the tumour has a determinate border, or, the vessel seems dilated, for a considerable length, in which circumstance, the swelling is oblong, and loses itself so gradually in the surrounding parts, that its margin cannot be exactly ascertained. The first case, which is the most common, is termed the *circumscribed true aneurism*; the last, the *diffused true aneurism*. When blood escapes from a wound, or rupture, of an artery, into the adjoining cellular substance, the swelling occasioned is denominated the *spurious*, or *false aneurism*. In this instance, the blood either collects in one mass, distends the cellular substance, and condenses it into a cyst, so as to form a distinctly circumscribed tumour; or it is injected into all the cavities of the surrounding cellular substance, and extends along the course of the great vessels, from one end of the limb to the other, thus producing an irregular, oblong swelling. The first case is named, the *circumscribed false aneurism*; the second, the *diffused false aneurism*. (*Richter's Anfangsgr. Band.* 1.)

Mixed aneurism was the name given by Dr. W. Hunter to one, which he supposed might proceed from the outer coats of an artery being cut, and the inner ones becoming consequently dilated. But, the experiments of Hunter and Home, as we shall have occasion to mention again, fully prove, that an aneurism will not arise from the kind of weakness which cutting, or even stripping off, the external coat of an artery, must produce; and Scarpa, as we shall presently notice, satisfactorily shews that the internal coats are always

ruptured. By the *mixed aneurism*, Dr. Monro implied, the state of a true aneurism, when its cyst has burst, and the blood has become diffused in the adjacent cellular substance. This event is certainly a real one, but, Dr. Hunter's case may be deemed altogether supposititious.

The symptoms of the circumscribed true aneurism take place as follows: the first thing the patient perceives is an extraordinary throbbing in some particular situation, and, on paying a little more attention, he discovers there a small pulsating tumour, which entirely disappears, when compressed, but, returns again as soon as the pressure is removed, It is commonly unattended with pain, or change in the colour of the skin. When once the tumour has originated, it continually grows larger, and, at length, attains a very considerable size. In proportion as it becomes larger, its pulsation becomes weaker, and, indeed, it is almost quite lost, when the disease has acquired much magnitude. The diminution of the pulsation has been ascribed to the coats of the artery losing their dilatable and elastic quality, in proportion as they are distended and indurated, and, consequently, the aneurismal sac being no longer capable of an alternate diastole and systole from the action of the heart. The fact is also imputed to the coagulated blood, deposited on the inner surface of the sac, particularly, in large aneurisms, in which some of the blood is always interrupted in its motion. In true aneurisms, however, the blood does not coagulate so soon, nor so often, as in false ones. Immediately, such coagulated blood lodges in the sac, pressure can only produce a partial disappearance of the swelling. In proportion as the aneurismal sac grows larger, the communication of blood into the artery beyond the tumour is lessened. Hence, in this state, the pulse, below the swelling, becomes weak and small, and the limb frequently cold. and œdematous. On dissection, the lower continuation of the artery is found preternaturally small and contracted. The pressure of the tumour on the adjacent parts also produces a variety of symptoms, ulceration, caries, &c. Sometimes, an accidental contusion, or concussion, may detach a piece of coagulum from the inner surface of the cyst, and the circulation through the sac be obstructed by it. The coagulum may possibly be impelled quite into the artery below, so as to induce important changes. The danger of an aneurism arrives when it is on the point of bursting, by which occurrence the patient usually bleeds to death, and this sometimes in a few seconds. The fatal event may generally be foreseen, as the part about to give way becomes particularly tense, elevated, thin, soft, and of a dark purple colour. *Richter's Anfangsgr. Band.* 1.

A large axillary aneurism, which burst in St. Bartholomew's Hospital, a few years ago, did not burst by ulceration, but by the detachment of a small slough from a conical, discoloured part of the tumour. This case fell under my observation, and, I have since learnt, that this is the ordinary mode in which the fatal hemorrhage is induced.

The *false aneurism* is always owing to an aperture in the artery, from which the blood gushes into the cellular substance. The case may arise from an artery being lacerated in violent exertions; but, the most common occasional cause is a wound. This is particularly apt to occur at the bend of the arm, where the artery is exposed to be injured in attempting to bleed. (For this case see *Hemorrhage.*) In this circumstance, as soon as the puncture has been made, the blood gushes out with unusual force, and in a bright scarlet, irregular, interrupted current. It flows out, however in an even, and less rapid stream, when pressure is applied higher up than the wound. These last are the most decisive marks of the artery being opened; for blood often flows from a vein with great rapidity, and, in a broken current, when the vessel is very turgid, and situated immediately over the artery, which imparts its motion to it. The surgeon endeavours precipitately to stop the hemorrhage by pressure, and he commonly occasions a *diffused false aneurism.* The external wound in the skin is closed, so that the blood cannot escape from it; but, hence, it insinuates itself into the cellular substance. The swelling, thus produced, is uneven, often knotty, and extends upward and downward along the track of the vessel. The skin is also usually of a dark purple colour. Its size increases, as long as the internal hemorrhage continues, and, if this should proceed above a certain pitch, mortification of the limb ensues.

The *circumscribed false aneurism* arises in the following manner. When proper pressure has been made in the first instance, so as to suppress the hemorrhage; but, the bandage has afterwards been removed too soon, or before the artery has healed, the blood passes through the unclosed wound, or that which it has burst open again, into the cellular substance. As this has now become agglutinated by the preceding pressure, the blood cannot diffuse itself into its cells, and, consequently, a mass of it collects in the vicinity of the aperture of the artery, and distends the cellular substance into a sac. Sometimes, though not often, this circumscribed false aneurism, originates immediately after the opening is made in the artery. This chiefly happens when the aperture in the vessel is exceedingly small, and consequently, the hemorrhage takes place so slowly, that the blood, which is first effused, coagulates, and prevents the entrance of that which follows into the cavities of the cellular substance, and, of course, its diffusion. A membrane, aponeurosis, &c. may also be just over the orifice, so as to prevent the aneurism from being diffused.

The circumscribed false aneurism consists of a sac, composed of cellular substance, filled with blood, and situated close to the artery, with which it has a communication. At every pulsation, fresh blood gushes from the opening of the artery into the sac, and distends it; but, its elasticity then makes it contract a little, and urge a portion of the blood back into the vessel. Hence, in false aneurisms, a throbbing is always perceptible, and is more manifest, the smaller such tumours are. The larger the sac becomes, the less elastic it is, and the greater is the quantity of coagulated blood in it; so that in very large aneurisms of this kind, the pulsation is sometimes wholly lost.

The tumour is at first small, and on compression entirely disappears; but, returns as soon as this is removed. It also diminishes, when the artery above it is compressed; but, resumes its wonted magnitude, immediately when such pressure is discontinued. When there is coagulated blood in the sac, pressure is no longer capable of producing a total disappearance of the tumour, which is now hard. The swelling is not painful, and the integuments are not changed in colour. It continually increases in size, and, at length, attains a prodigious magnitude.

The following are generally enumerated, as the discriminating differences between circumscribed true and false aneurisms: the true aneurism readily yields to pressure, and as readily recurs on its removal; the false one yields very gradually, and returns in the same way, as the blood in the sac can only pass and repass slowly through the aperture in the artery. Frequently, a hissing sound is very audible, when the blood gushes into the sac. The pulsation of the false aneurism is always more feeble, and, as the tumour enlarges, is sooner lost, than that of the true one, which even throbs after it has acquired a very considerable volume. The sac of the true aneurism is the artery itself; that of the false one is cellular substance. (See *Richter's Anfangsgr. Band.* 1.) Besides these common divisions of aneurism, there are two other kinds, one named the *aneurismal varix*, or *venous aneurism*, the other called by Mr. J. Bell, the *aneurism from anastomosis*; the particulars of both of which will be offered in due time.

If the doctrines, however, of Professor Scarpa, of Pavia, which were published in 1804, are correct, the grand distinction of aneurisms into *true* and *false* must be rejected, as erroneous: "for, (says he) after a very considerable number of investigations, instituted on the bodies of those, who have died of internal or external aneurisms, I have ascertained, in the most certain and unequivocal manner, that there is only one kind, or form of this disease; viz. that caused by a solution of continuity, or rupture of the proper coats of the artery, with effusion of blood into the surrounding cellular substance; which solution of continuity is occasioned sometimes by a wound, a steatomatous, earthy degeneration, a corroding ulcer, a rupture of the proper coats of the artery, I mean the internal and muscular, without the concurrence of a preternatural dilatation of these coats being essential to the formation of this disease; and, therefore, that every aneurism, whether it be internal or external, circumscribed, or diffused, is always formed by effusion." *Treatise on Aneurism by A. Scarpa. Transl. by Wishart. Preface.* If this opinion be true, the difference in the symptoms of aneurisms above related, is to be imputed to the difference in the degree of rupture, diffusion, &c.

[In the first volume of the Philadelphia Medical Museum, a case of varicose aneurism is described, different from all those which have been mentioned. Dr. Physick has illustrated his account of the case, with an engraving from which it appears, that the aneurismal sac was formed of cellular membrane, and situated between the vein and artery, communicating freely with both.

A case somewhat similar is described by Mr. Park in the 4th vol. of Medical Facts and Observations, both these cases are also recorded in Wishart's translation of Scarpa on aneurism.]

Scarpa observes, that it is an error to suppose, that the aneurism at the curvature, or in the trunk, of the aorta, produced by a violent and sudden exertion of the whole body, or of the heart in particular, and preceded by a congenital relaxation of a certain portion of this artery, or a morbid weakness of its coats, ought always to be considered, as a tumour formed by the distention, or dilatation of the proper coats of the artery itself, that is, of its internal and fibrous coats. Scarpa considers it quite demonstrable, that such aneurisms are produced by a corrosion and rupture of these tunics, and, consequently, by the effusion of arterial blood under the cellular sheath, or other membrane, covering the vessel. If ever there be a certain degree of preceding dilatation, it is not essential to constitute the disease; for it is not a constant occurrence, most aneurisms are unpreceded by it, and, in those rare cases, in which the aneurism is preceded and accompanied by a certain degree of dilatation of the whole diameter of the curvature of the aorta, there is an evident difference between an artery simply enlarged in diameter, and the capsule, which forms the aneurismal sac. *Scarpa.*

Dissections, carefully conducted, will shew, that the aorta contributes nothing to the formation of the aneurismal sac, and that this is merely the cellular membrane, which, in the sound state, covered the artery, or that soft cellular sheath, which the artery received in common with the neighbouring parts. This is raised by the blood into the form of a tumour, and is covered, in common with the artery, by a smooth membrane. *Scarpa.*

The Italian professor does not deny, that, from congenital relaxation, the proper coats of the aorta may not occasionally yield and become disposed to rupture; but, he will not admit, that dilatation of this artery precedes and accompanies all its aneurisms, or that its proper coats ever yield so much to distention, as to form the aneurismal sac. The root of an aneurism of the aorta never includes the whole circumference of the artery; but, the aneurismal sac rises from one side in the form of an appendix, or tuberosity. On the contrary, the dilatation of the artery always occurs in its whole circumference, and, therefore, differs essentially from aneurism. Thus, there is really a remarkable difference between a dilated and an aneurismatic artery, although these two affections are sometimes found combined together, especially, at the origin of the aorta. If we also consider, that the dilatation of an artery may exist, without any organic affection, the blood being always in the cavity of the vessel; that in an artery so affected, there is never collected any grumous blood, or polypous layers; that the dilatation never forms a tumour of considerable bulk, and, that, while the continuity of the proper coats remain uninterrupted, the circulation of the blood is not at all, or not so sensibly changed, we shall be obliged to allow that aneurism differs essentially from the dilatation of an artery. *Scarpa.*

Galen, Œtius, Paulus, Actuarius, Haly, Albucasis, Oribasius and Avicenna, who only treat of external aneurism, speak of no other cases, than those by *effusion*; and, although some of these writers introduce the distinction, that external aneurisms are produced in three ways, viz. by *anastomosis*, by *diapædesis*, and by *diæresis*, they all affirm, that external aneurisms are invariably formed by the extravasation of blood under the skin. By *dilatation*, the Greek and Arabian physicians did not mean the expansion of the proper coats of the diseased artery; but, that tumour which the effused and coagulated arterial blood forms in the cellular membrane under the skin. Thus Œtius: *oritur dilatatio, aut dum sanguis, et spiritus ex arteriis prosultant; aut dum oscula ipsorum aperiuntur, aut dum rumpuntur. Sanguis autem et spiritus paullatim excreti sub cute colliguntur.* See also additional quotations in Scarpa from Actuarius, Silvaticus, &c.

Fernelius first published the theory of the dilatation of the coats of the arteries, as the proximate cause of aneu-

risms, particularly, internal ones, arising from no evident causes. The theory of Fernelius, however, instead of being deduced from observations on the dead subject, was only the result of his own imagination, and false conjectures, that effused arterial blood would immediately putrify, and could never form, out of the vessels, a pulsating tumour. Sannertus, Hildanus, Barbette, and several others, rejected this theory, and were all convinced, that both internal and external aneurisms were formed by the rupture, and not by the dilatation of the internal coats of the artery. *Scarpa.*

Scarpa endeavours to demonstrate, by accurate dissections of arteries, both in the sound and morbid state, what share the proper and constituent coats of the artery have in the formation of the aneurismal sac, and what belongs to the cellular covering, and other adventitious membranes surrounding the artery.

The covering of an artery is merely an adventitious sheath, which the vessel receives in common with the parts in the vicinity of which it runs. On cutting an artery across in its natural situation, the segment of the cut vessel retires and conceals itself in this sheath.

This cellular covering is most evident round the curvature and trunk of the aorta, the carotid, mesenteric, and renal arteries; it is less dense round the trunk of the brachial, femoral, and popliteal arteries. The pleura lies over the cellular sheath of the arch of the aorta, and over that of the thoracic aorta; and that of the abdominal aorta is covered by the peritoneum. Both these smooth membranes adhere to, and surround, two-thirds of the circumference of the vessel. The great arteries of the extremities are not covered, in addition to the cellular substance, by any smooth membrane of this sort, but by a cellular sheath, which is demonstrably distinct from the adipose membrane, and serves to inclose the vessels, and connect them with the contiguous parts. *Scarpa.*

When air, or any other fluid, is injected by a small hole made artificially, between the cellular covering, and the subjacent muscular coat of the artery, the injected matter elevates into a tumour the cellular membrane, which closely embraces the artery, without properly destroying its cells, which it distends in a remarkable manner. When melted wax is injected, and pushed with much force, the cellular sheath of the artery is not only raised over the vessel, like a tumour, but, the internal cells of that covering are also lacerated, and, on examining afterwards the capsule of the artificial tumour, it appears as if it were formed of several layers, rough and irregular internally, smooth and polished externally. The same thing happens, when any injection is pushed with such force into an artery, as to rupture the internal and muscular coats at some point of their circumference. Nicholls performed the experiment several times before the Royal Society. (*Philos. Trans. an.* 1728.) As soon as the internal coat is ruptured, the muscular one also gives way; but, the external cellular sheath, being of an interlaced texture, and the thin laminæ, of which it is composed, being not simply applied to one another, but, reciprocally intermixed, is capable of supporting great distention, by yielding gradually to the impulse of the blood, without being torn, or ruptured. *Scarpa.*

This celebrated professor is of opinion, that the same phenomena may be observed, when the internal coat of the aorta becomes so diseased, as to be ruptured by the repeated jets of blood from the heart. In this circumstance, the blood, impelled by the heart, begins immediately to ooze through the connexions of the fibres of the muscular coat, and gradually to be effused into the interstices of the cellular covering, forming, for a certain extent, a kind of *ecchymosis*, or *extravasation of blood*, slightly elevated upon the artery. Afterwards, the points of contact, between the edges of the fibres of the muscular coat being insensibly separated, the arterial blood, penetrating between them, fills and elevates, in a remarkable manner, the cellular covering of the artery, and raises it after the manner of an incipient tumour. Thus the fibres and layers of the muscular coat, being wasted, or lacerated, or simply separated from each other, the arterial blood is carried with greater force, and in greater quantity, than before, into the cellular sheath of the artery, which it forces more outwards; and, finally, the divisions, between the interstices of the cellular coat being ruptured, converts it into a sac, which is filled with polypous concretions, and fluid blood, and at last forms, strictly speaking, the aneurismal sac. The internal texture, although apparently

composed of membranes placed one over the other, is, in fact, very different from that of the proper coats of the artery, notwithstanding the injured vessel and aneurismal sac are both covered externally, in the thorax and abdomen, with a smooth membrane, *Scarpa.*

Scarpa has examined a considerable number of aneurisms, of the arch, and of the thoracic, and abdominal trunk, of the aorta, without finding a single one, in which the rupture of the proper coats of the artery was not evident, and in which, consequently, the sac was produced by a substance completely different from the internal and muscular coats. *Scarpa.*

The aneurismal sac never comprehends the whole circumference of the vessel. At the place where the tumour joins the side of the tube, the aneurismal sac presents a kind of constriction, beyond which it becomes more or less expanded. This would never happen, or rather the contrary circumstance would occur, if the sac were formed by an equable distention of the tube and proper coats of the affected artery. In incipient aneurisms, at least, the greatest size of the tumour would then be in the artery itself, or root of the swelling, while its fundus would be the least. But, whether aneurisms be recent and small, or of long standing and large, the passage from the artery is always narrow, and the fundus of the swelling greater in proportion to its distance from the vessel. The sac is also always covered by the same soft dilatable cellular substance, which united the artery in a sound state to the circumjacent parts. Such cellular substance, in aneurisms of the thoracic aorta, is covered by the pleura, and, in those of the abdominal aorta, by the peritoneum, which membranes include the sac and ruptured artery, presenting outwardly a continued smooth surface, just as if the artery itself were dilated. *Scarpa.* But, if the aorta be opened lengthwise on the side opposite the constriction, or neck of the tumour, the place of the ulceration, or rupture, of the proper coats of the artery, immediately appears within the vessel, on the side opposite to that of the incision. The edge of the fissure, which has taken place, is sometimes fringed, often callous, and hard, and through it it was, that the blood formed itself a passage in the cellular sheath, which is converted into the aneurismal sac. If, as sometimes happens, in the arch of the aorta near the heart, the artery, before being ruptured, has been somewhat dilated, it seems, at first, as if there were two aneurisms; but, the constriction, which the sac next to the artery presents externally, points out exactly the limits, beyond which the internal and muscular coats of the aorta had not been able to resist the distention, and where of course they have been ruptured. The partition, which may always be seen dividing the tube of the artery from the aneurismal sac, and which is lacerated in its middle, consists of nothing else than the remains of the internal and muscular coats of the ruptured artery. *Scarpa.*

By carefully dissecting the proper coats of the ruptured aorta in its situation, and comparing them with the cellular substance forming the sac, the truth of the preceding statement may be indisputably demonstrated.

When an incision is made lengthwise in the side of the vessel opposite the rupture, its proper coats are found either perfectly sound, or a little weakened and studded with earthy points, but, still capable of being separated into distinct layers. On the contrary, in the opposite side of the aorta, where the rupture is, the proper coats are unusually thin, and are only separable from each other with difficulty, or even not at all; they are frequently brittle, like an egg-shell, and are disorganised and torn at the place where they form the partition between the ruptured artery and mouth of the aneurismal sac, Continuing to separate these coats, from within outwards, we arrive at the cellular sheath surrounding the aorta. This sheath being much thickened in large aneurisms, and very adherent to the subjacent muscular coat of the artery at the place of the constriction of the sac, is very apt to be mistaken for a dilated portion of the vessel itself. But, even in such case, we may at last separate it, without laceration, from the tube of the artery, above and below the injury, and, successively, from the muscular coat, as far as the neck of the aneurism. Then it is clear, the muscular coat does not pass beyond the partition, separating the cavity of the artery from that of the aneurismal sac, over which it is not prolonged, but terminates at the edge of the rupture like a fringe, or in obtuse points. Errors

are rendered more apt to occur, in consequence of the aorta and sac being both covered by the pleura, or peritoneum. *Scarpa.*

The portion of the aorta, within the pericardium, being only covered by a thin reflected layer of this membrane, such layer may also be lacerated, when the proper coats give way, and blood be effused into the cavity of the pericardium. Examples of this kind are related by Walter, Morgagni, &c. and Scarpa himself. In the latter instance, on making an incision into the concave part of the aorta, opposite the tumour which had formed under the layer of the pericardium, which had also burst by a small aperture, its internal coat, corresponding to the base of the swelling, was quite rough, interspersed with yellow hard spots, and actually ulcerated for the space of an inch in circumference. The preparation is preserved in the museum at Pavia.

But all other parts of the aorta having, between them and the pleura and peritoneum, a cellular sheath of a stronger and more yielding nature, which allows itself to be distended into a sac, and being strengthened internally by polypous layers, and, externally, by the pleura or peritoneum, oppose for a long while the fatal effusion of blood. *Scarpa.*

Scarpa believes, that what he calls the slow, morbid, steatomatous, fungous, squamous, degeneration of the internal coat of the artery is more frequently the cause of its bursting, than violent exertions of the whole body, blows, or an increased impulse of the heart. This kind of diseased change is very common in the curvature, and thoracic and abdominal trunks, of the aorta. In the incipient state of such disease, the internal coat of the artery loses, for a certain space, its beautiful smoothness, and becomes irregular and wrinkled. It afterwards appears interspersed with yellow spots, which are converted into grains, or earthy scales, or into steatomatous, and cheeselike concretions, which render the internal coat of the artery brittle and so slightly united to the adjoining muscular coat, that, upon being merely scratched with the knife, or the point of the nail, pieces are readily detached from it, and, on being cut, it gives a crackling sound, similar to the breaking of an egg-shell. This ossification cannot be said to be proper to old age, since it is sometimes met with in subjects not much advanced in life. The whole of the side of the artery, in that part which is occupied by the morbid affection, is, for the most part, hard and rigid, sometimes soft and fungous, and in most cases, the canal of the artery is preternaturally constructed. In the highest degree of this morbid disorganization, true ulcerations are found on the inside of the artery, with hard and fringed edges, fissures, and lacerations of the internal and fibrous coats of the artery. *Scarpa.*

Whenever an aneurismal sac of an immoderate size beats violently, and, for a long while against a bone, as the sternum, ribs, clavicle, and vertebræ, the bones are in the end invariably corroded, so that the aneurismal sac elevates the integuments of the thorax, or back, and pulsates immediately under the skin. Scarpa, with the best modern writers, attributes the effect to absorption, in consequence of the pressure.

Having presented the reader with an abridged account of the most important remarks, made by Scarpa, in support of the doctrine he defends, we now annex his conclusions. 1. That this disease is invariably formed by the rupture of the proper coats of the artery. 2. That the aneurismal sac is never formed by a dilatation of the proper coats of the artery, but, undoubtedly, by the cellular sheath, which the artery receives in common with the parts contiguous to it; over which cellular sheath the pleura is placed in the thorax, and the peritoneum in the abdomen. 3. That if the aorta, immediately above the heart, appears sometimes increased beyond its natural diameter, this is not common to all the rest of the artery, and when the aorta, in the vicinity of the heart, yields to a dilatation greater than natural, this dilatation does not constitute, properly speaking, the essence of the aneurism. 4. That there are none of those marks regarded by medical men as characteristic of aneurism from *dilatation*, which may not be met with in aneurism from *rupture*, including even the circumscribed figure of the tumour. 5. That the distinction of the aneurism into *true* and *spurious*, adopted in the schools, is only the production of a false theory; since observation shews, that there is only one form of this disease, or that caused by a rupture of the proper coats of the artery, and an effusion of arterial blood into the cellular sheath, which surrounds the ruptured artery.

(See *Treatise on Aneurism, by A. Scarpa, translated by J. H. Wishart. Edinburgh*, 1803.)

CURE OF ANEURISMS IN GENERAL.

A complete cure of an aneurism cannot be effected, in whatever part of the body the tumour is situated, unless the artery, from which the aneurism is derived, be, by nature or art, obliterated and converted into a perfectly solid, ligamentous substance, for a certain extent above and below the place of the ulceration, laceration, or wound. When aneurisms are cured by compression, the cure is never accomplished, as some have supposed, by the pressure strengthening the dilated proper coats of the artery, and restoring, especially to the muscular coat, the power of propelling the blood along the tube of the artery, as it did previously to its *supposed dilatation*. M. Petit, and Foubert thought, that the natural curative process sometimes consisted in a species of clot, which closed the laceration, ulceration, or wound of the artery, and resisted the impuse of the blood, so as still to preserve the continuity of the coats of the artery, and the previous state of the vessel. Haller imbibed a similar sentiment, from experiments made on frogs.—*Scarpa.*

That a punctured artery may occasionally be healed in this manner, Scarpa proves by a case which he examined, in which an aneurism took place from the wound of a lancet in bleeding. In *Hemorrhage* we shall see, that Jones's experiments shew the same thing, and the particular circumstances in which it may happen. But, the occurrence is excessively rare, and can hardly be called a *radical* cure, as the cicatrix is always found in a state ready to burst and break, if the arm is, by any accident, violently stretched or struck, where the wound was situated.—*Scarpa.*

Whenever the ulcerated, lacerated, or wounded artery, is accurately compressed against a hard body, like the bones, it ceases to pour blood into the surrounding cellular sheath, because its sides, being kept in firm contact, for a certain extent, above and below the breach of continuity, become united by the adhesive inflammation, and converted into a solid, ligamentous, cylinder. Molinelli, Guattani, and White, have given examples and plates, illustrative of this fact. When aneurisms get well spontaneously, the same fact is observed after death, as Valsalva, Ford, &c. have demonstrated. I have myself seen in St. Bartholomew's Hospital, an instance, in which a man had had a spontaneous cure of an aneurism in the left axilla, but afterwards died of hemorrhage from another one under the right clavicle; the artery on the left side was found completely impervious. My friend, Mr. Albert, has, at this moment, under his care in the York Hospital, Chelsea, a dragoon, who has just recovered spontaneously of a very large aneurism of the external iliac artery: the tumour sloughed, discharged about two quarts of coagulated blood, and then granulated and healed up. Paoli relates a similar termination of a popliteal aneurism. Moinichen and Guattani, relate other examples. Hunter found the femoral artery quite impervious, and obliterated, at the place where a ligature had been applied fifteen months before. Boyer noticed the same fact in a subject, eight years after the operation. Petit relates a spontaneous cure of an aneurism at the bifurcation of the right carotid, and the subject having afterwards died of apoplexy, the vessel on dissection, was found closed up and obliterated from the bifurcation, as far as the right subclavian artery. Desault had an opportunity of opening a patient, in whom a spontaneous cure of a popliteal aneurism was just beginning, he found a very hard, bloody thrombus, which extended for three finger-breadths, within the tube of the artery, above the sac, and was so firm, as to resist injection, and make it pass into the collateral branches.

Both the spontaneous and surgical cure of aneurisms, have two stages; in the first, the entrance of the blood into the aneurismal sac is interrupted; in the second, the parietes of the artery approach each other, and, becoming agglutinated, the vessel is converted into a solid cylinder. This doctrine is corroborated by the tumour first losing its pulsation, and then gradually diminishing and disappearing. Dr. Thomson as well as Scarpa, has long expressed his opinion that the spontaneous radical cure of aneurisms, may sometimes arise from the pressure of the aneurismal sac on the trunk of the injured artery, just above the communication between the vessel and the cavity of the aneurism. Morand proved

that a violent blow may lead to the obliteration of an artery, and Dr. Jones has demonstrated, that arteries always become impervious, after having a tight ligature put round them, even though such ligature be removed the moment after its application.

When an aneurism is affected deeply by gangrene, a dense, compact, bloody, coagulum is formed within the vessel, shutting up its canal, and interrupting completely the course of the blood. Hence the sphacelation which follows, and the bursting of the integuments, and of the aneurismal sac, are never accompanied by a fatal hemorrhage, and the patient is cured of the gangrene and the aneurism, if he has strength sufficient to resist the destructive action of the sphacelus on the constitution. When a patient dies of hemorrhage, after the mortification of an aneurism, it is because only a portion of the integuments and sac has sloughed, without the root of the aneurism, and especially the arterial trunk, being in this way affected.—*Scarpa.*

That compression may make the opposite sides of an artery unite, and thus produce a radical cure of an aneurism, Scarpa says, the degree of pressure must be such as to place these opposite sides in firm and complete contact, and such as to excite the adhesive inflammation in the coats of the artery, which must also possess a state of vitality, presently to be noticed. The point of compression must also fall above the laceration, or wound, of the artery; for when it operates below, it hastens the enlargement of the tumour; and Scarpa adds, that, in practice, bandages, which are expulsive and compressive, are more useful for making pressure, than any tourniquets or instruments, many of which are contrived to operate, without retarding the return of blood through the veins.

For pressure to succeed, the coats of the vessel must possess, at the place where it is made, such a degree of vitality, as to be capable of feeling the stimulus, and of inflaming. When the arterial coats, round the root of the aneurism, are diseased, as above described, they are insusceptible of the adhesive inflammation, although compressed together in the most scientific manner, and even when tied with a ligature, which only acts by making circular pressure on the vessel.

Some advise trying compression in every case of aneurism, whether small circumscribed, soft, flexible, indolent; or elevated, diffused, hard, and painful. In the latter case, however, compression is hurtful. Every bandage which compresses the aneurism, and also constricts circularly the affected part, is always injurious. The bandage, likewise, which compressing only the aneurism, directs the point of pressure below the rupture in the vessel; that which, on account of the great size, exquisite sensibility, depth of the root, of the aneurism, and fleshiness of the surrounding parts, cannot effectually compress the artery against the bones, so as to bring the opposite sides of the vessel into contact; and, lastly, the compression applied to a spontaneous aneurism, attended with a steatomatous, ulcerated, earthy, disease of the arterial coats; ought to be considered as an useless, or rather hurtful plan. In cases of a completely opposite description, bandages have produced, and may produce, radical cures of aneurism, and should not be entirely disused. *Scarpa.*

Guattani first employed compression systematically for the cure of aneurisms, and he has related many cases in which he succeeded. Freer details other ones; but, in general, pressure has hitherto been applied to the tumour itself, a method less likely to answer, than that of making pressure on a sound part of the artery. Mr. Freer recommends the employment of Sennfio's instrument, or the following method: first place a bandage moderately tight, from one extremity of the limb to the other; then place a pad upon the artery, a few inches above the tumour; next, surrounding the limb with a tourniquet, let the screw be fixed upon the pad, having previously secured the whole limb from the action of the instrument, by a piece of board wider than the limb itself, by which means the artery only will be compressed, when the screw is tightened. The tourniquet should now be twisted till the pulsation in the tumour ceases. In a few hours the limb will become œdematous and swelled, when the tourniquet may be removed, and the pressure of a pad and roller will afterwards be enough. By experiments which this gentleman made on the radial arteries of horses, these vessels were found to become in-

flamed, and to be rendered impervious by such a process.—*Freer, p.* 112.

Mr. A. Cooper, mentions an excellent machine for compressing the femoral artery, in case of popliteal aneurism. It was used by sir W. Blizard.

"The points of support for this instrument were the outer part of the knee, and the great trochanter, a piece of steel passing from one to the other; and to the middle of this a semicircular piece of iron was fixed, which projected over the femoral artery, having a pad at its end, moved by a screw, by turning which, the artery was readily compressed, and the pulsation in the aneurism stopped, without any interruption to the circulation in the smaller vessels." But, although the patient on whom it was tried possessed unusual fortitude of mind, and indifference to pain, he was incapable of supporting the pressure of the instrument longer than nine hours. Indeed, the agony arising from long continued pressure is insupportable to almost all men.—(*Med. and Phys. Journal, Vol.* 8.)

The grand means most to be depended upon, however, for curing aneurisms, is tying the artery above the tumour. This more certainly prevents the usual ingress of blood into the sac, and, what is more important, more certainly excites the adhesive inflammation, by dividing the internal coats of the vessel. The blood in the sac is afterwards gradually absorbed, and the tumour dwindles away in proportion. The natural course of the blood being now permanently interrupted in the arterial trunk, it passes more copiously into the collateral branches, and these enlarging and anastomosing with others, which originate from the large arteries beyond the obstruction, the necessary circulation is carried on.

The ligature of the superficial femoral artery, may be performed with the same confidence of success, as the ligature of the brachial artery, that is, without any fear of destroying the circulation, or depriving the subjacent limb of its vitality. Indeed, the numerous and conspicuous anastomoses, which are met with all round the knee, correspond exactly with those which are observed round the elbow, and at the bend of the arm. This is not a peculiarity of the arteries of the extremities, but it is a general rule which nature has followed in the distribution of all the arteries, that the superior trunks communicate with the inferior, by means of the lateral vessels. After the principal trunk of an artery is tied, its lateral branches not only carry on the circulation in the parts below the ligature, but do so with greater quickness and activity than they did before, when the course of the blood was unimpeded through the principal trunk. This evidently arises from the increase of pressure which the blood, that takes the rout of the lateral vessels, receives, as well as from the enlargement in the diameter of these vessels. After the amputation of the thigh, while the blood flows in a full stream from the superficial femoral artery, very little or no blood is poured out of the lateral vessels; but as soon as that artery is tied, the blood issues with impetuosity from the small arteries which run along, within the vasti and cruræus muscles; and, on these smaller arteries being also tied, the blood immediately oozes out, from the minute arterial vessel of the muscles and cellular membrane. When the principal trunk of an artery is tied, its lateral branches gradually acquire a much larger diameter. After amputation of the thigh, on account of a popliteal aneurism, the size and situation of which could not fail materially to impede the course of the blood through the trunk of the femoral artery, it has been often remarked, that, although both the trunk, and the greater and smaller branches, had been tied with the greatest accuracy, the patients have been in danger of losing their lives, on account of the repeated copious hemorrhages from the innumerable small lateral vessels, that had become unusually enlarged. In several cases, during the treatment, and especially after the radical cure of the popliteal aneurism, by tying the superficial femoral artery, in the upper third of the thigh, all the ramifications of the recurrent popliteal arteries have been felt beating strongly round the knee. Boyer found, in a man, who some years before had been operated on for a popliteal aneurism, but had afterwards died from a caries of the tibia, that the arterial branch, which runs through the substance of the sciatic nerve, was dilated so much, as to be equal in diameter to the radial artery. White, in dissecting the arm of a lady, who, fifteen years before had been operated on for

an aneurism in the bend of the arm, found the brachial artery obliterated, and converted into a solid cylinder, for three inches below the place of the ligature, and as far as the division into the radial and ulna arteries; but, the recurrent radial and ulna branches had become so much enlarged that, taken together, they exceeded the size of the brachial artery, above the situation of the ligature. In the dead body it is found, that an anatomical injection will pass more freely from one extremity to the other of an aneurismatic, than of a sound limb, and this, even when no vessels are visibly enlarged. Although it be self-evident, that the circulation through the collateral vessels ought to be much more easy and quick the lower down the ligature is applied to the principal trunk; yet experience shews, that this difference is not to be estimated very high; for in cases of popliteal aneurism, *cæteris paribus*, the success is the same, whether the femoral artery be tied very low down, or very high up in the thigh. (*Scarpa.*)

This facility of the passage of the blood through the lateral vessels, is not the same in subjects of all ages; and, in the same subject; it is not the same in the inferior, as in the superior extremity. An age under forty-five, and the operation being done on the arm, which is nearer the source of the circulation, than the lower extremity, increases the chance of success.

The circumstances chiefly preventive of success, especially in the popliteal and femoral aneurisms, are the following: Rigidity, atony, or disorganization of the principal anastomoses, between the superior and inferior arteries of the ham and leg, sometimes depending on advanced age, or on it, together with the large size of the aneurism, which, by long continued pressure, has caused a great change in the neighbouring parts; or sometimes on steatomatous, ulcerated, earthy, cartilaginous, disorganization of the proper coats of the artery, not confined to the seat of the rupture, but extending a great way above and below the aneurism, and also to the principal popliteal recurrent arteries, tibial arteries, and occasionally, to portions of the whole track of the superficial femoral artery. Sometimes, the pressure of large aneurisms, renders the thigh bone carious. In such circumstances the ligature is apt to fail in closing the trunk of the artery; and, if it should succeed, the state of the anastomosing vessels will not admit of a sufficient quantity of blood being conveyed into the lower part of the limb. Hence, when the patient is much advanced in life, languid and sickly, when the internal coat of the artery is rigid, and incapable of being united by a ligature; when the aneurism is of long standing, and considerable size, with caries of the os femoris, or tibia; when the leg is weak and cold, much swelled, heavy, and œdematous; Scarpa considers the operation contra-indicated. I must, however, declare in this place, that I have seen very large aneurisms, as well as aneurisms in persons of advanced age, cured by the Hunterian plan, in St. Bartholomew's Hospital.

It appears, then, that the obliteration of the artery, for a certain extent, above and below the place of rupture, forms the primary indication in the radical cure of aneurism, whether compression, or the ligature, be employed. All other means are only auxiliary. Internal remedies may be useful in so far as they tend to moderate the determination of the blood towards the place, where the artery has been tied or compressed. Bleeding in young, very robust, plethoric patients, low diet, diluent drinks, gentle laxatives and glysters, mental and bodily rest, and cool air, have such effect. When there is weakness, not from age, but from pain, long want of rest, or loss of blood, tonics, cordials, and a moderate diet, may be given. Scarpa also advises the outward use of corroborants and stimulants; but, I think, few English surgeons will approve the practice.

In internal aneurisms, debilitating remedies, abstinence, a milk diet, and quietude, are almost the only means; for, such cases are completely out of the reach of surgery. As bleeding, however, cannot always be frequently repeated, instead of it, the hands and feet may be immersed in tepid water, the limb rubbed, and water given internally, with a small quantity of Hoffman's liquor anodynus mineralis. (*Spir. Ætheris Vitriol. Comp.*) The great difficulty of breathing may receive a temporary relief, by applying sinapisms. (*Scarpa.*) All pressure on the tumour, when it protrudes externally, should be avoided, as it might increase the

compression on the viscera, and would certainly accelerate the fatal bursting of the aneurism.

Digitalis has been given with advantage; but, occasional bleedings, and opium, have been found to produce most relief. In the latter stage, opium can alone be relied on.—(*Freer.*)

OF THE POPLITEAL ANEURISM, AND OPERATION FOR ITS CURE.

On whatever side of the artery the tumour is produced, it can be plainly felt in the hollow between the hamstrings, and its nature is as easily ascertained by the pulsation in every part of the tumour. Though the disease may, perhaps, not occur in the popliteal artery so often as in the aorta itself, yet, it certainly is seen more frequently in the former vessel, than any other branch, which the aorta sends off. As Mr. Home has observed, this circumstance has never been satisfactorily explained, and, what is rather curious, in many recent instances of this disease, the patients have been coachmen and postilions. Morgagni found aneurisms of the aorta most frequent in guides, post boys, and other persons, who sit almost continually on horseback. This he imputes to the concussion and agitation to which they are exposed.

When we contemplate the effects of various postures of the leg and thigh on the popliteal artery, and the obstruction, which the circulation in it must experience, when the knee is in a state of flexion, we perceive an assignable cause, why this artery should be so often diseased. This account is, in some degree, strengthened by aneurisms of the aorta itself, occurring more frequently at its curvature, than any other part. *Home.*

The popliteal aneurism is generally supposed to arise from a weakness in the coats of the artery, independently of disease. If this were true, we might reasonably conclude, that, except at the dilated part, the vessel would be sound. Then the old practice of opening the sac, tying the artery above and below it, and leaving the bag to suppurate and heal up, would naturally present itself. Mr. Hunter finding, that the arterial coats were altered in structure higher up, than the tumour, and that the artery, immediately above the sac, seldom united when tied; but, that, when the ligature came away, the bleeding destroyed the patient; concluded, that some disease affected the coats of the vessel, before the actual occurrence of the aneurism. Dissatisfied with Haller's experiments on frogs, showing that weakness alone could give rise to aneurism, he tried what would happen in a quadruped, whose vessels were very similar in structure to the human. Having denuded above an inch of the carotid artery of a dog, and removed its external coat, he dissected off the other coats, layer after layer, till what remained were so thin, that the blood could be seen through it. In about three weeks, the dog was killed, when the wound was found closed over the artery, which was neither increased nor diminished in size. *Home.*

It being conjectured, that aneurism was, perhaps, prevented, by the parts being immediately laid down on the weakened portion of the artery, Mr. Home stripped off the outer layers of the femoral artery of a dog, placed lint over the exposed part of the vessel to keep it from uniting to the sides of the wound, and, in six weeks, killed the animal, and injected the artery, which was neither enlarged nor diminished, and its coats had regained their natural thickness and appearance.

These experiments strengthened Mr. Hunter's belief, that aneurismal arteries are diseased; that the morbid affection frequently extends a good way from the sac along the vessels; and that the cause of failure in the old operation, arose from tying a diseased artery, which was incapable of uniting, before the separation of the ligature.

Mr. Hunter's reflections led him to propose taking up the artery in the anterior part of the thigh, at some distance from the diseased portion, so as to diminish the risk of hemorrhage, and be enabled to get at the vessel again, in case it should bleed.

The flux of blood into the sac being stopped, he concluded, the sac and its contents would be absorbed, and the tumour gradually disappear, so as to render any opening of the sac unnecessary. *Home.*

The first operation of this kind, ever done, was performed on a coachman, by Mr. Hunter, in St. George's Hospital, December, 1785. An incision was made on the anterior and inner part of the thigh, rather below its middle, which wound was continued obliquely across the inner edge of the sartorine

muscle, and made large, in order to facilitate doing whatever might be necessary. The fascia, covering the artery, was then laid bare, for about three inches, after which the vessel itself could be plainly felt. A cut, about an inch long, was then made through this fascia, along the side of the artery, and the fascia dissected off. Thus the vessel was exposed. Having disengaged it from its connexions with the knife and a thin spatula, a double ligature was put under it, by means of an eye probe. The doubled ligature was then cut, so as to make two separate ones. The artery was now tied by both these ligatures, but, *so slightly as only to compress the sides together*. Two additional ligatures were similarly applied a little lower, with a view of compressing some length of artery, so as to make amends for the want of tightness, as it was wished to avoid great pressure on any one part of the vessel. The ligatures were left hanging out of the wound, which was closed with sticking plaster. On the second day, the aneurism had lost one-third of its size, and, on the fourth, the wound was every where healed, except where the ligatures were situated. On the ninth, there was a considerable discharge of blood from the apertures of the ligatures, but it ceased on applying a tourniquet and did not recur. On the fifteenth day after the operation, some of the ligatures came away, followed by a small quantity of matter, and about the latter end of January, 1786, the man went out of the hospital, the tumour having become still less. In the course of the spring, some abscesses in the vicinity of the cicatrix followed, and some pieces of ligature were discharged, from time to time. In the beginning of July, a piece of ligature, about one inch long came away, after which the swelling went off entirely, and the man left the hospital again on the 8th perfectly well, there being no appearance of swelling in the ham.

This subject died of a fever in March, 1787, and on dissection, the femoral artery was found impervious from the giving off of the arteria profunda down to the place of the ligature, and an ossification had taken place for an inch and a half along the course of this part of the vessel. Below this portion, the vessel was pervious, till just before it came to the aneurismal sac, where it was again closed. What remained of the sac was somewhat larger than a hen's egg, and it had no remains of the lower opening into the popliteal artery. The rest of the particulars of this dissection are very interesting. (See *Med. and Chir. Trans. Vol.* 1. *p.* 153.)

This celebrated case led to the knowledge, that simply taking off the force of the circulation is sufficient to cure an aneurism, the tumour being then taken away by absorption.

To confirm the fact, Mr. Home relates a case of femoral aneurism, which got well without an operation, but, on the same principle. A trial of pressure had been made, without avail. The tumour became very large, and such inflammation took place in the sac and integuments, that mortification seemed impending. In this state, no pulsation could be felt in the tumour, or the artery above it. A coagulum, which we know always occurs in an artery previously to mortification, seemingly to prevent bleeding, probably formed in this instance, and kept the blood from entering the sac. (*Home.*)

Mr. Hunter's second operation was on a trooper. Instead of using several ligatures, which were found hurtful, he tied the artery and vein with a single strong one; but, unluckily, made the experiment of dressing the wound from the bottom, instead of uniting it at once: the event was, the man lost a good deal of blood, and died.

After this Mr. Hunter's practice was to tie the artery alone with one strong ligature, and unite the wound as speedily as possible.

Since the time of Hunter, several innovations, and some considerable improvements in the mode of operating have been proposed.

The peculiarity in Mr. Abernethy's first operation consisted in applying two ligatures round the artery, close to where it was surrounded with its natural connexions. For this purpose, he passed two common sized ligatures beneath the femoral vessels, and having shifted one upwards, the other downwards, as far as these vessels were detached, he tied both the ligatures firmly.

The event of this case was successful. An uneasy sensation of tightness, however, extending from the wound down to the knee, and continuing for many days after the operation, made Mr. Abernethy determine, in any future

case, to divide the artery between the two ligatures, so as to leave it quite lax.

Mr. Abernethy next relates a case of popliteal aneurism, for which Sir Charles Blicke operated, with the innovation of dividing the artery between the ligatures The man did not experience the above kind of uneasiness; and no hemorrhage ensued when the ligatures came away, although there was reason to think, that the whole arterial system had a tendency to aneurism, as there was also another tumour of this kind in the opposite thigh.

Mr. Abernethy has referred bleeding, after operations for aneurisms, to two causes; viz. 1st. the inflammation and ulceration of the artery; 2dly. the want of union between the sides of the vessel. When an artery is laid bare, and detached from its natural connexions, and the middle of such detached portion tied with a single ligature, as was Mr. Hunter's practice, it is observed by Mr. Abernethy, that the vessel, so circumstanced, must necessarily inflame, and be very likely to ulcerate. The occurrence of bleeding led to a practice, which this gentleman justly censures, viz. applying a second ligature above the first, and leaving it loose, but ready to be tightened, in case of hemorrhage. As the second ligature, however, must keep a certain portion of the artery separated from the surrounding parts, and must, as an extraneous substance, irritate the inflamed vessel, it must make its ulceration more apt to follow. For the same reason, Mr. Abernethy thinks pieces of wood, cork, &c. hurtful, and when employed with a view of hindering the ligature from cutting completely through the artery, their interposition is not necessary, as such an accident scarcely ever occurs, and, as they would prevent the ligature from dividing the inner and muscular coat, (see *Hemorrhage*) they would tend to prevent the adhesion of the opposite sides of the vessel to each other.

When the artery is tied in Mr. Abernethy's manner, and is divided in the space between the ligatures, it becomes quite lax, possesses its natural attachments, and is, as nearly as possible, in the same circumstances as the femoral artery is, when tied on the surface of a stump.—(*See Surg. and Physiol. Essays by J. Abernethy.*)

Notwithstanding Scarpa has excelled other writers so much, in his description of the anatomy and formation of aneurisms, his practice in regard to the operation, is certainly far inferior to Mr. Abernethy's, and that of practitioners in general in this country. His interposing a cylindrical roll of linen, between the artery and knot of the ligature, and his not bringing the sides of the wound together immediately after the operation, are particularly objectionable parts of his method.

There is one excellence, however, in Scarpa's mode of operating, which I think will soon obtain the universal approbation of the surgical profession; he prefers making the incision in the upper third of the thigh, or a little higher than the place where Mr. Hunter used to make the wound. His reason for this, is to avoid the necessity of removing the sartorius muscle too much from its position, or of turning it back, to bring the artery into view, so as to be tied. I have seen the best operators embarrassed, by having the sartorius muscle immediately in their way after the first incision, and as the vessel is more superficial a little higher up, the place is further from the diseased part of the artery, and there is no hazard of the anastomoses failing to keep up the circulation; this part of Scarpa's practice is highly deserving of imitation.

It will in no manner diminish the merit of those men, who have successfully laboured to improve the present part of the practice of surgery, to state, that the most ancient surgeons seem to have known and practised some of the chief things, upon which the superiority of the plan now adopted appears principally to depend. Such methods having quite sunk into oblivion, and John Hunter not being one who pried into old works, his innovations claim all the honour due to the strictest originality. It is a fact, worthy of notice, that the Greeks were acquainted with the practice, lately commended, of tying and dividing the trunk of the artery high above the tumour, as will appear from the following extract: (*Ætii. 4 Serm. Tetr. 4 cap.* 10.) *At vero quod in cubiti cavitate fit aneurisma, hoc modo per chirurgiam aggredimur: primum arteria supernè ab ala ad cubitum per internam brachii parte simplicem sectionem, tribus, aut quatuor digitis infra alam, per longitudinem facimus, ubi maxime ad tactum arte-*

ria occurrit: atque ea paulatim denudata, deinceps incumbentia corpuscula sensim excoriamus ac separamus, et ipsam arteriam cæco uncino attractam duobus fili vinculis probe adstringimus, mediamque inter duo vincula dissecamus; et sectionem polline thuris explemus, ac linamentis inditis congruas deligationes adhibemus. Afterwards we are directed to open the aneurismal tumour at the bend of the elbow, and when the blood has been evacuated, to tie the artery twice, and divide it again. If the ancients had only omitted the latter part of their operation, they would absolutely have left nothing to be discovered by the moderns. What a striking example of the bold manner in which our forefathers have acted, without being guided by the light of anatomy and physiology! but there are two or three passages in Galen, Celsus, and Hippocrates, from which we may suspect, that even Ætius himself was not the inventor of this operation, &c. See also *Paul. Ægin. lib.* 6. *cap.* 37. (*Rees's Cyclopedia Art. Aneurism.*)

Mr. Astley Cooper has published a case of popliteal aneurism, in which a particular occurrence happened, that led this gentleman to make a little innovation in the method of tying arteries for the cure of aneurisms.

The femoral artery had been tied with two ligatures, as firmly as could be done without risk of cutting it through. "But, (says Mr. A. Cooper) as I was proceeding to dress the wound, I saw a stream of blood issuing from the artery, and when the blood was sponged away, one of the ligatures was found detached from the vessel. Soon after the other was also forced off, and thus the divided femoral artery was left without a ligature, and unless immediate assistance had been afforded him, the patient must have perished under hemorrhage."

The same kind of accident has occurred in Mr. Cline's practice.

These events naturally induced Mr. A. Cooper to reflect on the means, which were to be employed to obviate them, and the first which suggested itself was to include a larger portion of the artery between the two ligatures. But this plan was given up, when it was recollected, that many branches of arteries must be divided, and that it was a mode of security (if it was so) which could only apply to particular cases of aneurism, since, in some situations of that disease, there is scarcely any length of vessel between the tumour and a principal anastomosing branch of the artery.

Mr. A. Cooper thinks, that a plan of greater security, and more general application, consists in conveying the ligature, by means of two blunt needles under the artery, an inch asunder, and close to the coats of the vessel, excluding the vein and nerve, but passing the threads through the cellular membrane surrounding the artery. When these are tied, and the artery is divided between them, the ligatures will be prevented from slipping from the artery by the cellular membrane through which they are passed. Mr. A. Cooper next relates a case of aneurism after bleeding, which he cured by this way of operating.

"But although this plan, as to the event, answered my expectations, yet a different mode of securing the ligature, suggested to me by my young friend Mr. H. Cline, struck me so forcibly for its simplicity and security that I felt immediately disposed to adopt it."

Mr. A. Cooper put the new plan to the test of experiment in operating for a politeal aneurism on Henry Figg, aged 29. "An incision being made on the middle of the inner part of the thigh, and the femoral artery exposed, the artery was separated from the vein and nerve, and all the surrounding parts, to the extent of an inch, and an eye-probe, armed with a double ligature, having a curved needle at each end, was conveyed under the artery, and the probe cut away. The ligature nearest the groin was tied; the other was separated an inch from the first, and tied also. Then the needles were passed through the coats of the artery, close to each ligature and between them. The thread they carried, was tied into the knot of the ligature, which had been already secured around the vessel; and thus a barrier was formed in the artery, beyond which the ligature could not pass." The event of this operation was successful. (*Med. and Phys. Journ. Vol.* 8.)

Upon the foregoing proposal a few observations are necessary, and these I shall offer with due deference to the eminent character, whose fame alone has attached undue importance to the innovation.

In the first place I shall prove that Mr. Cline's proposal is not an original one. In the 13th chapter, on hemorrhage, in Richter's *Anfangsgrunde der Wundarzneykunst*, we read the following passage. *Die hervorgezogagane Schlder umwickelt man mit dem gewöhnlichen Faden zweymal, befestigt denselben mit einem Knoten, ziehet derauf, wenn die Schlagader gross ist, vermittelst einer Nadel ein ende des Fadens vor der Unterbindung durch dieselbe, knüft beyde Enden zusammen, und lässt sie wie gewöhnlich herabhängen. Dritte Auflage.* 1799." The artery, when drawn out, is to be twice surrounded with the common ligature. This is to be tied in a knot, and when the artery is large, one end of the ligature is to be passed, by means of a needle, through the vessel before the knot, then both ends are to be tied together, and left hanging out of the wound, as in the ordinary way. Edition 3. 1799. I do not mean to assert, however, that the same plan may not be described in some more ancient work than Richter's: my object is to remove the supposition, that the world is indebted to Mr. H. Cline for the suggestion, if we may use the term indebted, when the plan has certainly very little merit, and would undoubtedly never have acquired much celebrity, had not Mr. A. Cooper's name been coupled with it.

What power can possibly force the ligature, when tied with the due tightness, off the extremity of the vessel? If Mr. A. Cooper had reflected a little, he would have seen, that no action of the heart, or artery itself, no turgid state of this vessel, could do so. If a piece of string were tied round any tube for the purpose of preventing a fluid from escaping from its mouth, provided the string is applied with due tightness, no fluid can possibly escape, however great the propelling power may be, supposing that the string, and structure of the tube, do not break.

If the ligature be applied so slackly as to slip, who can doubt, that a hemorrhage will still follow, even though the ligature is carried through the end of the vessel, and tied in the way mentioned above.

In the cases, in which the ligatures slipped off, as mentioned by Mr. A. Cooper, we must, therefore, conclude that the arteries were not tied with sufficient tightness, perhaps through an unfounded fear that a ligature, might cut its way completely through all the coats of an artery. The inner coats of the artery we know, from the experiments of Dr. Jones, are invariably cut through when the vessel is properly tied, and the circumstance is always useful in promoting its closure.

OF ANEURISMS HIGH UP THE FEMORAL ARTERY.

Mr. Abernethy has been called upon in three cases to take up the external iliac artery. The events of all these have shewn, that the anastomosing vessels were fully capable of conveying blood enough into the limb below, and that a vessel even of this size could become permanently closed after being tied. Messrs. Freer and Tomlinson, of Birmingham, have both also done the same operation with success. Our limits, however, will only allow us to describe the operation, and the particulars must be consulted in *Abernethy's Surg. and Physiol. Essays; his Surgical Observations*, 1804. *Edinb. Med. and Surg. Journal for January*, 1807; *and Freer's Observations on Aneurism*, 1807.

In Mr. Abernethy's first operation of this kind, an incision, about three inches in length, was made through the integuments of the abdomen, in the direction of the artery, and thus the aponeurosis of the external oblique muscle was laid bare. This was next divided, from its connexion with Poupart's ligament, in the direction of the external wound, for the extent of about two inches. The margins of the internal oblique and transverse muscles being thus exposed, Mr. Abernethy introduced his fingers beneath them to protect the peritoneum, and then divided them. Next he pushed this membrane with its contents upwards and inwards, and took hold of the external iliac artery with his fingers and thumb. It now only remained to pass a ligature round the artery, and tie it; but, this required caution on account of the contiguity of the vein to the artery. These Mr. A. separated with his fingers, and introducing a ligature under the artery with a common surgical needle, tied it about an inch and a half above Poupart's ligament. (*Surg. Essays.*)

The following was the method Mr. Abernethy adopted the second time of tying the external iliac artery.

An incision of three inches in length was made through the integuments of the abdomen, beginning a little above Poupart's ligaments, and being continued upwards; it was more than half an inch on the outside of the upper part of the abdominal ring, to avoid the epigastric artery. The aponeurosis of the external oblique muscle being thus exposed, was next divided, in the direction of the external wound. The lower part of the internal oblique muscle was thus uncovered, and the finger being introduced below the inferior margin of it and of the transversalis muscle, they were divided by the crooked bistoury for about one inch and a half. Mr. Abernethy now introduced his finger beneath the bag of the peritoneum, and carried it upwards by the side of the psoas muscle, so as to touch the artery about two inches above Poupart's ligament. He took care to disturb the peritoneum as little as possible, detaching it to no greater extent than would serve to admit his two fingers to touch the vessel. The pulsations of the artery made it clearly distinguishable, but Mr. Abernethy could not get his finger round it with facility. He was obliged to make a slight incision on either side of it, in the same manner as is necessary when it is taken up in the thigh, where the facia which binds it down in its situation is strong. After this the forefinger could be put beneath the artery, which Mr. A. drew gently down, so as to see it behind the peritoneum. By means of an eyed-probe two ligatures were conveyed round the vessel; one of these was carried upwards as far as the artery had been detached, and the other downwards: they were firmly tied, and the vessel was divided in the interspace between them. (*Surg. Observ.* 1804.)

Mr. Abernethy, in his third instance of tying this vessel, operated exactly as in the foregoing case, and with complete success. (See *Edinb. Surg. Journ. Jan.* 1807.)

Mr. Freer, in his operation, made an incision about one inch and a half from the spine of the ilium, beginning about an inch above it, and extending it downwards about three inches and a half, so as to form altogether an incision four inches and a half long, extending to the base of the tumour. The tendon of the external oblique being exposed, was carefully opened, and also the internal oblique, when the finger was introduced between the peritoneum and transversalis, and served as a director for the crooked bistoury, which divided the muscle. Avoiding all unnecessary disturbance, Mr. Freer separated the peritoneum with his finger, till he could feel the artery beating, which was so firmly bound down, that he could not get his finger under it without dividing its fascia. The vessel being separated from the surrounding parts, a curved blunt needle, armed with a strong ligature was put under it, and tied very tight with the intention of dividing the internal coats of the vessel. The operation led to a perfect cure. (*Freer on Aneurism, p.* 83.)

Mr. Tomlinson applied only one ligature and, of course, left the artery undivided: the event was attended with perfect success.

The two last cases, on which Mr. Abernethy operated, I was an eye-witness of, and can, therefore, bear witness to the simplicity and ease of the necessary operation. Perhaps, however, it would be better not to have recourse to it before the circumstances, were urgent. Tying the external iliac artery must at least be deemed dangerous, in regard to some chance of hemorrhage, though I think, from the cases already on record, there is not much risk of the anastomoses not being sufficient. Besides there is always a certain chance of an aneurism getting spontaneously well, as did the aneurism in the groin lately under the care of my friend Mr. Albert, in the York Hospital.

Ought a surgeon, however, to wait till the tumour extends too high to allow an operation to be done? I think not.

ANEURISMS OF THE BRACHIAL ARTERY, AND THE OPERATION FOR THEM.

Surgical writings contain many histories of aneurisms in the bend of the arm, produced by the puncture of the brachial artery in venesection, or caused by a deep wound inflicted at the bend of the arm, along the inner side of the humerus, or in the axilla. Such cases must indisputably be formed by effusion. Although Morand, &c. have found, that along with aneurisms, caused by a wound of the brachial

artery, the diameter of the vessel is sometimes unusually enlarged through its whole length, above the seat of the tumour, this enlargement, which is very rare, might have existed naturally, before the puncture occurred. Even were it frequent, such an equable longitudinal expansion of the tube of the artery could not explain the formation of the aneurismal sac in the bend of the arm, along the inner side of the humerus, or in the axilla, after wounds. (*Scarpa, p.* 160.)

The proximate cause of these cases may invariably be traced to the solution of continuity in the two proper coats of the artery, and the consequent effusion of blood into the cellular substance. The effect is the same, whether from an internal morbid affection, capable of ulcerating the internal and fibrous coats of the artery, the blood be effused into the neghbouring cellular sheath surrounding the artery, which it raises after the manner of an aneurismal sac; or, the wound of the integuments having closed, the blood issue from the artery, and be diffused in the surrounding parts. The cellular substance, on the outside of the wounded vessel is first injected, as in ecchymosis; the blood then distends it, and elevates it in the form of a tumour, and, the cellular divisions being destroyed converts it at last into a firm capsule, or aneurismal sac. (*Scarpa, p.* 167.)

The circumscribed or the diffused nature of the aneurism, and the rapidity or slowness of its formation, depend on the greater or less resistance to the impetus of the blood, during the time of its effusion, by the interstices of the cellular substance surrounding the artery, and by the ligamentous fasciæ and aponeuroses, lying over the sac. The aponeurosis of the biceps muscle being only half an inch broad, and situated lower than the common place for bleeding, cannot, at least, in most cases, materially strengthen the cellular substance surrounding the artery, as is commonly supposed. *Scarpa, p.* 168—170. This author refers the greatest resistance to the intermuscular ligament, which after having covered the body of the biceps muscle extends over the whole course of the humeral artery, and is implanted into the internal condyle. This ligamentous expansion has a triangular shape, the base of which extends from the tendon of the biceps, to the internal condyle, while the apex reaches upward along the inner side of the humerus towards the os brachii. The humeral artery and median nerve, kept in their situation by the cellular sheath, and this ligamentous expansion run in the furrow, formed between it and the internal margin of the biceps.—*Scarpa*, 171. This author anatomically explains many circumstances relative to the diffusion, circumscription, shape, &c. of brachial aneurisms, from this intermuscular ligament. While aneurisms, from internal cause, are not unfrequent in the aorta, and ham, they are very rare in the brachial artery; but, such instances, however, are recorded.—(*Scarpa*, 176)

The mode of distinguishing a wound of the brachial artery, in attempting to bleed, and the method of trying to effect a cure by pressure, are described in the article *Hemorrhage.*

Anel is said to have been the first who tied the brachial artery, for the cure of aneurisms in the arm, in the same way that Hunter did the femoral, for the cure of those in the ham, viz. with one ligature above the tumour, without making any incision upon, or into, the sac itself.

The operation is performed as follows :—the surgeon having traced the course of the brachial artery, and felt its pulsations above the aneurism, he may either cut down to the vessel immediately above the tumour, or much higher, in the long space between the origins of the superior and inferior collateral arteries. The integuments are to be divided in the course of the artery, and also the cellular sheath, for the space of about two inches and a half. The surgeon now introducing his left fore-finger to the bottom of the wound, will feel the denuded vessel, and, if it is not sufficiently bare, he must divide the parts which still cover it, observing to introduce the edge of the knife, on the side next to the internal margin of the biceps, to avoid dividing any of the numerous muscular branches, which go off from the opposite side of the artery. He is then to insulate, with the point of his finger, the trunk of the vessel, alone if he can, or together with the median nerve and vein, and raise it a little from the bottom of the wound. He is to separate the median nerve and vein, for a small space from the artery, and with an eyed needle is to pass a

ligature under the latter, and then tie it with a simple knot.

Whoever, after these directions, says Scarpa, shall have the treatment of a *circumscribed* aneurism in the bend of the arm, will no longer, it is to be hoped, follow the method of those, who, supposing the tumour to be formed by the dilatation of the artery, used first to divide the integuments over the tumour, insulated the sac, and sought for the vessel above and below the aneurism, in order to tie it in two places; and then endeavoured to make the sac slough away. The operation is now reduced to the greatest simplicity, viz. tying the artery merely above the tumour. (See *Scarpa, p.* 358, 359.)

When the aneurism is *diffused*, and accompanied with violent inflammation and swelling of the whole arm, from the excessive distention of the clots of effused blood, Scarpa recommends the old operation of opening the tumour, and tying the artery at the bottom of the sac, above and below the wound made by the lancet. In this method it will be proper to apply a tourniquet to the upper part of the arm, near the axilla; or, if the limb should be very painful and swelled, it is better to let an assistant compress the artery from above the clavicle, against the first rib. The incision having been made into the tumour, and the blood discharged, a probe is to be introduced into the puncture in the vessel, from below upwards, so as to raise the artery. This, being separated from the parts beneath, and the median nerve, for a small extent, is to have two ligatures put under it, one of which is to be tied above, the other below, the wound in the vessel. Then the tourniquet, or pressure, is to be taken off, and if there be no bleeding, the wound is to be brought together.—(See *Scarpa, p.* 359.)

MR. LAMBERT'S PROPOSAL.

Having observed, after an operation performed in the common way, by a ligature above and below the aperture in the artery, such violent pain, swelling and inflammation, as threatened gangrene of the limb, and which symptoms, when mitigated, left the arm weak, and with a much more feeble pulse, than in the other arm, this gentleman wished to see the operation done, so as to make less disturbance of the circulation. I recollected, he remarks, all that I had seen or read of the effects of styptics, of pressure, and of ligatures, in the cure of hemorrhages. I considered the coats and motions of arteries, and compared their wounds with the wounds of veins and other parts. I reflected upon the process of nature in the cure of wounds in general, and considered, in particular, how the union of divided parts was brought about in the operation of the hare-lip, and in horses' necks, that are bled by farriers. Upon the whole, I was in hopes, that a suture of the wound in the artery might be successful; and, if so, it would certainly be preferable to tying up the trunk of the vessel. I communicated my thoughts to Mr. Hallowell, Mr. Keenlyside, and some other friends of the profession. A case of an aneurism from bleeding occurred, and fell to Mr. Hallowell's lot. I recommended the method I have hinted. He put it in execution June 15, 1759. Every thing was done in the usual method, till the artery was laid bare, and its wound discovered; and the tourniquet being now slackened, the gush of blood *per saltum* shewed there was no deception. Next, two ligatures, one above the orifice, and one below, were passed under the artery, that they might be ready to be tied at any time, in case the method proposed should fail. Then a small steel pin, rather more than a quarter of an inch long, was passed through the two lips of the wound in the artery, and secured by twisting a thread round it, as in the hare lip. This was found to stop the bleeding, upon which the arm was bound up, the patient put to bed, and ordered to be kept quiet, &c." The pin came away with the dressings, June 29, and July 19th, the patient, was discharged from the hospital perfectly well, and with a pulse in that arm nearly as strong as in the other. Indeed the pulse was very little altered immediately after the operation; it was weakened in a small degree, as might be expected from the diameter of the vessel being straitened; but it was so strong and equal, that we had not the least doubt of the blood's continuing to circulate freely through it."—(*Medical Observations and Inquiries, Vol.* 2.)

We need hardly inform the reader, that the idea of healing the wound in the vessel, so as to preserve the pervious state of it, is a mere hypothesis, certainly never realized by adopting

Mr. Lambert's method. If ever a small puncture of an artery heal, so as to leave the tube pervious, it is under the circumstances pointed out by Dr. Jones. (See *Hemorrhage.*) Had Lambert had an opportunity of examining the state of the vessel, some time after the above operation, he would have found its canal obliterated; and the preservation of the perviousness of the artery being the only foundation for Lambert's method, the practice must of course fall to the ground.

AXILLARY ANEURISMS.

Aneurisms occasionally take place in the axilla, and rather than that the patient should perish of hemorrhage, it is the duty of the surgeon to tie the axillary artery, if it be necessary, even as far inward, as where it proceeds over the first rib. This operation, however, should only be done in urgent circumstances, as when the aneurism is far advanced, makes the arm very œdematous, and insupportably painful, and when the tumour is in danger of bursting. For, in all cases of aneurism; there is a certain chance of the disease getting spontaneously well; and one axillary aneurism in a man in St. Bartholomew's Hospital a few years ago, had certainly disappeared of itself, as was proved by the account which the man gave of the case while living, and by the obliteration of the artery, found on inspection after death.

A wound of the axillary artery, might render it necessary to do this operation. This vessel was tied by a Mr. Hall, in Cheshire, when it had been wounded with a scythe, so as to bring the ends of the artery into view; and the arm was preserved, though it remained afterwards a little weak, which indeed, might be owing to some large nerve being divided. (See *Scarpa, p.* 372.) Mr. White, of Manchester, relates another instance of this vessel being tied, in the case of a wound; but, mortification of the limb, and death followed. Three of the nerves were found included in the ligature.—*London Medical Journal, Vol.* 4.

In a case of axillary aneurism, which had actually burst, and the hemorrhage from which could only be stopped by pressing the artery against the first rib, Mr. Keate, the surgeon-general, practised the following operation, which was attended with completely successful consequences. This gentleman determined on taking up the artery, above the diseased and ruptured part, in its passage over the first rib. Accordingly, he made an incision obliquely downwards, divided the fibres of the pectoral muscle, that were in his way, and, when he came to the artery, passed a curved, blunt-pointed, silver needle, armed double, as he conceived, under the artery, and tied two of the ends. After a careful examination, finding that the artery pulsated below the ligature, he determined on passing another ligature higher up, and nearer to the clavicle: he, therefore, passed the needle more deeply, so as evidently to include the artery. In a few days the swelling of the arm began to subside, the wound suppurated, and the ligatures came away with the dressings. The arm afterwards recovered its feeling, and the patient regained, in a great measure, the entire motion of the shoulder, &c. *Med. Review and Magazine for* 1801.

The axillary artery might certainly be got at by making an incision above the clavicle, and it is undoubtedly not a very difficult plan to accomplish in the dead subject, without any tumour under the clavicle. But I do not think it so eligible as Mr. Keate's, in a living subject, having a large axillary aneurism; for, then the clavicle becomes so much elevated, and the artery lies so deeply below it, that it is exceedingly difficult to get at the vessel. This was the case in an attempt which I once saw made to tie the artery, and in which one of the cervical nerves, affected by the pulsations of the artery, was mistaken for it, and tied, so that the aneurism soon afterwards burst, and a fatal hemorrhage arose. Were a surgeon, however, to choose operating above the clavicle, he might adopt the following plan:—An incision should be made just over the sternal end of the clavicle, and the clavicular portion of the sterno-cleido-mastoideus muscle detached with a blunt pointed curved bistoury. No further use should be made of a cutting instrument. The chief difficulty would now be, to get a ligature under the artery; but, it might, perhaps be done with the aid of an aneurismal needle. As the artery communicates its pulsations to the cervical nerves in the vicinity, the operator should be particularly careful not to mistake one of them for the vessel itself.

CAROTID ANEURISMS.

The possibility of tying the carotid artery, in cases of wounds and aneurisms, without any injurious effect on the functions of the brain, now seems completely proved. Petit mentions, that the advocate Vieillard, had an aneurism at the bifurcation of the right carotid, for the cure of which he was ordered a very spare diet, and directed to avoid all violent exercise. Three months after this prescription, the tumour had evidently diminished; and, at last, it was converted into a small, hard, oblong, knot, without any pulsation. The patient having died of apoplexy, the right carotid was found closed up and obliterated, from its bifurcation, as low down as the right subclavian artery.—*Acad. des Sciences de Paris, an.* 1765. Hebenstreit, vol. 5, of his Translation of B. Bell's Surgery, mentions a case, in which the carotid artery was wounded, in extirpating a scirrhous tumour. The hemorrhage would have been fatal, had not the surgeon immediately tied the trunk of the vessel. The patient lived many years afterwards.

Mr. Abernethy was under the necessity of tying the trunk of the carotid, in the case of a large, lacerated wound of the neck, in which accident the internal carotid, and all the branches in front of the external one, were wounded. The patient seemed to be going on very well at first, but in the night he became delirious and convulsed, and died about thirty hours after the ligature was applied. Mr. A. considers the delirium and the inflammatory appearance found on the brain, on opening the body, as the effects of stopping the supply of blood to the brain. I was fortunate enough to be a spectator of this interesting case, and, with due deference to Mr. Abernethy, cannot help thinking, especially when the above facts press on my mind, that the delirium might more properly be regarded as the consequence of so terrible a lacerated wound as this poor man received. Stopping the flow of blood to a part, has always been considered a chief means of averting inflammation of it, not bringing it on.

Mr. A. Cooper tied the carotid for an aneurism; the ligature came away on the twelfth day after the operation; on the seventeenth, inflammation took place in the aneurismal sac, and proceeded to suppuration. The consequence was, that such pressure was produced on the trachea and œsophagus, that the woman died suffocated on the twenty-first day.

In order to get at the carotid artery in the safest manner, Mr. Abernethy has recommended making an incision on that side of it next the trachea, where no important parts are exposed to injury, and then to pass a finger underneath the vessel. The par vagum must be carefully excluded from the ligature; for, to tie it would be fatal.—(*Surgical Observations*, 1804.)

ANEURISMAL VARIX, OR VENOUS ANEURISM.

The seat of this tumour is, in general, in the basilic vein, which is enlarged, so as to form an oblong swelling, in the middle of which is the scar, made by the lancet in bleeding. The tumour seldom extends more than two inches above and below the injury; beyond this distance the vein regains its natural size.

Dr. W. Hunter is undoubtedly the first who gave an accurate description of this disease, although Professor Scarpa is disposed to claim a share of the merit for his own countryman Guattani, who, about the same time when Dr. Hunter wrote in the Medical Observations and Inquiries, published the history of two cases of aneurismal varix.

"Does it ever happen in surgery," says Dr. Hunter, "that when an artery is opened through a vein, a communication, or anastomosis, is afterwards kept up between these two vessels? It is easy to conceive this case, and it is not long, since I was consulted about one, that had all the symptoms that might be expected, supposing such a thing to have actually happened, and such symptoms, as otherwise must be allowed to be very unaccountable. It arose from bleeding; and was of some years' standing, when I saw it about two years ago, and I understand very little alteration has happened to it since that time. The veins, at the bending of the arm, and especially the basilic, which was the vein that had been opened, were there prodigiously enlarged, and came gradually to their natural size, at about two inches above, and as much below the elbow. When emptied by pressure, they filled again almost instantaneously, and this happened,

even when a ligature was applied tight round the fore-arm, immediately below the affected part. Both when the ligature was made tight, and when it was removed, they shrunk, and remained of a small size, while the finger was kept tight upon the artery, at the part where the vein had been opened in bleeding. There was a general swelling in the place, and in the direction of the artery, which seemed larger, and beat stronger, than what is natural, and there was a tremulous jarring motion in the vein, which was strongest at the part, which had been punctured, and became insensible at some distance both upwards and downwards." (*Medical Observations and Inquiries, Vol.* 1.)

In the second volume of this work, Dr. Hunter adds some further remarks on the aneurismal varix.

"In the operation of bleeding, the lancet is plunged into the artery through both sides of the vein, and there will be three wounds made in these vessels, viz. two in the vein and one in the artery, and these will be nearly opposite to one another, and to the wound in the skin. This is what all surgeons know has often happened in bleeding, and the injury done the artery is commonly known by the jerking impetuosity of the stream, whilst it flows from the vein, and by the difficulty of stopping it, when a sufficient quantity is drawn."

"In the next place, we must suppose, that the wound of the skin, and of the adjacent, or upper side of the vein, heal up as usual; but, that the wound of the artery, and of the adjacent, or under side of the vein, remain open, (as the wound of the artery does in the spurious aneurism) and, by that means, the blood is thrown from the trunk of the artery, directly into the trunk of the vein. Extraordinary as this supposition may appear, in reality it differs from the common spurious aneurism in one circumstance only, viz. the wound remaining open in the side of the vein, as well as in the side of the artery. But, this one circumstance will occasion a great deal of difference in the symptoms, in the tendency of the complaint, and in the proper method of treating it: upon which account the knowledge of such a case will be of importance in surgery."

"It will differ in its symptoms from the common spurious aneurism principally thus. The vein will be dilated, or become varicose, and it will have a pulsating jarring motion on account of the stream from the artery. It will make a hissing noise, which will be found to correspond with the pulse for the same reason. The blood of the tumour will be altogether, or almost entirely fluid, because kept in constant motion. The artery, I apprehend, will become larger in the arm, and smaller at the wrist, than it was in the natural state; which will be found out by comparing the size, and the pulse, of the artery in both arms, at these different places. The reason of which I shall speak of hereafter. And the effects of ligatures, and of pressure upon the vessels above the elbow and below it, will be what every person may readily conceive, who understands any thing of arteries and veins in the living body."

"The natural tendency of such a complaint will be very different from that of the spurious aneurism. The one is growing worse every hour, because of the resistance to the arterial blood, and if not remedied by surgery must at last burst. The other, in a short time, comes to a nearly permanent state; and, if not disturbed, produces no mischief, because there is no considerable resistance to the blood, that is forced out of the artery."

"The proper treatment must, therefore be very different in these two cases, the spurious aneurism requiring chirurgical assistance, as much, perhaps, as any disease whatever; whereas, in the other case, I presume it will be best to do nothing."

"If such cases do happen, they will no doubt be found to differ among themselves, in many little circumstances, and particularly in the shape, &c. of the tumefied parts. Thus the dilatation of the veins may be in one only, or in several, and may extend lower, or higher, in one case, than in another, &c. according to the manner of branching, and to the state of the valves in different arms. And the dilatation of the veins may, also, vary, on account of the size of the artery, that is wounded, and of the size of the orifice in the artery and in the vein."

"Another difference in such cases will arise from the different manner, in which the orifice of the artery may be united, or continued with the orifice of the vein. In one case, the trunk of the vein may keep close to the trunk of the artery, and the very thin stratum of cellular membrane between them,

may, by means of a little inflammation and coagulation of the blood among its filaments, as it were, solder the two orifices of these vessels together, so that there shall be nothing like a canal going from one to the other; and then the whole tumefaction will be more regular, and more evidently a dilatation of the veins only. In other instances the blood, that rushes from the wounded artery, meeting with some difficulty of admission and passage through the vein, may dilate the cellular membrane, between the artery and vein, into a bag, as in a common spurious aneurism, and so make a sort of canal between these two vessels. The trunk of the vein will then be removed to some distance from the trunk of the artery, and the bag will be situated chiefly upon the under side of the vein. The bag may take on an irregular form, from the cellular membrane being more loose, and yielding, at one place, than at another, and from being unequally bound down by the fascia of the biceps muscle. And if the bag be very large, especially, if it be of an irregular figure, no doubt, coagulations of blood may be formed, as in the common spurious aneurism."

After relating two cases, very illustrative of the nature of the aneurismal varix, Dr. W. Hunter proceeds to inquire: "Why is the pulse at the wrist, so much weaker in the diseased arm, than in the other; surely, the reason is obvious and clear. If the blood can easily escape from the trunk of the vein, it is natural to think, that it will be driven along the extreme branches with less force, and in less quantity."

2. "Whence is it, that the artery is enlarged all the way down the arm; I am of opinion, that it is the consequence of the blood passing so readily from the artery into the vein, and is such an extension, as happens to all arteries, in growing bodies, and to the arteries of particular parts, when the parts themselves increase in their bulk, and, at the same time, retain a vascular structure. It is well known, that the arteries of the uterus grow much larger in the time of utero-gestation. I once saw a fleshy tumour upon the top of a man's head, as large nearly as his head; and his temporal and occipital arteries, which fed the tumour, were enlarged in proportion. I have observed the same change in the arteries of enlarged spleens, testes, &c. so that I should suppose it will be found to be universally true in fact, and the reason of it in theory seems evident." (See *Medical Observations and Inquiries Vol.* 2.)

Professor Scarpa, Dr. Hunter, Mr. B. Bell, Pott, and Garneri, mention cases of the aneurismal varix, which remained stationary for fourteen, twenty, and thirty-five years. Several cases are related by Brambilla, Guattani, and Monteggia, of a cure having been obtained by means of compression. But, as this method of cure, if it does not succeed, exposes the patient to the danger of a complication of the disease with an aneurism, it ought not to be employed, except in recent cases, where the tumour is small, and in slender patients, at an early period of life, and where both of the vessels can be compressed accurately against the bone. If the disease is complicated with an aneurism, which threatens to become diffused, we are under the necessity of having recourse to an operation. *Scarpa.*

ANEURISM FROM ANASTOMOSIS.

This is the term, which Mr. John Bell, of Edinburgh, has given to a species of aneurism, which resembles such bloody tumours, (*nævi materni*) as appear in new-born children, grow to a large size, and, ultimately bursting, emit a considerable quantity of blood.

The aneurism from anastomosis often affects adults, increasing from an appearance like that of a mere speck, or pimple, to a formidable disease, and being composed of a mutual enlargement of the smaller arteries and veins. The disease originates from some accidental cause; is marked by a perpetual throbbing; grows slowly, but incontrollably; and is rather irritated, than checked, by compression. The throbbing is at first indistinct, but when the tumour is perfectly formed, the pulsation is very manifest. Every exertion makes the throbbing more evident. The occasional turgid states of the tumour produce sacs of blood in the cellular substance, or dilated veins, and these sacs form little tender, livid, very thin, points, which burst, from time to time, and then, like other aneurisms, this one bleeds so profusely, as to induce extreme weakness.

The tumour is a congeries of active vessels, and the cellular substance, through which these vessels, are ex-

panded, resembles, as Mr. John Bell describes, the gills of a turkey cock, or the substance of the placenta, spleen, or womb. The irritated and incessant action of the arteries fills the cells with blood, and from these cells, it is reabsorbed by the veins. The size of the swelling is increased by exercise, drinking, emotions of the mind, and by all causes which accelerate the circulation.

Mr. John Bell states, that the hemorrhage from the aneurism by anastomosis usurps, in the female subject, the place of menstruation.

"This aneurism, observes the above writer, is a mere congeries of active vessels, which will not be cured by opening it; all attempts to obliterate the disease with caustics, after a simple incision, have proved unsuccessful, nor does the interrupting of particular vessels, which lead to it, affect the tumour; the whole group of vessels must be extirpated. In varicose veins, or in aneurisms of individual arteries, or in extravasations of blood, such as that produced under the scalp from blows upon the temporal artery, or in those aneurisms, produced in schoolboys by pulling the hair, and, also, in those bloody effusions from blows on the head, which have a distinct pulsation, the process of cutting up the varix, aneurism, or extravasation, enables you to obliterate the vessel and perform an easy cure. But, in this enlargement of innumerable small vessels, in this aneurism by anastomosis, the rule is 'not to cut into, but to cut it out.' These purple and ill looking tumours, because they are large, beating, painful, covered with scabs, and bleeding, like a cancer in the last stage of ulceration, have been but too often pronounced cancers! incurable bleeding cancers! and the remarks, which I have made, while they tend, in some measure, to explain the nature and consequences of the disease, will remind you of various unhappy cases, where either partial incisions only had been practised, or the patient left entirely to his fate." (See *John Bell's Principles of Surgery, Vol.* 1.)

For information on aneurism, read *Louth's Scriptores de Aneurismatibus, which contains Guattani, Asman, &c. A paper by Mr. Home in the Medical and Chirurgical Transactions. Some Cases and Remarks by Mr. Abernethy, interspersed in his Works. Monro's Observ. in the Edinb. Med. Essays. Various productions in the Med. Observ. and Inquiries. The Article Aneurism in Rees's Cyclopædia. Freer's Observations on Aneurism,* 1807. *Above all, a Treatise on the Anatomy, Pathology, and Surgical Treatment of Aneurism by A. Scarpa, translated by J. H. Wishart,* 1808. *The original Italian was published* 1804.

ANODYNES, (from α neg. and ὀδύνη pain.) Medicines are so termed, which diminish, or remove, pain, and they are indicated in surgery in all cases, in which it is desirable to relieve any intense pain. Opium is the principal one deserving confidence.

ANTHRACOSIS, (from ἄνθραξ, a burning coal.) A red, livid, burning, sloughy, very painful, tumour, occurring on the eyelids. At first, antiphlogistic means are proper; but the grand thing is to make a free and early opening for the discharge of the matter contained in the swelling. The eyelids and eye should be bathed with a collyrium, and kept cool with the saturnine lotion.

ANTHRAX, (ἄνθραξ, a burning coal,) See *Carbuncle.*

ANTIMONIUM CALCINATUM.—(Supposed to be very similar to James's Powder.) Is commonly called the antimonial powder. In all cases of surgery, in which it is desirable to promote the secretions in general, and those of urine, perspiration, and of the alimentary canal, in particular, it is proper to have recourse to this important preparation. In all inflammations of the brain and its membranes, and, in every instance, in which there exists an inflammation of a viscus of high importance in the system, antimony should be exhibited, and, in general, the antimonial powder is as eligible a prescription as any. For an adult, four or five grains may be ordered, and the dose, if requisite, may be repeated two or three times a day.

ANTIMONIUM MURIATUM. This has often been named, *butter of antimony,* and is employed in surgery as a caustic.

ANTIMONIUM TARTARISATUM. *Emetic Tartar.* This medicine is well known as the most common emetic. For this purpose, it may be given in either of the following ways, as the indications of the case may demand. ℞.

Antimonii Tart. gr. ij. Aq. distil. ℥iv. Misce et cola. Dosis ℥ij. pro emetico; vel ℥ss quadrante quoque horæ, donec supervenerit vomitus.

If tartarised antimony be exhibited merely to excite a diaphoresis, half an ounce, or one table spoonful, of the above mixture is to be given once every six hours.

This preparation is very much employed by the best continental surgeons, for increasing the gastric secretions, and maintaining, for a length of time, a lax state of the bowels. We shall have occasion to notice its efficacy in the cure of numerous surgical diseases.

ANTIPHLOGISTICS, (from αντι, against, and φλεγω, to burn.) All means are so termed, which have a tendency to subdue inflammation. (See *Inflammation.*)

The first of these, to which the surgeon should direct his attention, when he wishes to cure an inflammatory affection, is to remove as far as it is in his power, the occasional cause. Extraneous bodies, lodged in parts, susceptible of this kind of irritation, and which substances produce inflammation by their mechanical operation, should be extracted as soon as possible, if their particular situation, shape, &c. will admit of it. The removal of substances, which irritate by their chemical properties, is difficult, and sometimes impracticable.

On account of their great activity, however it is necessary to oppose their effects, without loss of time. This is accomplished, in a certain degree, by diluting such substances with aqueous fluids, defending the parts from their action by oily and sedative applications; and, by correcting the specific irritation of the substances applied, by means of other substances, which have a particular affinity with them.

Antiphlogistic remedies, properly so called, are divided into *general* ones, by which are meant such as affect the whole system; and into *topical* ones, the operation of which is, at least, for a certain time, entirely local and circumscribed.

General antiphlogistics are: 1. Bleeding. (See this word.)

2. Glysters, and gentle laxative medicines. The most active cathartics may sometimes be considered in the same light; but, there are many inflammations, in which the effect of strong purgatives is hurtful and dangerous. Such are, in particular, all instances, in which there is inflammation of the thoracic, and abdominal viscera.

3. Aqueous diluting beverages, taken in large quantities.

4. The warm bath.

5. Cooling medicines, such as acid drinks, saline draughts, and some of the neutral salts, such as nitre, the ammonia muriata, aq. ammon. acet.; &c.

6. Anodynes, especially opium, only to be given, however, under the circumstances, and in the way, to be noticed in the article, *Inflammation.*

With these, direct means of diminishing the action of the sanguiferous system, we must combine a more, or less complete abstinence from all solid animal food. Too warm an atmosphere should also be avoided, as well as all stimulants whatever, every kind of noise, every thing likely to alarm, or disturb the mind, &c.

Topical antiphlogistics are: 1. Local bleeding practised by means of leeches scarifications, or cupping.

2. Emollient poultices, which are proper, when the inflammation is accompanied by an extraordinary degree of pain and hardiness, and, especially, when it is disposed to suppurate. The best emollient poultice is that of linseed oil described in the article *Inflammation.* Some use the one made of bread and milk; some disliking milk, in consequence of its inutility, and its tendency to turn sour, only use water; while others make the bread into a poultice by softening it and beating it up, with Goulard's lotion.

3. Discutients are particularly used in all cases, in which the inflammation is less acute, and seems to have no tendency to suppurate. Cold water, various preparations containing lead, a solution of sal ammoniac in vinegar and water, spirit of wine, vinegar, æther, the various infusions of bitter aromatic plants, and the decoction of bark, are very good discutient remedies.

4. The maintenance of a continual evaporation from the surface of the inflamed part, by applying folded linen, wet with the lotio aq. litharg. acet. cold water, a solution of zincum vitriolatum, &c. Spirits, æther, snow, or powdered ice, produce more cold, and, are sometimes, though not very commonly, made use of. This is the ordinary principle,

on which surgeons conduct the local treatment of phlegmonous inflammation, when there is the prospect of avoiding the formation of an abscess.

5. Fomentations. These are prepared by dipping flannels in some warm liquor, squeezing a certain quantity of fluid out of them, and then placing them quite warm on the inflamed part. They are mostly used in cases, in which emollient poultices are the permanent local applications, and when the patient suffers extraordinary pain. A decoction of white poppy heads, or camomile flowers, is the liquor commonly employed. Fomentations are very temporary means, being only applied in general, about half an hour, two, or three times a day. The best opportunity of doing this, is when the poultice is to be changed.

6. Among the means, essential to an antiphlogistic regimen, perfect quietude, both of body and mind, is not the least important. (See *Inflammation.*) *Encyclopédie Méthodique ; Partie Chirurgicale.*

ANTISEPTICS, from αντι against, ond σηπω, to putrify.) This name is given to such remedies, as are supposed to have the virtue of resisting the tendency to putrefaction in the human body, or to arrest its progress, after it has commenced. According to these ideas, they are indicated in cases of mortification, and sloughing ulcers.

The greatest part of antiphlogistic remedies are also antiseptic, as we shall see the reason of in the article *Mortification.* The most renowned antiseptic remedies of the internal kind, are vegetable, and mineral acids, fluids impregnated with carbonic acid gas, wine, aromatics, camphor, bitters, in general, and, particularly, bark. The chief external antiseptic applications are preparations of lead, cold water, snow, ice, spirits, turpentine, or aromatics, such as camomile flowers, rue &c. It has also been recommended to apply the carbonic acid gas itself. This may be done, either by directing the air against the parts affected through a funnel, as soon as the gas is extricated from the substances, which contain it; or by applying to the parts affected poultices, composed of such ingredients, as will ferment, and form a large quantity of the gas. (See *l'Encyclopédie Méthodique ; Partie Chirurgicale.*)

ANTRUM MAXILLARE. This is a considerable cavity, situated in the upper jaw bone. It is also named the *Sinus Maxillaris*, or *Antrum Highmorianum*, from the name of an anatomist, who gave the first accurate description of it.

The antra are liable to several morbid affections. Sometimes, their membranous lining inflames, and secretes pus. At other times, in consequence of inflammation, or other causes, various excrescences and fungi are produced in them. Their bony parietes are occasionally affected with exostosis, or caries. Extraneous bodies may be lodged in them, and, it is even asserted, that insects may be generated in them, and cause, for many years, very afflicting pains.

ABSCESSES IN THE ANTRUM.

Of all the above cases, this is far the most common. Violent blows on the cheeks, inflammatory affections of the adjacent parts, and, especially, of the pituitary membrane lining the nostrils, exposure to cold and damp, and, above all things, bad teeth, may induce inflammation and suppuration in the antrum. The first symptom is a pain, at first imagined to be a tooth-ach, particularly if there should be a carious tooth, at this part of the jaw. This pain, however, extends more into the nose, than that usually does, which arises from a decayed tooth ; it also affects, more or less, the eye, the orbit, and the situation of the frontal sinuses. But, even such symptoms are insufficient to characterize the disease, the nature of which is not unequivocally evinced, till a much later period. The complaint is, in general, of much longer duration, than one entirely dependent on a caries of a tooth, and its violence increases more and more, until, at last, a hard tumour becomes perceptible below the cheek bone. The swelling, by degrees, extends over the whole cheek; but, it afterwards rises to a point, and forms a very circumscribed hardness, which may be felt above the back grinders. This symptom is accompanied by redness, and sometimes by inflammation and suppuration of the external parts. It is not uncommon, also, for the outward abscess to communicate with the antrum.

The circumscribed elevation of the tumour, however, does not occur in all cases. There are instances, in which

the matter makes its way towards the palate, causing the bones of this part to swell, and, at length, rendering them carious, unless timely assistance be given. There are other cases, in which the matter escapes between the fangs and sockets of the teeth. Lastly, there are other examples, in which matter, formed in the antrum, makes its exit at the nostril of the same side, when the patient is lying with his head on the opposite one, in a low position. If this mode of evacuation should be frequently repeated, it prevents the tumour, both from pointing externally, and bursting, as it would do if the purulent matter could find no other vent. But this evacuation of pus from the nostrils is not very common; for, according to Mr. Hunter, the opening between the antrum and cavity of the nose, is generally stopped up. This celebrated anatomist even seems inclined to think, that the disease may sometimes be occasioned by the impervious state of this opening, in consequence of which obstruction, the natural mucus of the antrum may collect there in such quantity, as to irritate and inflame the membrane, with which it is in contact. This may happen in the same way as an obstruction in the ductus nasalis hinders the passage of the tears into the nose, and causes an abscess in the lachrymal sac. However, in the majority of cases, we may conclude, that the impervious state of the opening is rather an effect, than the cause, of the disease, since inflammation in the antrum is often manifestly produced by causes of a different kind, and since the opening in question is not invariably closed.

Abscesses in the antrum require a free exit for their contents, and, if the surgeon neglects to procure such opening, the bones become more distended and pushed out, and, finally, carious. When this happens, the pus makes its appearance, either towards the orbit, the alveoli, the palate, or, as is mostly the case, towards the cheek. The matter having thus made a way for its escape, the disease now becomes fistulous.

In all cases the principal indication is to discharge the matter, whether the pus is simply confined in the antrum, or whether the case be conjoined with a carious affection of the bones.

The ancients seem to have known very little of the treatment of diseases of the antrum. Drake, an English anatomist, is reputed to be the first proposer of a plan for curing abscesses of this cavity. Meibomius, however, had, a long while before him, proposed, with the same intention, to extract one or more of the teeth, in order that the matter might find an opening for its escape, through the sockets. This plan may be employed with success. The pus frequently has a tendency to make its way outward towards the teeth; it often effects their fangs; and, after their extraction, the whole of the abcess is seen to escape through the sockets. But this very simple plan will not suffice for all cases, as there are numerous instances, in which there is no communication between the alveoli and the antrum.

Drake, and, perhaps, before him, Cowper, took notice of the insufficiency of Meibomius's method, and, hence, they proposed making a perforation through the socket into the antrum with an awl, for the purpose of letting out the matter, and injecting into the cavity such fluids as were judged proper.

The extraction of one or more teeth, and the perforation of the alveoli, being essential steps in treating diseases of the antrum, we must consider what tooth ought to be taken out in preference to others.

A caries, or even a mere continual aching, of any particular tooth, in general ought to decide the choice. But if all the teeth should be sound, which is not often the case, writers direct us to tap each of them gently, and to extract the one, which gives most pain on this being done. When no information can be thus obtained, other circumstances ought to guide us.

All the grinding teeth, except the first, correspond with the antrum. They even sometimes extend into this cavity, and the fangs are only covered by the pituitary membrane. The bony lamella, which separates the antrum from the alveoli, is extenuated, towards the back part of the upper jaw. Hence, it is best, when the choice is in our power, to extract the third or fourth grinder, as, in this situation, the alveoli can be more easily perforated. Though, in general, the first grinder and canine tooth do not communicate with the antrum, yet, their fangs occasionally approach the side of this cavity.

When one or more teeth are carious, they should be removed, because they

are both useless and hurtful. The matter frequently makes its escape, as soon as a tooth is extracted, in consequence of the fang having extended into the antrum, or rather in consequence of its bringing away with it a piece of the thin partition between it and the sinus. Perhaps a discharge may follow from the partition itself being carious. If the opening, thus produced, be sufficiently large to allow the matter to escape, the operation is already completed. But as it can easily be enlarged, it ought always to be so when there is the least suspicion of its being too small. However, when no pus makes its appearance, after a tooth is extracted, the antrum must be opened by introducing a pointed instrument in the direction of the alveoli. Some use a small trocar, or awl; others a gimblet for this purpose.

The patient should sit on the ground, in a strong light, resting his head on the surgeon's knee, who is to sit behind him. Immediately when the instrument has reached the cavity, it is to be withdrawn. Its entrance into the antrum is easily known by the cessation of resistance. After the matter is discharged, surgeons advise the opening to be stopped up with a wooden stopper, to keep victuals from getting into the antrum.

The stopper is to be taken out, several times a day, to allow the pus to escape. This plan soon disposes the parts affected to discontinue the suppuration, and resume their natural state. Sometimes, however, the pus continues to be discharged for a long time after the operation, without any change occurring, in regard to its quality or quantity. In such instances the cure may often be accelerated by employing injections of brandy and water, lime-water, or a solution of zincum vitriolatum.

Some surgeons prefer a silver cannula instead of the stopper, as it can always be left pervious except at meals.

If no opening were made in the antrum, the matter would make its way, sometimes, towards the front of this cavity, which is very thin; sometimes, towards the mouth, and fistulous openings, and caries would inevitably follow.

When the bones are carious, the above plan will not accomplish a cure, until the affected pieces of bone exfoliate. A probe will generally enable us to detect any caries in the antrum. The fetid smell, and ichorous appearance of the discharge, also, leave little doubt that the bones are diseased; and, in proportion as the bones free themselves of any dead portions, the discharge has less smell, and its consistence becomes thicker.

There are cases, in which there are loose pieces of dead bone to be extracted, and, in which it is requisite to make a larger opening into the antrum, than can be obtained, at its lower part. Instances also occur, in which patients have lost all the grinding teeth, and the sockets are quite obliterated, so that a perforation from below could hardly be effected. Some practitioners have also objected to ever sacrificing a sound tooth. In these circumstances, it has been advised to make a perforation in the antrum, above the alveolary processes. M. Lamorier is the first who proposed this method. It consists in making a transverse incision, below the malar process, and above the root of the third grinder. Thus the gum and periosteum are divided, and the bone exposed. A perforating instrument is to be conveyed into the middle of this incision and the opening in the antrum made as large as requisite. There are cases of very extensive exfoliations of the antrum, in which it is absolutely necessary to expose a great part of the surface of the bone, and to cut away the dead pieces which are wedged, as it were, in the living ones. A small trephine may sometimes be advantageously applied to the malar process of the superior maxillary bone.

Surgeons formerly treated carious affections of the antrum in the most absurd and unscientific way, introducing setons through its cavity, and even having recourse to the actual cautery. The moderns, however, are not much inclined to adopt this sort of practice. It is now known, that the detachment of a dead portion of bone, in other terms, the process of exfoliation, is nearly, if not entirely, the work of nature, in which the surgeon can at most only act a very inferior part. Indeed, he should limit his interference to preventing the lodgment of matter, maintaining strict cleanliness, and removing the dead pieces of bone, as soon as they become loose. But, it is to be understood, that there are occasional

examples, in which the dead portions of bone are so tedious of separation, and so wedged in the substance of the surrounding living bone, that an attempt may be properly made to cut them away.

TUMOURS OF THE ANTRUM.

Ruysch, Bordenaave, Desault, Abernethy, and many others, have recorded cases of polypous, fungous, and cancerous diseases of the antrum, and of the parietes of this cavity being affected with exostosis.

The indolence of any ordinary fleshy tumour in the antrum, while in an incipient state, certainly tends to conceal its existence; but, such a disease rarely occurs without being accompanied by some affection of the neighbouring parts, and, hence, its presence may generally be ascertained before it has attained such a size as to have altered the conformation of the antrum. This information may be acquired by examining, whether any of the teeth have become loose, or have spontaneously fallen out; whether the alveolary processes are sound, and whether there are any fungous excrescences making their appearance at the sockets; whether there is any habitual bleeding from one side of the nose; any sarcomatous tumour at the side of the nostril, or towards the great angle of the eye. When the swelling has attained a certain size, the bony parietes of the antrum are always protruded outwards, unless the body of the tumour should be situated in the nostril, and only its root in the antrum. This case, however, is very uncommon.

As soon as a tumour is certainly known to exist in the antrum, the front part of this cavity should be opened, without waiting till the disease makes further progress. In a few instances, indeed, we may avail ourselves of the opening, which is sometimes found in the alveolary process, and enlarge it sufficiently to allow the tumour to be extirpated. If the front of the antrum were freely opened, it would in general be better to cut away the disease in its interior.

A swelling of the parietes of the antrum, in consequence of an abscess, or a sarcomatous tumour in its cavity, may lead us to suppose the case an enlargement of the bones, or an exostosis. The symptoms of the two first affections have been already detailed. A sign of an exostosis is, when besides the absence of the symptoms characterizing an abscess or a sarcoma, the thickened parietes of the antrum form a solid resistance; whereas, in cases of mere expansion, the dimensions of the surface of the bone being increased, while its substance is proportionally extenuated, the resistance is not so considerable.

When such an exostosis depends upon a particular constitutional cause, and especially, upon one of a venereal nature, it must be attacked by remedies suited to this affection. But when the disease resists internal remedies, and its magnitude is likely to produce an aggravation of the case, a portion of the bone may be removed with a trephine, or a cutting instrument. Such operations however require a great deal of delicacy and prudence.

Mr. B. Bell, vol. 4, describes a kind of exostosis of the upper jaw, very different from what we have mentioned, since instead of its being distinguishable from other diseases of the antrum by the greater firmness of the tumour, the substance of the bone gradually acquires such suppleness and elasticity, that it yields to the pressure of the fingers, and immediately resumes its former plumpness, when the pressure is discontinued. If the bone be cut, it is found to be as soft as cartilage, and, in an advanced stage of the disease, its consistence is almost gelatinous. The swelling increases gradually, and extends equally over the whole cheek, without becoming prominent at any particular point, or only so in the latter periods of the malady, when the soft parts inflame and become affected. The complaint is described as totally incurable. Cutting and trephining the tumour, as recommended in other cases of exostosis, only exasperate the patient's unhappy condition.

Mr. Abernethy has related an account of a very singular disease of the antrum. The patient, who was 34 years of age when the account was written, perceived, when about ten years old, a small tumour on his left cheek, which gradually attained the size of a walnut, and then remained, for some time, stationary. About a year afterwards, the tumour having again enlarged, a caustic was applied to the integuments, so as to expose the bone. The actual cautery was next applied, and an opening

thus made into the antrum. After the exfoliation of the antrum became filled with a fungus, which rose out upon the cheek, and could not be restrained by any applications. Part of the fungus also made its way into the mouth, through the socket of the second tricuspid tooth, the other teeth remaining natural. The disease continued in this state nine years, occasionally bleeding in an alarming way. When the patient was in his 29th year, the whole fungus sloughed away during a fever, and has not returned. After this the sides of the aperture in the bone began to grow outwards, forming an exostosis, which has grown to a great magnitude. A small exostosis took place in the mouth, but became no larger than a horse bean. The exostosis of the maxillary bone is of an irregular figure, and projects from the whole circumference of the aperture a great way directly forward. Mr. Abernethy compares its appearance, when he was writing, with that of a large tea-cup fastened upon the face, the bottom of which may be supposed to communicate with the antrum. The diameter of the cup, formed by the circular edge of the bone was 3 inches and a half; the depth 2 inches and seven-eighths. The general height of the sides of the exostosis, from the basis of the face was 2 inches; its walls were not thick, and terminated in a thin circular edge. The integuments, as they approach this edge, become extenuated, and they extend over the edge into the cavity. The exostosis now reaches to the nose in front, and to the masseter muscle behind; above it includes the very ridge of the orbit, and below it grows from the edge of the alveolary process. A line that would have separated the diseased from the sound bone, would have included the orbit and nose, and indeed, one half of the face. Mr. Abernethy saw no means of affording the man relief. (*Med. Chirurg. Trans. Vol.* 2.)

In a case of fungus growing in the antrum, and which had distended the antrum, hindered the tears from passing down into the nose, raised the lower part of the orbit, caused a protrusion of the eye, made two of the grinding teeth fall out, and occasioned a carious opening in the front of the antrum, through which opening a piece of the fungus projected, Desault operated as follows: The cheek was first detached from the os maxillare, by dividing the internal membrane of the mouth, at the place where it is reflected over this bone. Thus, the outer surface of the bone was denuded of all the soft parts. A sharp, perforating instrument was applied to the middle of this surface, and an opening made more forward than the one already existing. The plate of bone, situated between the two apertures, was removed with a little falciform knife, which, being directed from behind forward, made the division without difficulty. The opening, thus obtained, being insufficient, Desault endeavoured to enlarge it below, by sacrificing the alveolary process. This he endeavoured to accomplish with the same instrument, but, finding the resistance too great, he had recourse to a gouge and mallet. A considerable piece of the alveolary arch was thus detached, without any previous extraction of the corresponding teeth, three of which were removed by the same stroke. In this manner an opening was procured in the external and inferior part of the antrum, large enough to admit a walnut, Through this aperture a considerable part of the tumour was cut away with a knife, curved sideways, and fixed in its handle. A most profuse hemorrhage took place, but Desault, unalarmed, held a compress in the antrum for a short time; this being removed, the actual cautery was applied repeatedly to the rest of the fungus. The cavity was dressed with lint, dipped in powdered colophony.

On the eighteenth day the swelling was evidently diminished, the eye less prominent, and the epiphora less visible. But, at this period a portion of fungus made its appearance again. This was almost entirely destroyed by applying the actual cautery twice. It appeared again, however, on the 25th day, and required a third and last recourse to the cautery. From this time the progress of the cure went on rapidly. Instead of fungous excrescences, healthy granulations were now formed in the bottom of the sinus. The parietes of the antrum, gradually approaching each other, the large opening made in the operation was obliterated, and reduced to a small aperture, hardly large enough to admit a probe. Even this little opening was closed in the fourth month, at which time no vestiges of the disease remained, except the loss of teeth, and a very obvious depression just where they were situated.

In all fungous diseases of the antrum, making a free exposure of them is an essential part of the treatment: if you neglect this method, how can you inform yourself of the size, form, and extent, of the tumour? How could you remove the whole of the fungus, through a small opening, which would only allow you to see a very little portion of the excrescence? How could you be certain that the disease were extirpated, to its very root? Even when the antrum is freely opened, this circumstance can only be learnt with difficulty; and how could it be ascertained, when only a point of the cavity is opened? A portion, left behind, very soon gives origin to a fresh fungus, the progress of which is more rapid, and the character more fatal, in consequence of being irritated by the surgical measures adopted.—(*Œuvres Chirurgicales de Desault, Tom. 2. par Bichat.*

I imagine that English surgeons, unaccustomed to use the actual cautery, will peruse with a degree of aversion, this means so commonly applied in France by Desault, and other celebrated surgeons. Nor can I expect that they will altogether approve the use of the mallet and gouge, for making a free opening into the antrum. Perhaps, it might be better to trephine this cavity with a small instrument for the purpose, and then cut the fungus away. After removing as much of it as possible in this manner, some instrument of suitable shape might be used to scrape the part, where the tumour has its root. However, if there be any case in which potent and violent measures, like Desault's, are allowable, it is the one of which we have just been treating. Inveterate diseases demand powerful means, and tampering with them is generally more hurtful than useful.

There is an interesting case of a fungus in the maxillary sinus, related in the first volume of the *Parisian Chirurgical Journal.* It was at last cured by opening the antrum, applying the cautery, and tying the portion of the tumour, which had made its way into the nose. In the second volume of the same work, is an excellent case, exhibiting the dreadful ravages which the disease may produce when left to itself.

INSECTS IN THE ANTRUM.

It is said, that insects in this cavity sometimes make it necessary to open the part. This case, however, must be exceedingly rare, and even what we find in authors (*Pallas de insectis viventibus intra viventia,*) appears so little authentic, that we should hardly have thought it necessary to make mention of the circumstance, if there were not, in a modern work (*Med. Comm. Vol.* 1.) a fact which appears entitled to implicit belief. Mr. Heysham, a medical practitioner at Carlisle, relates, that a strong woman, aged sixty, in the habit of taking a great deal of snuff, was subject, for several years, to acute pains in the antrum, extending over one side of the head. These pains never entirely ceased, but were more severe in winter than summer, and were always subject to frequent periodical exasperations. The patient had taken several anodyne medicines, and others, without benefit, and had twice undergone a course of mercury, by which her complaints had been increased. All her teeth on the affected side had been drawn. At length it was determined to open the antrum with a large trocar, though there were no symptoms of an abscess, nor of any other disease in this cavity. For four days no benefit resulted from this operation. During this space, bark injections, and the elixir of aloes, were introduced into the sinus. On the fifth day a dead insect was extracted, by means of a pair of forceps, from the mouth of the cavity. It was more than an inch long, and thicker than a common quill. The patient now experienced relief for several hours; but, the pains afterwards recurred with as much severity as before; oil was next injected into the antrum, and two other insects, similar to the former, were extracted. No others appeared, and the wound closed. The pains were not completely removed, but they were considerably diminished for several months, at the end of which time they became worse than ever, particularly affecting the situation of the frontal sinus.

Mr. Bordenaave has published, in the fourth and fifth volumes of the *Mem. de l'Acad. de Chir.* two excellent papers on the diseases of the antrum. In the fifth volume he relates the history of a case, in which a great many worms, together with a piece of fetid fungus, were discharged from the antrum, after an opening had been made on account of an abscess of the antrum, at

tended with caries. But, in this instance, the worms had probably been generated after the opening had been made in the cavity; for, when they made their appearance the opening had existed nine months.—(See on this subject *l'Encyclopédie Méthodique, Partie Chirurgicale. Mem. de l'Acad. de Chirurgie. Parisian Chirurgical Journal. Œuvres de Desault par Bichat. Medical Communications, Vol.* 1.)

ANUS. The lower termination of the great intestine, named the rectum, is so called, and its office is to form an outlet for the fæces.

The anus is furnished with muscles, which are peculiar to it; viz. the sphincter, which keeps it habitually closed, and the *levatores ani*, which serve to draw it up into its natural situation, after the expulsion of the fæces. It is also surrounded, as well as the whole of the neighbouring intestine, with muscular fibres, and a very loose sort of cellular substance.

The anus is subject to various diseases, in which the aid of surgery is requisite; of these we shall next treat.

IMPERFORATED ANUS.

This complaint is sometimes met with, though not very often. As it is of the utmost consequence that such mal-formations should not remain long unknown, one of the earliest duties of an accoucheur, after delivery, should be the examination of all the natural outlets of the new-born infant.

Such an inspection sometimes evinces, that the place in which the extremity of the rectum, or the anus, ought to be, is entirely, or partly, shut up by the membrane, or fleshy adhesion. In other instances, no vestige of the intestine can be found, as the skin retains its natural colour over the whole space, between the parts of generation and the os coccygis, without being more elevated in one place than another. In such cases the intestine sometimes terminates in one of the two culs-de-sac, about an inch upward from the ordinary situation of the anus. Sometimes it does not descend lower than the upper part of the sacrum; sometimes it opens into the bladder, or vagina.

When a surgeon is consulted for such cases, he must not lose much time in deliberation; for, if a speedy opening be not made for the fæces, the infant will certainly very soon perish, with symptoms similar to those of a strangulated hernia. After ascertaining the complaint, which is an easy matter, we should endeavour to learn, whether the anus is merely shut by a membrane, or fleshy adhesion: or whether the anus is altogether wanting, in consequence of the lower portion of the cavity of the gut being obliterated, or the rectum not extending sufficiently far down.

When a membrane, or production of the skin closes the opening of the rectum, the part producing the obstruction, is somewhat different in colour from the neighbouring integuments. It is usually of a purple or livid hue, in consequence of the accumulations of the meconium on its inner surface. The meconium, propelled downward by the viscera above, forms a small, roundish prominence, which yields like dough to the pressure of the fingers; but, immediately projects as before, when the pressure is removed. When a fleshy adhesion closes the intestine, the circumstance is obvious to the eye, if the part protrude, which is generally the case. The finger feels greater hardness and resistance, than when there is a mere membrane, and the livid colour of the meconium cannot be seen through the obstructing substance.

These last signs alone are enough to convince the surgeon of the necessity of the operation; but, they do not clearly shew, whether the intestine descends, as far as it ought, in order to form a proper kind of anus. Complete information on this point can only be acquired, after the membrane, or adhesion, has been divided; or else after the child's death, when the operation has proved ineffectual. Though there be no mark to denote, where the anus ought to be situated, and no degree of prominence, yielding, like soft dough, to the pressure of the fingers, and rising again, when such pressure is removed; yet, it may happen, especially on our being consulted immediately after the child is born, that, notwithstanding the absence of such symptoms, denoting the presence of the meconium, and the natural extent of the intestine, as far as where the anus ought to be, the gut may exist, and have a cavity, as far as the membrane, or adhesion, closing it.

When the anus is only covered with skin, and its place pointed out by a prominence, arising from the contents

of the rectum, we have only to make an opening with a knife, sufficient to let out the meconium. Levret recommends making a circular incision in the membrane; but, a transverse cut is sufficient. A small tent of lint is afterwards to be introduced, in order to keep the opening from closing. If the anus should only be partly closed by a membrane, the opening may be dilated with a tent; but, if the aperture should be very small, it is preferable to use the bistoury for its enlargement.

When no external appearance denotes where the situation of the anus ought to be, the case is much more serious and embarrassing; and this, whether the intestine is stopped up by a fleshy adhesion, or the coalescence of its sides, or whether a part of the gut is wanting.

However, it is the surgeon's duty to do every thing in his power to afford relief. For this purpose, an incision, an inch long, is to be made in the situation where the anus ought to be, and the wound is to be carried more and more deeply in the natural direction of the rectum. The cuts are not to be made directly upwards, nor in the axis of the pelvis, for the vagina, or bladder, might thus be wounded. On the contrary, the operator should cut backward, along the concavity of the os coccygis, where there is no danger of wounding any part of importance. In all cases of this kind, the surgeon's finger is the best director. The operator, guided by the index finger of his left hand, introduced within the os coccygis, is to dissect in the direction above recommended, until he reaches the fæces, or has cut as far as he can reach with his finger. If he should fail in finding the meconium, as death must unavoidably follow, one more attempt ought to be made, by introducing, upon the finger, a long trocar, in such a direction as seems best calculated for finding the rectum.

By the prudent adoption of such proceedings, many infants have been preserved, which otherwise would have been devoted to certain death. Hildanus, La Motte, Roonhuysen, and many others, have successfully adopted the above practice. Mr. B. Bell informs us, he has seen two of these cases, in which the intestine was very distant from the integuments, and in which he was so successful, as to form an anus, which fulfilled its office tolerably well for several years; but, he found it exceedingly difficult to keep the passage sufficiently large and pervious. As soon as he removed the dossils of lint, and other kinds of tents, used for maintaining the necessary dilatation, such a degree of contraction speedily followed, that the evacuation of the intestinal matter became very difficult, for a long while afterwards. He employed, at different times, tents made of sponge, gentian root, and other substances, which swell on being moistened. But these always produced so much pain and irritation, that it was impossible to persevere in their use. After remarking such inconveniences, he recommends, in opposition to the advice of other authors, not to make use of such tents in these cases. He is of opinion, that whoever makes trial of them upon parts, as sensible as the rectum, will soon find, that the advice of the writers alluded to is ill founded.

Tents, made of very soft lint, dipped in oil, or rolls of bougie plaster, cause less irritation, than those composed of any other materials.

Though keeping the opening dilated may seem simple and easy, to such men as have had no opportunities of seeing cases of this description, it is far otherwise in practice. Mr. Bell assures us, that he never met with any disease, which gave him so much trouble and embarrassment, as he experienced in the two cases of this sort, which occured in his practice. Although in both instances he at first made the openings sufficiently large, it was only by very assiduous attention, for eight or ten months, that the necessity for another operation, and even repeated ones, was prevented. When only the skin has been divided, the rest of the treatment is doubtless more simple; for, then, nothing more is requisite, than keeping a piece of lint, for a few days, in the opening made with the knife. But, when the extremity of the rectum is at a certain distance, though we may generally hope to effect a cure, after having succeeded in giving vent to the intestinal matter; yet, the treatment, after the operation, will always demand a great deal of attention and care on the part of the surgeon, for a long while. The difficulty of success may be considered as, in some measure, proportioned to the depth of the necessary incision.

Sometimes, while the anus appears pervious and well-formed, infants suffer the same symptoms, as if there were no anus at all. The reason of this depends upon the intestine being occasionally closed by a membranous partition, situated more or less upward, above the aperture of the anus, and, sometimes the symptoms are owing to the termination of the gut in a cul-de-sac. This erroneous formation may always be suspected, whenever an infant, whose anus is externally open, does not void any excrement, for two or three days after its birth, and, especially, when urgent symptoms arise, such as swelling of the belly, vomiting, &c. We are now to endeavour to ascertain, whether the rectum is impervious above the anus, by attempting to inject glysters, or to introduce a probe. If the gut be shut up, there is nothing to be done, but having recourse to the method described above, and forming a communication by means of a bistoury guided on the finger, or else with a pharyngotomus. If the obstacle should only consist of a transverse membrane, the operation will be easy, and its success almost certain. But, if there should be a strangulation, or obstruction of the intestine, the case is infinitely more serious. However, as the operation is the only resource for saving the child's life, we ought not to hesitate about performing it.

When the anus is imperforate, the intestine sometimes opens into the vagina, or bladder. The first of these cases is the least dangerous of all the malformations of this sort. The intestine may also open, and terminate at two places, at the same time, viz. at the usual place, so as to form a proper anus, more or less perfect; and also in the vagina.

If these two openings should be ample enough for the easy evacuation of the excrement, nothing can be done at so tender an age; for, though voiding the fæces through the vagina, is a most unpleasant inconvenience, yet, there is no effectual means of closing the opening of the intestine in this situation, nor could one be devised, which would not seriously incommode the infant.

But, when the two openings are exceedingly small, and the alvine evacuations cannot readily pass out, even with the aid of glysters, the opening of the anus ought to be dilated by cannulæ of different sizes. If this method should not avail, the knife must be employed, and the wound dressed, as already explained.

For the most part, the intestine has only one opening in the vagina. In this circumstance, as in the instance in which the fæces have no vent at all, we must make an incision in that place, which the anus ought to occupy. The natural course of the fæces being opened by the operation, which in such a case is not at all perilous, much less excrement will pass out of the vagina, and, of course, the infirmity will be diminished. By the introduction of a tube into the new anus, the communication between the rectum and vagina might possibly be obliterated, and a perfect cure accomplished. The opening between the intestine and vagina, may, also, be too small for the easy evacuation of the fæces, and this might even expose the infant to the same sort of dangerous symptoms, as it would be subject to, if the rectum had positively no opening at all.

In male infants, the rectum sometimes opens into the bladder, and, in this circumstance, there is generally no anus. The case is easily known by the meconium being blended with the urine, which acquires a thick greenish appearance, and is voided almost continually, though in small quantities. The most fluid part of the meconium, is the only one voided in this manner. The thicker part not getting from the rectum into the bladder, nor from the bladder into the urethra, greatly distends the intestines and bladder, and produces the same symptoms, as take place, in case of total imperforation. Hence, without the speedy interference of art to form an anus, capable of giving vent to the fæces, with which the urinary organs cannot remain obstructed, the infant will inevitably die. This case must, therefore, be treated like the foregoing ones. Though we can hardly hope to completely prevent the inconveniences, resulting from the rectum opening into the bladder, since even a new passage will not completely hinder the fæces from following the other course; yet, we shall thus afford the child a very good chance of preservation, and the only one which its situation will allow.

In cases, in which we cannot procure an outlet for the fæces, by any of the methods pointed out above, it has been proposed to make an opening into the

abdomen above the pubis, or on the right side, in order to get at the colon, and form an artificial anus, in one of these situations. But the prospect of success would be so small, that the plan is not likely to be much adopted. (See *Médicine Opératoire, par Sabatier.*)

ANUS, ABSCESSES OF. *Fistula in Ano.*

The custom of giving the appellation of *fistula* to every collection of matter formed near to the anus, has, by conveying a false notion of them, been productive of such methods of treating them, as are diametrically opposite to those which ought to be pursued.

A small orifice or outlet from a large or deep cavity, discharging a thin gleet, or sanies, made a considerable part of the idea, which our ancestors had of a fistulous sore, wherever seated. With the term fistulous, they always connected a notion of callosity: and, therefore, whenever they found such a kind of opening yielding such sort of discharge, and attended with any degree of induration, they called the complaint a *fistula*. Imagining this callosity to be a diseased alteration made in the very structure of the parts, they had no conception that it could be cured by any means, but by removal with a cutting instrument, or by destruction with escharotics: and, therefore, they immediately attacked it with knife or caustic, in order to accomplish one of these ends: and very terrible work they often made.

That abscesses, formed near the fundament, do sometimes, from bad habits, from extreme neglect, or from gross mistreatment, become fistulous, is certain; but the majority of them have not, at first, any one character or mark of a true fistula; nor can, without the most supine neglect on the side of the patient, or the most ignorant mismanagement on the part of the surgeon, degenerate, or be converted into one.

Collections of matter from inflammation (wherever formed) if they be not opened in time, and in a proper manner, do often burst. The hole, through which the matter finds vent, is generally small, and not often situated in the most convenient, or most dependent part of the tumour: it therefore is unfit for the discharge of all the contents of the abscess; and, instead of closing, contracts itself to a smaller size, and becoming hard at its edges, continues to drain off what is furnished by the undigested sides of the cavity.

When an abscess about the anus bursts, the smallness of the accidental orifice; the hardness of its edges; its being found to be the outlet from a deep cavity; the daily discharge of a thin, gleety, discoloured kind of matter; and the induration of the parts round about, have all contributed to raise, and confirm the idea of a true fistula.

Upon this idea was built the old pernicious doctrine of free excision, or as free destruction.

Abscesses about the anus present themselves in different forms.

Sometimes the attack is made with symptoms of high inflammation; with pain, fever, rigor, &c. and the fever ends as soon as the abscess is formed.

In this case, a part of the buttock near to the anus is considerably swollen, and has a large circumscribed hardness. In a short time, the middle of this hardness becomes red, and inflamed; and in the centre of it matter is formed.

This (in the language of our ancestors) is called in general a *phlegmon*; but when it appears in this particular part, a *phyma*.

The pain is sometimes great, the fever high, the tumour large, and exquisitely tender; but however disagreeable the appearances may have been, or however high the symptoms may have risen, before suppuration, yet, when that end is fairly and fully accomplished, the patient generally becomes easy and cool; and the matter formed under such circumstances, though it may be plentiful, yet is good.

On the other hand, the external parts, after much pain, attended with fever, sickness, &c, are sometimes attacked with considerable inflammation, but without any of that circumscribed hardness, which characterized the preceding tumour; instead of which, the inflammation is extended largely and the skin wears an erysipelatous kind of an appearance. In this, the disease is more superficial; the quantity of matter small, and the cellular membrane sloughy to a considerable extent.

Sometimes, instead of either of the preceding appearances, there is formed in this part, what the French call *une suppuration gangreneuse*; in which the cellular and adipose membrane is affect-

ed in the same manner, as it is in the disease called a carbuncle.

In this case the skin is of a dusky red or purple kind of colour; and although harder than when in a natural state, yet it has, by no means, that degree of tension or resistance, which it has either in the phlegmon, or in the erysipelas.

The patient has generally, at first, a hard, full, jarring pulse, with great thirst, and very fatiguing restlessness. If the progress of the disease be not stopped, or the patient relieved by medicine, the pulse soon changes into an unequal, low, faultering one; and the strength and the spirits sink in such manner, as to imply great and immediately-impending mischief. The matter formed under the skin, so altered, is small in quantity, and bad in quality; and the adipose membrane is gangrenous and sloughy throughout the extent of the discoloration. This generally happens to persons, whose habit is either naturally bad, or rendered so by intemperance.

In each of these different affections, the whole malady is often confined to the skin and cellular membrane underneath it; and no other symptoms attend, than the usual general ones, or such as arise from the formation of matter or sloughs in the part immediately affected. But it also often happens, that, added to these, the patient is made unhappy by complaints arising from an influence, which such mischief has on parts in the neighbourhood of the disease; such as the urinary bladder, the vagina, the urethra, the hemorrhoidal vessels, and the rectum; producing retention of urine, strangury, dysury, bearing down, tenesmus, piles, diarrhœa, or obstinate costiveness: which complaints are sometimes so pressing, as to claim all our attention. On the other hand, large quantities of matter, and deep sloughs are sometimes formed, and great devastation committed on the parts about the rectum, with little or no previous pain, tumour, or inflammation.

Sometimes the disease makes its first appearance in an induration of the skin, near to the verge of the anus, but without pain or alteration of colour; which hardness gradually softens and suppurates. The matter, when let out, in this case, is small in quantity, good in quality; and the sore is superficial, clean, and well-conditioned. On the contrary, it now and then happens, that although the pain is but little, and the inflammation apparently slight, yet the matter is large in quantity, bad in quality, extremely offensive, and proceeds from a deep crude hollow, which bears an ill-natured aspect.

The place also where the abscess points, and where the matter, if let alone, would burst its way out, is various and uncertain. Sometimes it is in the buttock, at a distance from the anus; at other times near its verge, or in the perineum: and this discharge is made sometimes from one orifice only, sometimes from several. In some cases, there is not only an opening through the skin externally, but another through the intestine into its cavity: in others, there is only one orifice and that either, external, or internal.

Sometimes the matter is formed at a considerable distance from the rectum, which is not even laid bare by it; at others, it is laid bare also, and not perforated: it is also sometimes not only denuded, but pierced; and that in more places than one.

All consideration of preventing suppuration, is generally out of the question: and our business, if called at the beginning, must be to moderate the symptoms; to forward the suppuration; when the matter is formed, to let it out; and to treat the sore in such manner, as shall be most likely to produce a speedy and lasting cure.

When there are no symptoms which require particular attention, and all that we have to do is to assist the maturation of the tumour, a soft poultice is the best application. When the disease is fairly of the phlegmonoid kind, the thinner the skin is suffered to become, before the abscess be opened, the better; as the induration of the parts about will thereby be the more dissolved, and consequently, there will be the less to do after such opening has been made. This kind of tumour is generally found in people of full, sanguine habits; and who, therefore, if the pain be great, and the fever high, will bear evacuation, both by phlebotomy, and gentle cathartics: which is not often the case of those, who are said to be of bilious constitutions; in whom the inflammation is of larger extent, and in which the skin wears the yellowish tint of the erysipelas; persons of such kind of ha-

bit, and in such circumstances, being in general seldom capable of bearing large evacuation.

When the inflammation is erysipelatous, the quantity of matter formed is small, compared with the size and extent of the tumour; the disease is rather a sloughy, putrid state of the cellular membrane, than an imposthumation; and therefore, the sooner it is opened, the better: if we wait for the matter to make a point, we shall wait for what will not happen; at least, not till after a considerable length of time: during which, the disease in the membrane will extend itself, and, consequently, the cavity of the sinus, or abscess, be thereby greatly increased.

When, instead of either of the preceding appearances, the skin wears a dusky, purplish-red colour; has a doughy, unresisting kind of feel, and is very little sensible: when these circumstances are joined with an unequal, faultering kind of pulse, irregular shiverings, a great failure of strength and spirits, and inclination to doze, the case is formidable, and the event generally fatal.

The habit, in these circumstances, is always bad; sometimes from nature, but much more frequently from gluttony and intemperance. What assistance art can lend, must be administered speedily; every minute is of consequence; and if the disease be not stopped, the patient will sink. Here is no need for evacuation of any kind: recourse must be immediately had to medical assistance; the part affected should be frequently fomented with hot spirituous fomentations; a large and deep incision should be made into the diseased parts, and the application made to it should be of the warmest, most antiseptic kind.

This also is a general kind of observation, and equally applicable to the same sort of disease in any part of the body. Our ancestors have thought fit to call it in some a carbuncle, and in others, by other names; but it is (wherever seated) really and truly, a gangrene of the cellular and adipose membrane; it always implies great degeneracy of habit, and, most commonly, ends ill.

Strangury, dysury, and even total retention of urine, are no very uncommon attendants upon abscesses forming in the neighbourhood of the rectum and bladder; more especially, if the seat of them be near the neck of the latter.

They sometimes continue from the first attack of the inflammation, until the matter is formed, and has made its way outward; and sometimes last a few hours only.

The two former most commonly are easily relieved by the loss of blood, and the use of gum-arabic, with nitre, &c. But the last (the total retention,) they who have not often seen this case, generally have immediate recourse to the catheter; but the practice is essentially wrong.

The neck of the bladder does certainly participate, in some degree, in the said inflammation. But, the principal part of the complaint arises from irritation, and the disease is, strictly speaking, spasmodic. The manner in which an attack of this kind is generally made; the very little distention which the bladder often suffers; the small quantity of urine sometimes contained in it, even when the symptoms are most pressing; and the most certain, as well as safe, method of relieving it; all tend to strengthen such opinion.

But whether we attribute the evil to inflammation, or to spasmodic irritation, whatever can, in any degree, contribute to the exasperation of either, must be manifestly wrong. The violent passage of the catheter through the neck of the bladder (for violent in such circumstances it must be) can never be right.

If the instrument be successfully introduced, it must either be withdrawn as soon as the bladder is emptied, or it must be left in it: if the former be done, the same cause of retention remaining, the same effect returns; the same pain and violence must again be submitted to, under (most likely) increased difficulties. On the other hand, if the catheter be left in the bladder, it will often, while its neck is in this state, occasion such disturbance, that the remedy (as it is called) will prove an exasperation of the disease, and add to the evil it is designed to alleviate; nor is this all; for the resistance which the parts, while in this state, make, is sometimes so great, that if any violence be used, the instrument will make for itself a new rout in the neighbouring parts, and lay the foundation of such mischief as frequently baffles all our art.

The true, safe, and rational method of relieving this complaint is by evacuation and anodyne relaxation: this not only procures immediate ease, but does, at the same time, serve another very material purpose; which is that of maturating the abscess. Loss of blood is necessary; the quantity to be determined by the strength and state of the patient: the intestines should also be emptied, if there be time for so doing, by a gentle catharthic; but the most effectual relief will be from the warm bath, or semicupium, the application of bladders with hot water to the pubes and perineum, and, above all other remedies, the injection of glysters, consisting of warm water, oil, and opium. There may have been cases which have resisted and baffled this method of treatment; but Pott has never met with them.

A painful tenesmus is no uncommon attendant upon an inflammation of the parts about the rectum.

If a dose of rhubarb, joined with a warm anodyne, such as the conf. mithrid. or such-like, does not remove it, the injection of thin starch and opium, or tinct. thebaic. is almost infallible.

The bearing down, in females, as it proceeds in this case, from the same kind of cause (viz. irritation) admits relief from the same means as the tenesmus.

In some habits an obstinate costiveness attends this kind of inflammation, accompanied, not unfrequently, with a painful distention and enlargement of the hemorrhoidal vessels, both internally and externally. While a quantity of hard fæces are detained within the large intestines, the whole habit must be disordered; and the symptomatic fever, which necessarily accompanies the formation of the matter, must be considerably heightened. And while the vessels surrounding the rectum (which are large and numerous) are distended, all the ills preceding from pressure, inflammation, and irritation, must be increased. Phlebotomy, laxative glysters, and a low, cool regimen, must be the remedies; while a soft cataplasm applied externally serves to relax and mollify the swollen, indurated piles, at the same time that it hastens the suppuration.

When the abscesses have formed, and are fit to be opened, or when they have already burst, they may be reduced to two general heads, viz.

1. Those, in which the intestine is not at all interested; and,

2. Those, in which it is either laid bare, or perforated.

In making the opening, the knife or lancet should be passed in deep enough to reach the fluid; and, when it is in, the incision should be continued upward and downward, in such manner as to divide all the skin covering the matter. By these means, the contents of the abscess will be discharged at once; future lodgment of matter will be prevented; convenient room will be made for the application of proper dressings; and there will be no necessity for making the incision in different directions, or for removing any part of the skin composing the verge of the anus.

Notwithstanding all these collections of matter are generally called *fistulæ*, and are all supposed to affect the intestinum rectum, yet it is very certain that the seat of the abscess, is sometimes at such distance from the gut, that it is not at all interested by it; and that none of these cases either are, or can be originally *fistulæ*.

In this state of the disease, we have no more necessarily to do with the intestine, than if it was not there; the case is to be considered merely as an abscess in the cellular membrane.

Suppose a large and convenient opening to have been made by a simple incision; the contents of the abscess to have been thereby discharged; and a sore or cavity produced, which is to be filled up.

The term *filling up*, and the former opinion, that the induration of the parts about is a diseased callosity, have been the two principal sources of misconduct in these cases.

The old opinion, with regard to hollow and hardness, was that the former is caused entirely by loss of substance: and the latter, by diseased alteration in the structure of the parts.

The consequence of which opinion was, that as soon as the matter was discharged, the cavity was filled and distended, in order to procure a gradual regeneration of flesh, and the dressings, with which it was so filled, were most commonly of the escharotic kind, intended for the dissolution of hardness.

The practice is a necessary conse-

quence of the theory. Whoever supposes diseased callosity, and great loss of substance, will necessarily think himself obliged to destroy the former, and to prevent the cavity, formed by the latter, from filling up too hastily. On the other hand, he who regards the cavity of the abscess as being principally the effect of the gradual distraction and separation of its sides, with very little loss of substance, compared with the size of the said cavity; and who looks upon the induration round about, as nothing more than a circumstance which necessarily accompanies every inflammation in membranous parts, more especially in those which tend to suppuration; will, upon the smallest reflection, perceive, that the dressings applied to such cavity ought to be so small in quantity, as to permit nature to bring the sides of the cavity toward each other, and that such small quantity of dressings ought to consist of materials proper only to encourage easy and gradual suppuration.

Suppuration is to be produced and maintained, not by thrusting in such applications, as by their quantity distend, and by their quality irritate and destroy; but by dressing slightly and easily with such as appease, relax and soften.

If the hollow, immediately it is opened, be filled with dressings (of any kind,) the sides of it will be kept from approaching each other, or may even be farther separated. But if this cavity be not filled, or have little or no dressings of any kind introduced into it, the sides immediately collapse; and, coming nearer and nearer, do, in a very short space of time, convert a large hollow into a small sinus. And this is also constantly the case, when the matter instead of being let out by an artificial opening, escapes through one made by the bursting of the containing parts.

True, this sinus will not always become perfectly closed; but the aim of nature is not, therefore, the less evident; nor the hint, which art ought to borrow from her, the less palpable.

In this, as in most other cases, where there are large sores, or considerable cavities, a great deal will depend on the patient's habit, and the care that is taken of it: if that be good, or if it be properly corrected, the surgeon will have very little trouble in his choice of dressings; only to take care that they do not offend either in quantity or quality: but if the habit be bad, or injudiciously treated, he may use the whole farrago of externals, and only waste his own and his patient's time.

By light, easy treatment, large abscesses formed in the neighbourhood of the rectum will sometimes be cured, without any necessity occurring of meddling with the said gut. But it much more frequently happens, that the intestine, although it may not have been pierced or eroded by the matter, has yet been so stripped or denuded, that no consolidation of the sinus can be obtained, but by a division; that is, by laying the two cavities, viz. that of the abscess, and that of the intestine, into one.

When the intestine is found to be separated from the surrounding parts by the matter, the operation of dividing it had better (on many accounts) be performed at the time the abscess is first opened, than be deferred to a future one. For, if it be done properly, it will add so little to the pain, which the patient must feel by opening the abscess, that he will seldom be able to distinguish the one from the other, either with regard to time or sensation: whereas, if it be deferred, he must either be in continual expectation of a second cutting, or feel one at a time when he does not expect it.

The intention in this operation is to divide the intestine rectum from the verge of the anus up as high as the top of the hollow in which the matter was formed; thereby to lay the two cavities of the gut and abscess into one; and by means of an open, instead of a hollow or sinuous sore, to obtain a firm and lasting cure.

For this purpose, the curved, probe-pointed knife, with a narrow blade, is the most useful and handy instrument of any. This, introduced into the sinus, while the surgeon's fore-finger is in the intestine, will enable him to divide all that can ever require division; and that with less pain to the patient, with more facility to the operator, as well as with more certainty and expedition than any other instrument whatever. If there be no opening in the intestine, the smallest degree of force will thrust the point of the knife through and thereby make one: if there be one already, the same point will find and pass through it. In either case, it will

be received by the finger in ano; will thereby be prevented from deviating, and being brought out by the same finger, must necessarily divide all that is between the edge of the knife, and the verge of the anus: that is, must by one simple incision (which is made in the smallest space of time imaginable) lay the two cavities of the sinus and of the intestine into one.

Authors make very formal distinction between those cases in which the intestine is pierced by the matter, and and those in which it is not; but although this distinction may be useful when the different states of the disease are to be described, yet in practice, when the operation of dividing the gut becomes necessary, such distinction is of no consequence at all; it makes no alteration in the degree, kind, or quantity of pain which the patient is to feel; the force required to push the knife through the tender gut is next to none, and when its point is in the cavity, the cases are exactly similar.

Immediately after the operation, a soft dossil of fine lint should be introduced (from the rectum) between the divided lips of the incision; as well to repress any slight hemorrhage, as to prevent the immediate reunion of the said lips; and the rest of the sore should be lightly dressed with the same. This first dressing should be permitted to continue, until a beginning suppuration renders it loose enough to come away easily; and all the future ones should be as light, soft, and easy as possible; consisting only of such materials as are likely to promote kindly and gradual suppuration. The sides of the abscess are large; the incision must necessarily, for a few days, be inflamed; and the discharge will, for some time, be discoloured and gleety: this induration, and this sort of discharge, are often mistaken for signs of diseased callosity, and undiscovered sinuses; upon which presumptions, escharotics are freely applied, and diligent search is made for new hollows; the former of these most commonly increase both the hardness and the gleet; and by the latter new sinuses are sometimes really produced. These occasion a repetition of escharotics, and, perhaps, of incisions; by which means, cases which at first, and in their own nature were simple and easy of cure, are rendered complex and tedious.

To quit reasoning, and speak to fact only: In the great number of these cases, which must have been in St. Bartholomew's Hospital, within these ten or twelve years, *I do aver*, (says Pott) *that I have not met with one, in the circumstances before described, that has not been cured by mere simple division, together with light, easy dressings: and that I have not, in all that time, used, for this purpose, a single grain of præcipitate, or of any other escharotic.*

The best and most proper method of dividing the intestine, in the case of a collection of matter formed juxta anum, we have already described.

The intention to be aimed at by incision in the present case, is exactly the same, and ought to be executed in the same manner.

Let us first suppose the matter to be fairly formed; to have made its point, as it is called; and to be fit to be let out.

Where such a point is, that is, where the skin is most thin, and the fluctuation most palpable, there the opening most certainly ought to be made, and always with a cutting instrument, not caustic, as was formerly done.

We have supposed the matter of the abscess to have been formed, and collected; but still to have been contained within the cavity, until let out by an incision.

We are now to consider it, as having made its own way out, without the help of art.

This state of the disease is also subject to some variety of appearance; and these different appearances have produced, not only a multiplicity of appellations, but a groundless supposition also, of a variety of essentially different circumstances.

When a discharge of the matter by incision is too long delayed or neglected, it makes its own way out, by bursting the external parts somewhere near to the fundament, or by eroding and making a hole through the intestine into its cavity; or sometimes by both, In either case, the discharge is made sometimes by one orifice only, and sometimes by more. Those, in which the matter has made its escape by one or more openings, through the skin only, are called *blind external fistulæ;* those, in which the discharge has been made into the cavity of the intestine, without any orifice in the skin, are na-

med *blind, internal;* and those, which have an opening both through the skin, and into the gut, are called *complete fistulæ.*

Thus, all these cases are deemed fistulous, when hardly any of them ever are so; and none of them necessarily. They are still mere abscesses, which are burst without the help of art; and if taken proper and timely care of will require no such treatment as a true fistula may possibly stand in need of.

The most frequent of all are what are called the *blind, external;* and the *complete.* The method whereby each of these states may be known is, by introducing a probe into the sinus by the orifice in the skin, while the fore-finger is within the rectum: this will give the examiner an opportunity of knowing exactly the true state of the case, with all its circumstances.

Whether the case be, what is called a complete fistula, or not; that is, whether there be an opening in the skin only, or one there, and another in the intestine, the appearance to the eye is much the same. Upon discharge of the matter, the external swelling subsides, and the inflamed colour of the skin disappears, the orifice, which at first was sloughy and foul, after a day or two are past, becomes clean and contracts in size; but the discharge, by fretting the parts about, renders the patient still uneasy.

As this kind of opening seldom proves sufficient for a cure, (though it sometimes does) the induration, in some degree, remains; and if the orifice happens not to be a depending one, some part of the matter lodges, and is discharged by intervals, or may be pressed out by the fingers of an examiner. The disease, in this state, is not very painful; but it is troublesome, nasty and offensive; the continual discharge of a thin kind of fluid from it, creates heat, and causes excoriation in the parts about; it daubs the linen of the patient; and is, at times, very fetid; the orifice also sometimes contracts so, as not to be sufficient for the discharge; and the lodgment of the matter then occasions fresh disturbance.

The means of cure proposed and practised by our ancestors, were three, viz. caustic, ligature, and incision.

The intention in each of these is the same, viz. to form one cavity of the sinus and intestine, by laying the former into the latter. The two first are now completely, and most properly exploded.

Hitherto we have considered the disease either as an abscess, from which the matter has been let out by an incision, made by a surgeon; or from which the contents have been discharged by one single orifice, formed by the bursting of the skin somewhere about the fundament.—Let us now take notice of it, when instead of one such opening, there are several.

This state of the case generally happens when the quantity of matter collected has been large, the inflammation of considerable extent, the adipose membrane very sloughy, and the skin worn very thin before it burst.—It is, indeed, a circumstance of no real consequence at all; but from being misunderstood, or not properly attended to, is made one of additional terror to the patient, and additional alarm to the inexperienced practitioner: for it is taught, and frequently believed, that each of these orifices is an outlet from, or leads to a distinct sinus, or hollow; whereas in truth, the case is most commonly, quite otherwise; all these openings are only so many distinct burstings of the skin covering the matter; and do all, be they few or many, lead and open immediately into the one single cavity of the abscess: they neither indicate, nor lead to, nor are caused by distinct sinuses; nor would the appearance of twenty of them (if possible) necessarily imply more than one general hollow.

If this account be a true one, it will follow, that the chirurgic treatment of this kind of case ought to be very little, if at all, different from that of the preceding; and that all that can be necessary to be done, must be to divide each of these orifices in such manner as to make one cavity of the whole. This the probe-knife will easily and expeditiously do; and when that is done, if the sore, or more properly its edges, should make a very ragged, uneven appearance, the removal of a small portion of such irregular angular parts will answer all the purposes of making room for the application of dressings, and for producing a smooth, even cicatrix after the sore shall be healed.

When a considerable quantity of matter has been recently let out, and the internal parts are not only in a crude, undigested state, but have not yet had time to collapse, and approach

each other; the inside of such cavity will appear large; and if a probe be pushed with any degree of force, it will pass in more than one direction into the cellular membrane by the side of the rectum. But let not the unexperienced practitioner be alarmed at this, and immediately fancy that there are so many distinct sinuses; neither let him, if he be of a more hardy disposition, go to work immediately with his director, knife, or scissars: let him enlarge the external wound by making his incision freely; let him lay all the separate orifices open into that cavity; let him divide the intestines lengthwise by means of his finger in ano; let him dress lightly and easily; let him pay proper attention to the habit of the patient; and wait, and see what a few days, under such conduct, will produce. By this he will frequently find, that the large cavity of the abscess will become small and clean; that the induration round about will gradually lessen; that the probe will not pass in that manner into the cellular membrane; and consequently, that his fears of a multiplicity of sinuses were groundless. On the contrary, if the sore be crammed or dressed with irritating, or escharotic medicines, all the appearances will be different: the hardness will increase, the lips of the wound will be inverted, the cavity of the sore will remain large, crude, and foul; the discharge will be thin, gleety, and discoloured; the patient will be uneasy and feverish; and, if no new cavities are formed by the irritation of parts, and confinement of matter, yet the original one will have no opportunity of contracting itself; and may very possibly become truly fistulous.

Sometimes the matter of an abscess, formed juxta anum, instead of making its way out through the skin, externally near the verge of the anus, or in the buttock, pierces through the intestine only. This is what is called a *blind internal fistula.*

In this case, after the discharge has been made, the greater part of the tumefaction subsides, and the patient becomes easier. If this does not produce a cure, which sometimes, though very seldom, happens, some small degree of induration generally remains in the place where the original tumour was; upon pressure on this hardness, a small discharge of matter is frequently made per anum; and sometimes the expulsion of air from the cavity of the abscess into that of the intestine may very palpably be felt, and clearly heard; the stools, particularly, if hard, and requiring force to be expelled, are sometimes smeared with matter; and although the patient, by the bursting of the abscess, is relieved from the acute pain which the collection occasioned, yet he is seldom perfectly free from a dull kind of uneasiness, especially if he sits for any considerable length of time in one posture. The real difference between this kind of case, and that in which there is an external opening (with regard to method of cure) is very immaterial, for an external opening must be made, and then all difference ceases. In this, as in the former, no cure can reasonably be expected, until the cavity of the abscess, and that of the rectum are made one; and the only difference is, that in the one case we have an orifice at, or near the verge of the anus, by which we are immediately enabled to perform that necessary operation; in the other, we must make one.

We come now to that state of the disease, which may truly and properly be called *fistulous.* This is generally defined, *sinus angustus, callosus, profundus; acri sanie diffluens:* or, as Dionis translates it, "*Un ulcére profond, & Caverneux, dont l'entrée, est etroite, & le fond plus large; avec issue d'un pus acre & virulent; et accompagné de callosités.*"

Various causes may produce or concur in producing such a state of the parts concerned as will constitute a fistula, in the proper sense of the word; that is, a deep, hollow sore, or sinus, all parts of which are so hardened, or so diseased, as to be absolutely incapable of being healed, while in that state; and from which a frequent, or daily discharge is made, of a thin, discoloured sanies, or fluid.

These are divided into two classes, viz. those which are the effect of neglect, distempered habit, or of bad management, and which may be called, without any great impropriety, local diseases; and those which are the consequence of disorders, whose origin and seat is not in the immediate sinus or fistula, but in parts more or less distant, and, which, therefore, are not local complaints.

The natures and characters of these are obviously different by description; but they are still more so in their most frequent event, the former being gene-

rally curable by proper treatment; the latter frequently not so by any means whatever.

Under the former are reckoned all such cases as were originally mere collections of matter within the coats of the intestine rectum, or in the cellular membrane surrounding the said gut; but which, by being long neglected, grossly managed, or, by happening in habits which were disordered, and for which disorders no proper remedies were administered, suffer such alteration, and get into such state, as to deserve the appellation of *fistulæ*.

Under the latter, are comprised all those cases in which the disease has its origin and first state in the higher and more distant parts of the pelvis, about the os sacrum, lower vertebræ of the loins, and parts adjacent thereto; and are either strumous, or the consequence of long and much distempered habits; or the effect of, or combined with other distempers, local, or general; such as a diseased neck of the bladder, or prostate gland, or urethra, &c. &c. &c.

Among the very low people, who are brought into hospitals, we frequently meet with cases of the former kind: cases, which, at first, were mere simple abscesses; but which from uncleanliness, from intemperance, negligence, and distempered constitutions, become such kind of sores, as may be called *fistulous*.

In these the art of surgery is undoubtedly, in some measure, and at some time, necessary; but it very seldom is the first or principal fountain from whence relief is to be sought: the general effects of intemperance, or debauchery, and diseases of the habit are first to be corrected and removed, before surgery can with propriety, or with reasonable prospect of advantage be made use of.

The surgery required in these cases, consists in laying open and dividing the sinus, or sinuses, in such manner that there may be no possible lodgment for matter, and that such cavities may be fairly opened lengthwise into that of the intestine rectum: if the internal parts of these hollows are hard, and do not yield good matter, which is sometimes the case, more especially where attempts have been made to cure by injecting astringent liquors, such parts should be lightly scratched or scarified with the point of a knife or lancet, but not dressed with escharotics; and if, either from the multiplicity of external orifices, or from the loose, flabby, hardened, or inverted state of the lips and edges of the wound near to the fundament, it seems very improbable that they can be got into such a state as to heal smooth and even, such portion of them should be cut off as may just serve that purpose. The dressings should be soft, easy, and light; and the whole intent of them to produce such suppuration as may soften the parts, and may bring them into a state fit for healing.

If a loose, fungous kind of flesh has taken possession of the inside of the sinus, (a thing much talked of, and very seldom met with) a slight touch of the lunar caustic will reduce it sooner, and with better effect on the sore, than any other escharotic whatever.

The method and medicines by which the habit of the patient was corrected, must be continued (at least in some degree) through the whole cure; and all those excesses and irregularities which may have contributed to injure it, must be avoided.

By these means, cases which at first have a most disagreeable and formidable aspect, are frequently brought into such state, as to give very little trouble in the healing.

If the bad state of the sore arises merely from its having been crammed, irritated, and eroded; the method of obtaining relief is so obvious, as hardly to need recital.

A patient who has been so treated, has generally some degree of fever; has a pulse which is too hard, and too quick; is thirsty, and does not get his due quantity of natural rest. A sore which has been so dressed, has generally a considerable degree of inflammatory hardness round about; the lips and edges of it are tumid, full, inflamed, and sometimes inverted; the whole verge of the anus is swollen; the hemorrhoidal vessels are loaded; the discharge from the sore is large, thin, and discoloured; and all the lower part of the rectum participates of the inflammatory irritation, producing pain, bearing-down, tenesmus, &c. *Contraria contrariis* is never more true than in this instance: the painful, uneasy state of the sore, and of the rectum, is the great cause of all the mischief, both general and particular; and the first intention must be to alter that. All escharotics must be thrown out, and disused; and in lieu of them, a soft diges-

tive should be substituted, in such manner as not to cause any distention, or to give any uneasiness from quantity; over which a poultice should be applied: these dressings should be renewed twice a day; and the patient should be enjoined absolute rest. At the same time, attention should be paid to the general disturbance, which the former treatment may have created. Blood should be drawn off from the sanguine; the feverish heat should be calmed by proper medicines; the languid and low should be assisted with the bark and cordials; and ease in the part must, at all events, be obtained by the injection of anodyne clysters of starch and opium.

If the sinus has not yet been laid open, and the bad state of parts is occasioned by the introduction of tents imbued with escharotics, or by the injection of astringent liquors, (the one for the destruction of callosity, the other for the drying up gleet and humidity) no operation of any kind should be attempted until both the patient and the parts are easy, cool, and quiet: cataplasms, clysters, rest, and proper medicines must procure this: and when that is accomplished, the operation of dividing the sinus, and (if necessary) of removing a small portion of the ragged edges, may be executed, and will, in all probability, be attended with success. On the contrary, if such operation be performed while the parts are in a state of inflammation, the pain will be great, the sore for several days very troublesome, and the cure prolonged or retarded, instead of being expedited.

Abscesses and collections of diseased fluids are frequently formed about the lumbar vertebræ, under the psoas muscle, and near to the os sacrum; in which cases, the said bones are sometimes carious, or otherwise diseased. These sometimes form sinuses, which run down by the side of the rectum, and burst near to the fundament.

The chirurgic treatment of such sores and sinuses can have little influence on the remote situation, where the collection of matter is originally formed. (See *Lumbar Abscess.*)

Fistulous sores, sinuses, and indurations about the anus, which are consequences of diseases of the neck of the bladder, and urethra, called fistulæ in perinæo, require separate and particular consideration. (See *Fistula in perinæo.*)

Pott may be considered as the source and authority of the foregoing remarks.

For information, relative to former opinions concerning *fistula in ano*, refer to *Celsus; Heister's Surgery; Le Dran's Operations; Sharp's Operations; La Faye's Notes on Dionis. In Kirkland's Medical Surgery, Vol. 2. may be found an account of the opinions and practice of many former celebrated practitioners. The best modern practical remarks are contained in Pott's Treatise on the Fistula in Ano, in which he has offered also an excellent critique on some opinions of Le Dran, De la Faye, and Cheselden. The reader may also consult with advantage Sabatier's Médicine Opératoire, Tom. 2; B. Bell's Surgery, Vol. 2; Latta's Surgery, Vol. 2.*

[See also the writings of Desault, in which are many valuable remarks on this subject.]

Anus, Prolapsus of. When a portion of the rectum is protruded out of the anus, in a preternatural degree, the disorder is termed *prolapsus ani.* Sometimes, only a very small part of the gut is thus displaced; on other occasions, there is a very considerable portion of it.

The sphincter ani, and the surrounding parts, serve, in the healthy state, as a base, and support, for the lower part of the rectum, and every thing, which tends to weaken them, tends, also, to produce a prolapsus ani.

The most common cause of this disease, however, is referrible to too violent and repeated exertions of the rectum itself, excited by some source of irritation about the extremity of this intestine. Thus, the too frequent employment of aloetic medicines, the action of which particularly affects the large intestines, often occasions the above consequence. The same thing results from small worms, known by the name of ascarides, and which, lodging about the lower part of the rectum, occasionally cause excessive irritation. Habitual costiveness; hemorrhoids; in a word, every thing, which by stimulating the rectum, excites too violent an action of this intestine, may induce the complaint under consideration.

There are numerous instances, in which a prolapsed portion of the rectum has remained, for a long while, unreduced, and in which, notwithstanding such neglect, no serious bad consequences have ensued. It follows from

this, that this bowel can bear exposure to the external air much better, than any other part of the intestinal canal. But, we ought never, on this account, to omit doing every thing in our power for the immediate reduction of the intestine. Authors of surgical works have, not uncommonly, recommended fomenting the prolapsed part with emollient and antiseptic decoctions, before making an attempt to reduce it. They even advise the operator, for the purpose of succeeding with more ease, to cover his fingers with linen, smeared with wax and oil. But, all such preparations are useless, and, when a surgeon is called to a patient afflicted with a prolapsus ani, the greatest service he can render, is to put back the displaced part, as quickly as possible, into its natural situation, without leaving the intestine exposed to the dangerous effects, which may arise during the time wasted in employing fomentations, &c. Also, as much greater manual dexterity can be made use of, when the fingers are perfectly uncovered, than when they have greasy gloves on, it is best not to follow the latter method. However, if it should be judged proper to cover the hands with any thing, a piece of fine cotton will best answer the purpose.

The patient being in bed, lying upon his side, or, what is better, on the abdomen, while his buttocks are raised rather higher than the rest of the body, the surgeon is to make strong, but equal pressure, with the palm of his hand on the lower portion of the prolapsed intestine. By continuing such pressure, the intestine may, in general, be easily reduced. But, if this plan should not suffice, the upper part of the protruded intestine must be compressed with the fingers of one hand, while the lower part is pressed upward by the palm of the other one. In this way, we are almost sure to succeed. It is true, that if, in consequence of having too long delayed the reduction, from some other cause, the gut has become much swollen and inflamed, it will be impossible to reduce the part, before such symptoms have been subdued. For this purpose, it may be proper to take some blood from the patient, in such quantity, as his strength will allow. The intestine may also be fomented with a warm solution of the acetite of lead, (saccharum saturni.) When the swelling has been diminished by these means, there will be no difficulty in replacing the parts, by pursuing the plan already explained.

The greatest difficulty is not the returning of the intestine, but keeping it in its place. The latter object often gives a great deal of trouble. For, after the bowel has frequently descended, the sphincter sometimes becomes so weakened, that it can no longer keep the part supported. Hence, the complaint not only recurs whenever the patient goes to stool; but, even whenever he walks, or places himself in an erect posture; as there are examples of.

Different bandages have been devised, for supporting the anus after its reduction. But, it is not an easy matter to invent one, which is in every respect adapted to what such an inconvenience requires. A compress, doubled several times, is usually applied to the anus, and supported in this position by means of a T bandage. In many cases, this method of keeping up the intestine answers very well. A machine was invented by Mr. Gooch, which has the double advantage of supporting the intestine more securely, than any other, with which we are acquainted, and of allowing the patient to take a great deal more exercise, than he could do without its assistance. (See *Gooch's Surgery.*)

But, what, in our opinion, is still better, than all such contrivances, are elastic gum pessaries, which were invented a few years ago by M. Bernard, an ingenious artist, who has employed this substance for making various things, which are used by surgeons. The instrument, which we have just mentioned consists of an oblong oval body, rounded at one end, and terminating at the other in a narrow, rather long neck, with a flat border at its extremity. The body of this instrument, when introduced into the intestine beyond the sphincter, dilates and supports the gut, while the sphincter embraces its neck, and the border of this part of the instrument hinders it from ascending too far up the rectum. A string is also attached to the edge, which tends to prevent the occurrence. This pessary is very smooth, and, consequently, cannot do any injury to the parts. It is also very light, being only composed of a very thin, though tolerably solid, substance. As it is pierced at its termination, it does not impede the discharge

of air, which might otherwise incommode the patient.

When the intestine is protruded at the time the patient is at stool, the part is to be immediately replaced. This the patient should accustom himself to do without assistance, and then the bandage, or pessary, is to be applied. In order to strengthen the sphincter ani and adjacent parts, the weakness of which must, in the majority of cases, be regarded as the entire cause of the disease, the patient should take preparations of bark and steel, make use of the cold bath, and frequently have cold water dashed against his buttocks and loins. Astringent injections, particularly, such as are composed of an infusion of gall-nuts, or oak-bark, are also very serviceable. A small quantity of alum, or sugar of lead, has sometimes been added to these injections; but, in general, all additions of saline substances are to be deemed improper, because salts usually produce an irritation of the intestine.

Diseases of this kind may always be cured, or at least palliated, so as to be very bearable, by the employment of some of the above means.

Before concluding this article, we shall observe, however, that a much more serious disorder has been confounded with the prolapsus ani; viz. one, in which a considerable portion of the colon, cæcum, and, even sometimes, of the ilium, becomes everted and pushed out at the anus. The generality of practitioners consider this occurrence in the same point of view, as the disease of which we have just been treating. In this case, they believe that the whole of the rectum becomes everted, in consequence of the relaxation of the sphincter and levatores ani, and, that it then draws after it other portions of the intestinal canal. But, they ought to have been undeceived by the strangulation, which sometimes occurs under such circumstances, and which not only throws a great obstacle in the way of the reduction of the displaced part, but even sometimes brings on mortification. Besides the connexions of the rectum with the neighbouring parts, by means of the cellular substance, which surrounds it; and the attachment of this intestine to the posterior surface of the urinary bladder; render the above origin of the complaint impossible. Such an explanation could only be admitted with regard to those protrusions of the rectum, which come on in a very slow manner. This account could not afford a satisfactory explanation of certain cases, in which the everted intestine presents a very enormous tumour. Fabricius ab Aquapendente mentions his having seen tumours, occasioned by a prolapsus of the rectum, which were as long as the forearm, and as large as the fist. In the *Mélanges des Curieux de la Nature*, we find an account of a tumour of this sort, which was two feet long, and occurred in a woman from parturition. Nor is a more satisfactory reason assigned for these cases, by supposing, that they originate from a relaxation of the villous coat of the rectum, and separation from the muscular one. We are not authorized to imagine, that such a separation can take place to a considerable extent, nor so suddenly, as to give rise to the phenomena, sometimes remarked in this disease.

But more accurate observations have removed all doubt upon this subject. In the fourth volume of the *Mémoires de l'Académie de Chirurgie*, we read an account of a pretended prolapsus of the rectum, which, after death, was discovered to be an eversion of the cæcum, the greater part of the colon being found at the lower end of this intestine, and most of the rectum at its upper part. This eversion began at the distance of more than eleven inches from the anus, and terminated about five or six from this opening, the tumour, formed by the disease, having been reduced some time before the child's death. It was impossible to draw back the everted part, in consequence of the adhesions, which it had contracted. Another dissection has evinced the same fact. A child, after suffering very acute pain in the abdomen, after receiving a blow, had a prolapsus of intestine through the anus, about six or seven inches long. This was taken for a prolapsus of the rectum. After death, the termination of the bowel out of the anus was found to be nothing less, than the cæcum, which had passed through the colon, and rectum, to make a protrusion at the anus. See *Intussusceptio.* (*Encyclopédie Méthodique ; Partie Chirurgicale.*)

ANUS ARTIFICIAL. This signifies an accidental opening in the parietes of the abdomen, to which opening some part of the intestinal canal tends.

and through which the fæces are, either wholly, or in part, discharged.

When a strangulated hernia occurs, in which the intestine is simply pinched, and this event is unknown; when the occurrence has not been relieved by the usual means; or when the necessary operation has not been practised in time; the protruded part becomes gangrenous, and the fæces escape. Putrefaction takes place in the cellular substance, and under the adjoining integuments, while the gangrenous affection of the tumour spreads from within outward. One or more openings soon form in the mortified parts, and through these apertures the fæces are discharged, until the separation of the sloughs gives a freer vent to the excrement. But if the patient should be at last operated upon, his fæces are discharged through the wound, and the intestines are more easily emptied. In both cases, the excrement continues to be discharged from the opening, when the loss of substance in the intestine is great, and a considerable contraction of the bowels has taken place below the part affected. When the mortification has been too extensive, and the cicatrix, following the detachment of the dead parts, has greatly diminished the diameter of the bowels, the fæces more readily pass out of the wound, than along the intestinal canal, and, consequently, they are entirely discharged through the artificial opening. In this way, an artificial anus is formed, through which the excrement is evacuated during life.

The same occurrence may follow wounds, penetrating the abdomen, and doing considerable injury to the intestines. The inflammation, which always accompanies such wounds, occasions salutary adhesions, between the edges of the divided intestine and those of the opening in the peritoneum and muscles. This prevents any extravasation of matter in the abdomen. The fixed and permanent situation of the large intestines renders all wounds, occurring to them, much more prone, than those befalling the small intestines, to this consequence, so favourable in many respects. However, artificial anuses have been known to form after wounds of the small intestines. A case of this sort may be perused in Fernel, and a second in Bauhin. (*Sabatier sur les Anus contre Nature, in Mem. de l'Acad. de Chir. Tom. 5.*)

In cases of hernia with gangrene, an artificial anus is formed, under the above circumstances, according to the design of nature, and it would frequently be wrong to hinder the occurrence, even though it were practicable to heal the wound, which is the situation of it. For, the intestine being too much contracted at the place of the cicatrix, the patient would continue subject to cholic complaints. In this manner, he might be put in more or less immediate danger of perishing from a bursting of the intestinal canal within the abdomen, or else from a simple obstruction in the cavity of the bowels. This is not the case, when an artificial anus is formed, in consequence of a wound of the intestines, and if the patient could receive timely succour, before such a consequence had completely taken place, possibly, the event might often be prevented.

However advantageous the formation of an artificial anus may be, in many cases, in which the patient's life depends upon the event, it must be confessed, that the consequence is a most afflicting and disgusting infirmity. It is true, however, that the matter, which is discharged, not having been long retained in the bowels, is not so fetid as that which is evacuated in the ordinary way; but, as the opening which gives vent to the matter is not endued with the same organization as the lower end of the rectum, and, as in particular, it is not furnished with any sphincter capable of contracting and relaxing itself, as occasion requires, the fæces are continually escaping without any knowledge of the circumstance on the part of the patient. Some persons in this state, among the number of those whose histories are on record, have made use of a metal box, in which their excrement has been received. Schenckius relates the case of an officer, who was wounded in the belly, and who allowed his fæces to escape into a vessel made for the purpose. Dionis makes mention of a similar case. What occurred to an invalid soldier, says this eminent writer, is too singular to serve as an example in practice, since nature alone preserved him, by making the wound of the abdomen as an opening for the discharge of his fæces. The intestine has become adherent to it, and he daily evacuates his excrement through this opening. The matter coming away in-

voluntarily, necessitates him to have a tin-box for its reception

M. Moscati, principal surgeon of the hospital at Milan, has also communicated to the academy of surgery, an account of a wounded man, in whom an artificial anus took place, in consequence of a wound in the abdomen below the right hypochondrium. His excrement used also to be received in a tin-box, fastened to him by a belt. The above surgeon very properly remarks as a very singular circumstance in this wound, that it admitted of a leaden cannula being introduced, to which cannula the tin-box was accommodated. But, would the situation of wounds, liable to be followed by an artificial anus, be always sufficiently favourable, to allow of the intestinal matter being received in an appropriate vessel? May not the pressure, which the edges of such vessels are apt to make on the circumference of the opening, be detrimental? Lastly, would not such a vessel, though apparently fixed in a suitable manner, change its position, and sometimes allow the fæces to escape on the patient's clothes?

Uncleanliness is not the only inconvenience of an artificial anus. Persons have been known to be quite debilitated by the affliction, and even ultimately to die in consequence of it. This is liable to happen, whenever the intestinal canal is opened very high up, so that aliment escapes before chylification is completed, and the nutritious part of the food, has been taken up by the lacteals. But, when the opening only interests the lower circumvolutions of the ilium, or, what is more frequent, when it has occurred in the large intestines, the danger, to which the patient is exposed by this event, is rendered very trivial. There is no fact of this kind recorded, which had a fatal termination; on the contrary, many writers confirm, that such patients as they have seen with an artificial anus, have been healthy and well-looking.

The most grievous occurrence, to which persons with an artificial anus are exposed, is a prolapsus of the bowel, similar to what sometimes happens through the anus, with respect to the rectum. The descent of the bowel is sometimes simple, only affecting a portion of the intestinal canal just above and below the opening. On other occasions the complaint is double, the bowel both above and below the opening being prolapsed. This descent of the intestine forms a tumour, the dimensions of which vary considerably in the different subjects in whom it is observed. When the protrusion is caused by the upper part of the intestinal canal, the fæces are voided at the extremity of the tumour, and, when the swelling consists of the lower portion of the bowel, the excrement is evacuated at the base of the prolapsed part.

When the tumour is double, it is easy to perceive, by observing this evacuation, to which end of the intestinal canal each protruded portion belongs. This consequence of an artificial anus is very serious, because it greatly increases the inconvenience, which the patient suffers. Sometimes, the tumour is exquisitely sensible; and, occasionally, when the eversion of the intestine is considerable, a strangulation is produced, which puts the patient's life in danger, unless such prompt assistance be afforded, as the nature of the case demands.

The business of the surgeon is to prevent, if possible, the formation of an artificial anus, as we shall see elsewhere; but, when the event has occurred, and, particularly, when the whole or the greater part of the stools are discharged in this way, no attempt can be made to stop up the opening without exposing the patient's life to the most alarming danger. Even when a considerable quantity of the fæces is discharged in the natural manner, it is always to be presumed, that the bowel is considerably contracted at the place, where it communicates with the wound, and that the intestine will be very apt to inflame, when an unusual accumulation of its contents has taken place, unless they have an opportunity of escaping through the external opening. Such an occurrence would make the patient likely to die in a very short time.

But, if it is dangerous to close an artificial anus, when the case is of the most simple description, the thing is absolutely impracticable, when the affliction is complicated with an everted prolapsus of a part of the bowel; although we read in the Philosophical Transactions, that M. Le Cat undertook such an operation, in a case, in which there was an eversion of each portion of the intestinal canal.

But the pain which he gave the patient in endeavouring to reduce the protruded intestine, induced him to

abandon all further attempts. When, also, in such a case, it were easy to reduce the displaced portions of intestine, and when that, which is connected with the rectum, is nearly of its natural diameter, (a circumstance not to be expected,) prudence does not allow us to place these portions opposite each other, for the sake of reestablishing the continuity of the canal. The number and depth of the adhesions, which the intestines may have contracted with each other, and the neighbouring parts, are likely to render such an operation impracticable. It would also be terrible to make an unsuccessful attempt of this kind, and to plunge into imminent peril, a person in other respects quite well, and who, with the exception of some inconvenience, may enjoy life as well as subjects of the best constitutions.

Though we cannot remedy such eversions of the intestine, as are brought on by an artificial anus, when the tumour is rather large, and of long standing; yet, there is a possibility of affording relief, when the swelling is small and recent. In this circumstance, skilful treatment would probably prevent the progress of the disorder, and even effect an entire cure. The treatment must obviously be very similar to that of the prolapsus ani, for both complaints are of the same nature. The practitioner should endeavour gently to return the tumour into the abdomen, and to retain it there by means of a soft pad of suitable size. This pad should be changed very frequently, on account of the matter discharged from the opening. As posture must greatly tend to bring about a cure, the patient should be recommended to lie down, as much as possible, on the side opposite the disease. He should be enjoined to make no violent exertion, which would put the abdominal muscles and diaphragm into action, and force the intestines through the external opening. If there be any difficulty in evacuating the fæces from the artificial anus, the belly should be kept gently open. The parts in the vicinity of the artificial anus should be strengthened by slightly astringent fomentations, &c. It might also be very useful to support the margin of the opening by an ivory or elastic-gum compress, if the patient should void fæces of a thick consistence, and should feel, before the evacuation, the kind of inclination which precedes the discharge of the fæces in the natural way.

Thus by advice, which is both simple and easy to follow, a grievous affliction may be prevented; and one which would expose the patient to the most pressing danger, were the swelling, to which the intestines protruded from an artificial anus are subject, to acquire such a size, that the bowels themselves become strangulated in the opening, through which they pass. (*Encyclopédie Méthodique; Partie Chirurgicale. Art. Anus contre Nature.*)

Mr. Lawrence has made a few very accurate remarks on the present subject, and he has also related some particulars of a case of artificial anus, which convey considerable instruction.

"If the complaint (a mortified hernia) terminates in the formation of an artificial anus, we must endeavour to alleviate those distressing inconveniences, which arise from the involuntary discharge of wind and fæces through the new opening, by supplying the patient with an apparatus, in which these may be received, as they pass off. An instrument of this kind, the construction of which appears very perfect, is described by Richter (*Anfrangsgr der Wundarzn, Vol. 5.*) from the *Traité des Bandages* of Juville. The patient will be best enabled to adapt any contrivance of this sort to the particular circumstances of his own case. It has been found, in some instances, that a common elastic truss, with a compress of lint under the pad, has been more serviceable than any complicated instrument. (*Parisian Journal, Vol.* 1. *p.* 193.) in preventing the continual flow of feculent matter from the artificial opening." *Treatise on Hernia, p.* 206.

"I know (says Mr. Lawrence) a patient with an artificial anus, in whom the gut often protrudes to the length of eight or ten inches, at the same time bleeding from its surface. This is attended with pain, and compels him to lie down; in which position the intestine recedes. The patient has now discharged all his fæces at the groin for fifteen years; and has enjoyed tolerable health and strength during that time. His evacuations are generally fluid; but, sometimes, of the natural consistence. Whenever he retains his urine, after feeling an inclination to void it, a quantity of clear inoffensive mucus, like the white of an egg, amounting to about four ounces, is expelled from

the anus; and this may occur two or three times in the day. (*P.* 208.)

When the protruded intestine is strangulated, an operation may become necessary for the removal of the stricture.* We should always endeavour to prevent such protrusions, when a disposition to their formation seems to exist, by the use of a steel truss, which should, indeed, be worn by the patient independently of this circumstance. If the tumour has become irreducible by the hand, an attempt may be made to replace it by keeping up a constant pressure on the part, the patient being at the same time confined to bed. By these means, Desault (*Parisian Journal, Vol.* 1. *p.* 178.) returned a very large prolapsus, and, by pressure on the opening, the fæces were made to pass entirely by the anus, although, for four years, they had been voided only through the wound. (*Lawrence p.* 209. 210.)

In cases of mortified hernia, the wound sometimes closes, except a small fistulous opening, which discharges a thin fluid, and cannot be healed. Mr. Lawrence has related, in his excellent treatise on hernia, a case, in which the fæces came from the wound some time after an operation, although the bowel did not appear gangrenous when this proceeding was adopted. (*P.* 211.)

In the appendix to this work, the author adds some further account of the case of artificial anus, which he has related (*P.* 208.) The man is sixty years of age, and appears to be healthy, active, and even younger, than he really is. He had had a scrotal hernia, which ended in mortification, and involved the testicle of the same side, and a large portion of the integuments, in the destruction. It is now nearly seventeen years since this event, and the fæces have during all this time been discharged from the groin. He has never made use of a truss, nor taken any step, except that of always keeping a quantity of tow in his breeches.

The prolapsed portion of intestine varies in length and size at different times. It was four inches long when Mr. Lawrence saw it, and the basis, which is the largest part, measured nearly six inches in circumference. The prolapsus never recedes entirely, and it has occasionally protruded to the length of eight or ten inches, being as large as the forearm, and emitting blood. This occurrence is painful, and only comes on when the bowels are out of order. Warm fomentations, and a recumbent position, afford relief, and accomplish a reduction of the bowel.

The projecting part is of an uniform red colour, similar to that of florid and healthy granulations. The surface, although wrinkled and irregular, is smooth, and lubricated by a mucous secretion. It feels firm and fleshy, and can be squeezed and handled, without exciting pain. "The man has not the least power of retaining his stools. When these are fluid, they come away repeatedly in the course of the day, and with considerable force. When of a firmer consistence, there is only one stool, every one or two days, and the evacuation requires much straining. Such fæces are not broader than the little finger. When the patient is purged, the food is often voided very little changed. This is particularly the case with cucumber. In this state he is always very weak. Ale is sometimes discharged five minutes after taken, being scarcely at all altered. The bowels are strongly affected by slight doses of purgatives. (*Lawrence, in Treatise on Hernia.*)

Consult *Sabatier in Mém. de l'Acad. de Chirurgie, Tom.* 5, *4to. and in Médecine Opératoire, Tom.* 2. *L'Encyclopédie Méthodique, Partie Chirurg. Richter's Anfangsgr. der Wundarzn, Band* 5. *Parisian Chururgical Journal. Œuvres Chirurg. de Desault par Bichat. Schmucker's Chirurgische Schriften, Vol.* 2. *Lawrence's Treatise on Hernia.*

APHÆRESIS, (from αφαιρεω, to remove). This term was formerly much used in the schools of surgery, to signify that part of the art, which consists in taking off any diseased, or preternatural, portion of the body.

APOSTEMA (from αφιστημι to recede.) An abscess.

APPARATUS. This implies the pre-

* Schmucker Vermischte Chirurgische Schriften, Tom. 2. Two cases, which terminated fatally from this cause, are mentioned by Sabatier, in a memoir in the 5 Tom. de l'Acad. de Chir. Mr. Lawrence also refers to Le Blanc Precis d'Operations de Chir. Tom. 2. p. 145.

paration, and arrangement of every thing necessary in the performance of an operation, or in the application of dressings. The apparatus varies according to circumstances. Instruments, machines, bandages, tapes, compresses, pledgets, dossils of lint, tents, &c. are parts of the apparatus, as well as any medicinal substances used.

It is a rule in surgery, to have the apparatus ready before beginning an operation. All preparations of this kind should not be made in the patient's room when the thing can be avoided, nor any where in his presence, as it would agitate him, and render him timid, and more restless in the operation.

APPARATUS MINOR; APPARATUS MAJOR; APPARATUS ALTUS. Three ways of cutting for the stone. (See *Lithotomy.*)

AQUA AMMONIÆ ACETATÆ. This is given in the dose of half an ounce in many surgical cases, in which the object is to keep up a gentle perspiration.

AQUA ARSENICATA.

℞ Arsenici in pulverem triti unc. ss.
Aquæ distillatæ lib. j.

These are to be boiled together in a flask till one fourth of the liquor is evaporated, and, when cold, filter the remainder through paper by means of a glass funnel. Has been applied to foul ulcers and cancers.

AQUA CUPRI VITRIOLATI CAMPHORATA.

℞ Cupri vitriolati
Boli Gallici sing. unc. ss.
Camphoræ drach. j.
Aquæ ferventis lib. iv.

Boiling water is to be added to the other ingredients, and the liquor filtered when cold. Is chiefly employed in a diluted state, as a collyrium; but it may also prove of service as an application to foul ulcers.

AQUA KALI. (*L.*) No adequate trial of this as an external application to ulcers or herpetic eruptions has yet been made; but, in the dose of 40 drops, night and morning, Mr. Hunter thinks it cures some sores, resembling mild chancres, which were unaltered by the internal use of mercury and irritated by its use as a topic.

AQUA KALI ARSENICATI.

℞ Kali Arsenicati grana duo.
Aquæ Menthæ Sativæ uncias quatuor.
Spiritus Vinosi tenuioris unciam.
Misce et cola.

Two drams of this may be given thrice a day in cases of cancer. Mr. Barnes lately shewed me a case of herpes of the nose, or noli me tangere, which was greatly benefited by this remedy externally applied. The patient was under Mr. Harvey, in St. Bartholomew's Hospital, and, at the time when I saw her, Mr. Barnes was using the lotion with double the proportion of arsenic. There are many ulcerations round the roots of the nails of the fingers and toes, to which many apply Plunket's caustic; but, the aqua kali arsenicati would, in all probability, be quite as efficacious an application, and, certainly, it is a neater one.

AQUA KALI PURI, (*L.*) This has been given with a view of dissolving urinary calculi, in considerable doses, for a length of time. The trials, however, have not proved so successful as could have been wished, nor is the exhibition of so active a remedy unattended with disadvantageous consequences to the system; for which reason, under the name of *mephitic alkaline water*, vegetable alkali supersaturated with fixed air, has of late been much substituted.

AQUA LITHARGYRI ACETATI (*L.*) Is extensively used largely diluted with water, as an application to inflamed parts. One dram to a quart of water is quite strong enough for common purposes. Mr. Justamond and Dr. Cheston used to apply it mixed with an equal proportion of a spirit resembling the tinctura ferri muriati, to the edges of cancerous sores.

The fear of the absorption of lead, has induced many practitioners to give up the use of this remedy, and have recourse to solutions of vitriolated zinc, which, it is said, answer equally well; but it is now rendered probable, from the experiments of Mr. Baynton, of Bristol, that cold water alone is of as much service as either in removing inflammation. (See *Pharmacopœia Chirurgica.*)

AQUA PICIS. May be applied to tinea capitis. There are ulcers on the legs, surrounded with a scorbutic redness, and pimples, covering a large extent of the skin. In such instances, the aqua picis, used as an application round the limb, over the dressings, is of great service.

ARDOR URINÆ. Difficulty and pain in making water, attended with a sense of heat in the urethra, and is a symptom of gonorrhœa, and some other affections.

ARGEMA, or ARGEMON, (from αργος, white.) A small white ulcer of the globe of the eye. (See *Cornea, ulcers of.*)

ARGENTUM NITRATUM, (*Nitrate of silver, lunar caustic.*) Is the best of the mildest caustics. Its utility for stimulating indolent ulcers, and keeping granulations from rising too high, is known to every one.

Mr. Hunter recommends the use of the argentum nitratum, on the first appearance of a chancre, before absorption can be supposed to have taken place. He directs the caustic to be scraped to a point, like a black-lead pencil; so that, when it is applied, every part of the surface of the chancre may come into contact with it; and he advises the repetition of this process, till the last slough, which is thrown off, leaves the sore florid and healthy. (*Hunter on the Venereal.*)

From this treatment, there is a chance, that the constitution will not be infected; but it is generally prudent, notwithstanding, to give the pil. hydrargyri.

The important use of the argentum nitratum, in the cure of numerous diseases, we shall have occasion to remark in various places of this work; particularly when we come to the article *Urethra, strictures of*, in the removal of which disease it is peculiarly useful.

ARNICA. (αρνικη, from αρς a lamb.) *Leopardsbane.*

Amaurosis is the principal case in which surgeons now ever employ this medicine. From a dram to half an ounce of the flowers may be infused in a pint of water, and this may be taken in the course of four and twenty hours. Arnica, thus exhibited, sometimes produces vomiting, profuse perspiration, and an increased secretion from the kidneys. At other times, no evident effects of this sort arise. The virtues of this medicine have undoubtedly been exaggerated, though no one can question that, as it is a powerful one, the trial of it should still be continued.

ARSENIC. (from the Arabic *Arsanek*, or αρσην, *masculus*, from the strength of its qualities.) Every one is acquainted with the deleterious effects of this mineral, which, in the dose of a few grains, acts as the most violent poison. Notwithstanding such effects which are generally dreaded, practitioners have ventured to employ arsenic as a remedy for diseases, and this has sometimes been done with success, not only as an external topical application, but, even as an internal medicine.

Arsenic is the principal ingredient of a secret remedy, which, in Ireland, has long possessed very great celebrity for the cure of cancer, and which is known by the name of Plunket's caustic. This application is said to consist of the ranunculus acris, the greater crow-foot, the flammula vulgaris, and the lesser crow-foot: an ounce of each is to be bruised, and added to a dram of arsenic, and five scruples of sulphur. The whole is to be beaten into a paste, formed into balls, and dried in the sun. When used, they are to be beaten up with the yolk of an egg, and applied on a piece of pig's bladder. The use of the ranunculus is to destroy the cuticle, on which the arsenic does not act. The application is to remain on twenty-four hours, and the slough is to be afterwards dressed with any simple, unirritating ointment. Arsenic seems to have been first recommended as an external application to cancers, and it was generally combined with opium. It certainly sometimes produces a salutary change in the appearance of the sore. We have reason to regret, that this change is usually not of a permanent continuance. Besides Plunket's remedy, various other preparations of arsenic have been externally employed.

Mr. Justamond's applications to cancer, originally suggested by a receipt, said to be preserved in the Earl of Arundel's family, were somewhat varied. They were generally combinations of arsenic and sulphur. The above receipt directs an ounce of yellow arsenic, with half that quantity of armenian bole, and sometimes as much red precipitate. Mr. Justamond also employed a sulphuret of arsenic, and a combination of this sulphuret with crude antimony. The arsenical preparation, preferred, was scraped and laid on the middle of the sore, while its edges were moistened with a combination of muriated iron, and sal ammoniac. The effects were, the correction of the fetid smell, melioration of the appearance of

the sore, and separation of the cancerous part.

In the Pharmacopœia Chirurgica, Mr. Justamond's arsenical caustic is directed to be made in the following manner: ℞ antimonii pulverizati ℥ij, arsenici pulverizati ℥j. These are to be melted together in a crucible. The application may be reduced to any degree of mildness by the addition of powdered opium. The latter ingredient may also act specifically in diminishing the pain. M. Febure's remedy consisted of ten grains of arsenic, dissolved in a pint of water, with an ounce of the extract of cicuta, three ounces of Goulard's extract, and a dram of laudanum. With this fluid the cancer was washed every morning. He gave also arsenic internally, and directs two grains to be dissolved in a pint of water, to which must be added syrup of chicory, with half an ounce of rhubarb. A table-spoonful is to be given night and morning, with half a dram of the syrup of poppies. It may be remarked, that the dose of the arsenic, in this preparation, is one twelfth of a grain.

The kali arsenicatum is an excellent preparation for internal exhibition, and is thus made:

℞ Arsenici Albi, Nitri Purificati, singulorum unciam:

Crucibulo amplo igne candenti injice nitrum, et liquefacto adde gradatim arsenicum in frustulis, donec vapores nitrosi oriri cessaverint. Solve materiam, in aquæ distillatæ libris quatuor, et post idoneam evaporationem sepone, ut fiant crystalli.

Dosis, Grani pars decima ter quotidie.

It may be given in the following way.

℞ Kali arsenicati gr. ij.
Aq. Menthæ Sativæ ℥iv.
Spirit. Vinosi tenuioris ℥j. M. et cola.
Dosis drachmæ duæ ter quotidie.

The following is Dr. Fowler's method of preparing arsenic for internal use. Take of powdered arsenic, and prepared kali, each sixty four grains; boil them gently in a Florentine flask, or other glass vessel, with half a pound of distilled water, until the arsenic is dissolved. To this solution, when cold, add half an ounce of the compound spirit of lavender, and as much water as will make the whole equal to a pint, or fifteen ounces and a half in weight. The dose of this solution is as follows: From two years old to four, gutt. ij or iij to v; from five to seven, gutt. v to vij; from eight to twelve, gutt. vij to x; from thirteen to eighteen, gutt. x to xii; from eighteen upwards gutt. xij.

These doses may be repeated once in eight or twelve hours, diluted with thick gruel or barley-water.

The following plan should be pursued, when arsenic has been swallowed in such a quantity as to endanger life. An emetic of white or blue vitriol should be exhibited immediately, and large quantities of water swallowed, in which the liver of sulphur (kali sulphuratum) is dissolved. The stomach having been thus emptied, a mixture, containing the kali sulphuratum, about a scruple to a dose, should be exhibited, frequently giving alternately, milk, butter, or castor oil. (See *Motherby's Medical Dictionary. Quincy's Lexicon Medicum, by R. Hooper. Pharmacopœia Chirurgica. Pharmacopœia Nosocomii Sancti Bartholomei.*)

ARTERIOTOMY. (from αρτηρια, an artery, and τεμνω, to cut.) The operation of opening an artery, for the purpose of taking away blood for the relief of diseases. (See *Bleeding.*)

ARTERIES *Wounded.* (See *Hemorrhage.*)

ARTICULATION, (from *Articulus.*) A joint. The joints are subject to numerous diseases, which are more, or less, alarming, according to their nature. Like all other parts, they are liable to inflammation and abscesses; their capsules frequently become distended with an aqueous secretion, and the disease termed *hydrops articuli*, is produced; but, the most important of all their morbid affections, are, what are called, *white swellings*, and the *disease of the hip-joint.*

WOUNDS OF JOINTS.

Wounds of the large joints, made either by puncture or incision, are of a very dangerous nature, as these parts are surrounded with tendinous and membranous structures, which, though not very sensible in a sound state, yet, when inflamed, become exquisitely sensible, often attended with vehement pain and fever, and sometimes with delirious symptoms. (See *Hunter's Commentaries, Part* 1, *P.* 69.)

Superficial wounds of the joints are often disagreeable cases; but the danger is always increased, when the injury penetrates the capsular ligament. This event may be detect-

ed by the introduction of a probe, and often by a discharge of the synovia, which is secreted by glands in the joint to facilitate its motion. But, as a discharge of a similar kind, may proceed from mere wounds of such *bursæ mucosæ*, as lie under the tendons of muscles, in the vicinity of joints, our judgment might be deceived, were we unacquainted with the situation of these little membranous bags. Wounds which penetrate large joints, must be looked upon as much more dangerous, than those, in which only these bursæ are opened.

When the large joints, particularly the knee, are wounded, the stomach is frequently very much affected. I remember being shewn by Mr. Best of Newbury, a man, who, in his occupation as a wheelwright, happened to give himself a wound on one side of the knee: a good deal of inflammation and suppuration ensued; but, what particularly struck me, was the manner in which the man complained of the affection of his stomach.

In speaking of cartilaginous substances in the joints, we shall have occasion to advert again to the danger attendant on wounds of these parts.

INFLAMMATION OF JOINTS.

Idiopathic cases of this kind are not common. The complaint ordinarily originates, in consequence of a contusion, sprain, wound, or some other kind of injury, done to the part affected.

The inflamed joint shews the common symptoms of inflammation; viz. preternatural redness, increased heat, throbbing, pain, and swelling, while the constitution is also disturbed by the usual symptoms of the inflammatory fever. It is highly deserving notice, however, that in these cases, such symtoms are often exceedingly severe, and the pulse is more frequent, and less full and strong, than when parts, more disposed to return to a state of health, are affected. The inflammation first attacks some part of the capsular ligaments, and very quickly diffuses itself universally over their whole extent, as usually happens in all inflammations of smooth membranes.

The capsules of the joints are naturally not very sensible; but, like many other parts similarly circumstanced, they become acutely painful, when inflamed. The complaint is accompanied by an increased secretion of the synovia, which becomes of a more aqueous, and of a less albuminous quality, than it is in the healthy state. Hence, this fluid is not so well calculated for lubricating the articular surfaces, and preventing the effects of friction, as it is in the natural condition of the joint. This circumstance may explain, why a grating sensation is often perceived on moving the patella, when the knee is inflamed.

The capsular ligaments, like other parts, are frequently thickened by inflammation, and, sometimes, coagulating lymph, being effused on their internal surfaces, organized cartilaginous, or osseous bodies, are formed in their cavities.

When the inflammation attains a higher pitch, an abscess may occur in the capsular ligament. This part, at length, ulcerates, and the pus makes its way beneath the skin, and is sooner, or later, discharged through ulcerated openings.

An abscess rarely takes place in an important articulation, in consequence of acute inflammation, without the system being, also, so deranged, that life itself is imminently endangered. In the violent stage of the inflammation, just before the abscess forms, very severe symptoms of inflammatory fever afflict the patient, and, occasionally, delirium and coma taking place, death itself ensues.

In these cases, the inflammatory fever is very quickly converted into the hectic: indeed, when an abscess has taken place in a large joint, in consequence of acute inflammation, hectic symptoms immediately begin to shew themselves, and the strong actions of the common inflammatory fever suddenly subside.

Local consequences, even worse than those above described, may follow inflammation of a joint. As the layer of the capsular ligament, reflected over the cartilages of the articulation is often inflamed, the cartilages themselves are very apt to have the inflammation communicated to them. Parts partaking of a cartilaginous structure, being very incapable of bearing the irritation of disease, often ulcerate, or, in other words, are absorbed, so as to leave a portion, or, the whole, of the articular surface of the bones, completely denuded of its natural covering. At length, the heads of the bones themselves in-

flame, and become carious; or the consequence may be an anchylosis.

Sometimes, only such parts, as are exterior to the capsular ligament, are affected, and in this case, the symptoms are never so severe, (*Russel on the knee, p.* 60.) nor so obstinate, as when the complaint interests the capsular ligament, and parts contained in it. Even when an abscess takes place on the outside of the capsular ligament, the case cannot be considered as dangerous, provided the cavity of the joint be not involved in the inflammatory attack. As I have stated in my *Treatise on the Diseases of the Joints*, every inflammation of a large joint may be deemed a case of considerable importance. I do not mean to assert, that cases, in which the inflammation is mild in degree, and simple in its nature, are dangerous; no—I only wish to inculcate, that though the inflammation be originally genuine, it is always very likely to be converted into one of a specific nature, whenever there is a tendency in the system to scrophulous disorder. A person, whose constitution is scrophulous, may sometimes continue, during life, exempt from any local disease of this specific nature, provided he be fortunate enough to avoid all irritation of parts, on which scrophula is most particularly disposed to make its attack. Among such parts we must class the joints, especially the knee, hip, elbow, and ankle. Hence, when a joint is inflamed, how mild soever the affection may be, we ought never to forget, that, when there is a tendency to scrophula in the system, the original case of simple inflammation is very apt to be the exciting cause of the white swelling, one of the most severe and intractable diseases, which increase the catalogue of human miseries.

Hence, the curative means should be most rigorously put in execution, not merely on account of an abstract view of the present state of the case; but, also, on account of the opportunity, which is now afforded for a terrible disease to arise, which often remains previously dormant.

It will considerably shorten what we have to say concerning the treatment of inflamed joints, to observe, that the antiphlogistic plan, in the full sense of the expression, is to be strictly adopted. But, as there is a variety of means, often adapted to the same purpose, it seems necessary to offer a few remarks on those, which lay the greatest claim to our commendations. The treatment of an inflamed knee will serve to illustrate that of all other large joints.

There are few other surgical cases, in which general, and, especially topical bleeding is more strongly indicated.

The violence of the inflammation, and the strength, age, and pulse of the patient, must determine with regard to the use of the lancet; but, the topical application of leeches may be said to be invariably proper. When the leeches fall off, the bleeding is to be promoted by fomenting the part. The surgeon should daily persist in this practice, until the acute stage of the inflamation has subsided. But, in conjunction with this treatment, we are to keep the joint continually surrounded with linen wet with the saturnine lotion.

In a few instances, however, the patient seems to derive more ease and benefit from the employment of fomentations and emollient poultices, and the feelings of the afflicted should always be consulted; for, if the pain be materially alleviated by this, or that application, its employment will hardly ever be wrong.

Nothing more need be said, concerning the rest of the treatment, proper during the vehemence of the inflammation, as the duty of the surgeon is not materially different from what it is in other inflammatory cases.

As soon as the acute stage of the affection has subsided, the grand object is to remove the effects, which have been left. These are the thickened state of the capsular ligament, and parts surrounding the articulations; a stiffness of the joint, and pain, when it is moved; a collection of fluid in the capsule, &c. This state of the complaint, when neglected, and there is a tendency to scrophula, may prove exceedingly obstinate, and even terminate in an irremediable, specific distemper of the joint.

When the second stage of the disorder seems tardy in going off, the application of a blister is proper, and it should be kept open for a few days, by means of the savin cerate.

In other cases, in which the inflammation has been more trivial, and the effects, which it has left, are slight; lotions, composed of vinegar and sal-ammoniac, suffice for the removal of the chronic complaints, continuing after the abatement of the acute stage of the disorder.

The severity of the constitutional symptoms is mostly, if not always, greater, when the inflammation of a larger joint arises from a wound, than when it is the consequence of a bruise, or sprain. (See *Treatise on the Diseases of the Joints*, 1807.)

LOOSE CARTILAGES IN JOINTS.

The existence of extraneous bodies in the articulations is by no means a rare occurrence, though unknown to the ancients.

Paré is the first who speaks of this disorder: he says, that *a hard, polished, white body, of the size of an almond*, was discharged from the knee of a patient, in the year 1558, in which he had made an incision for an *aqueous aposteme*, (without doubt an hydrops articuli.) *Liv.* 25. *Chap.* 15.

One of these extraneous bodies was found on dissection in a knee-joint, by Dr. Alexander Monro. Mr. Simson extracted one of these some years afterwards, which at first he did not suppose was in the cavity of the articulation, notwithstanding its mobility, and the pain it occasioned. (*Edinb. Med. Essays.*) Since these periods, examples have been multiplied of this disease.

Such detached and moveable cartilages are not peculiar to the joint of the knee, they occasionally occur in other joints of the body; but they are most frequently met with in the knee, and it is in that joint that they produce symptoms which render them the object of a chirurgical operation. Morgagni has seen them in the ankle; Haller in the joint of the jaw; and Hey in the elbow.

These substances, in their structure, are, as Mr. Home remarks, analogous to bone, but in their external appearance bear a greater resemblance to cartilage; they are not, however, always exactly of the same structure, being in some instances softer than in others. Their external surface is smooth and polished, which, being lubricated by the synovia, allows them to be moved readily from one part of the joint to another, seldom remaining long at rest, while the limb is in motion; when they happen to be in such situation as to be pressed upon with force by the different parts of the joint, they occasion considerable pain, and materially interfere with its necessary motions.

The circumstance of their being loose, and having no remains of a visible attachment, made it difficult to form conjectures respecting their formation; and according to Mr. Home, no satisfactory account of their origin had been given till Mr. Hunter's observations threw light upon the subject. The circumstances which led him to the investigation of this subject, appear at first sight so foreign to the purpose, that they require some explanation.

In the course of his experiments and observations, instituted with a view to establish a living principle in the blood, Mr. Hunter was naturally induced to attend to the phænomena which took place when that fluid was extravasated, whether in consequence of accidental violence, or other circumstances. The first change which took place he found to be coagulation; and the coagulum thus formed, if in contact with living parts, did not produce an irritation similar to extraneous matter, nor was it absorbed and taken back into the constitution, but, in many instances, preserved its living principle, and became vascular, receiving branches from the neighbouring blood-vessels for its support; it afterwards underwent changes, rendering it similar to the parts to which it was attached, and which supplied it with nourishment.

In attending to cases of this kind, he found that where a coagulum adhered to a surface, which varied its position, adapting it to the motions of some other part; the attachment was necessarily diminished by the friction, rendering it in some instances pendulous, and in others breaking it off entirely.

Hence it was easy to explain the mode in which those pendulous bodies are formed, which are sometimes attached to the inside of circumscribed cavities, and the principle being established, it became equally easy for Mr. Hunter to apply it under other circumstances, since it is evident from a known law in the animal economy, that extravasated blood, when rendered an organized part of the body, can assume the nature of the parts into which it is effused, and consequently the same coagulum which in another situation might form a soft tumour, would when situated on a bone, or in the neighbourhood of bone, often form a hard one. The cartilages found in the knee-joint, therefore, appeared to him to originate

from a deposit of coagulated blood upon the end of one of the bones, which had acquired the nature of cartilage, and had afterwards been separated. This opinion was further confirmed by the examination of joints which had been violently strained, or otherwise injured, where the patients had died at different periods after the accident. In some of these there were small projecting parts, preternaturally formed, as hard as cartilage, and so situated, as to be readily knocked off by any sudden, or violent motion of the joint. (*Med. and Chir. Transactions, Vol.* 1.)

One or more of these preternatural bodies may be formed in the same joint. Mr. Home mentions one instance in which there were three; they are commonly about the size of a horse-bean, often much smaller, and sometimes considerably larger; when very large, they do not give so much trouble to the patient as the smaller kind. A soldier in the 56th regiment has one nearly as big as the patella, which occasions little uneasiness, being too large to insinuate itself into the moving parts of the joint. Morgagni has seen twenty-five in one joint.

If we except making an incision into the joint, for the purpose of extracting the cartilaginous tumours, we are not acquainted with any certain means of freeing a patient from the inconvenience of this complaint. To this plan, the danger attendant on all wounds of so large an articulation as the knee, is a very serious objection. Middleton and Gooch endeavoured to conduct the extraneous body into a situation, where it produced no pain, and to retain it in that position, a long time, by bandages, under the idea, that the cartilaginous substance would adhere to the contiguous parts, and occasion no further trouble. No conclusion, however, can be drawn from the cases brought forward by these gentlemen, because they had no opportunity of seeing their patients again at the end of a reasonable time, and we know, that loose cartilages in the joints sometimes disappear for half a year, and then make their appearance again.

Mr. Hey, impressed with a just sense of the dangerous symptoms, which have occasionally resulted from the most simple wounds penetrating the knee-joint, very laudably tried the efficacy of a laced knee-cap, and the cases, which he has adduced, clearly demonstrate, that the benefit, thus obtained, is not temporary, at least, as long as the patient continues to wear the bandage. In one case, the method had been tried for ten years, with all the success, which the patient could desire.

Contemplating the evidence, which we have upon the point, and the perilous symptoms, sometimes following wounds of the knee-joint, I am decidedly of opinion, that the effect of a knee-cap, or of a roller and compress, applied over the loose cartilage, when this body is so situated as not to create pain, and to admit of being compressed, ought generally to be tried, before having recourse to excision. I say generally, because the conduct of the surgeon ought, in such cases, to be adapted to the condition, and inclination of the patient. If a man be deprived of his livelihood by not being able to use his knee; if he cannot, or will not take the trouble of wearing a bandage; if he be urgently desirous of running the risk of an operation after things have been impartially explained to him; if a bandage should not be productive of sufficient relief; and, lastly, if excessive pain, severe inflammation of the joint, and lameness, should frequently be produced by the complaint; I think it is the duty of a surgeon to operate. It is very certain, that success has generally attended the operation; but, small as the chance is of losing the limb, and even life, in the attempt to get rid of the disease; yet, since the inconveniences of the complaint are, in most cases, very bearable, and are even capable of palliation by means of a bandage, endangering the limb and life in any degree, must seem to many persons contrary to the dictates of prudence. I am ready to allow, with M. Brochier, that the danger, attendant on wounds of the large joints, has always been exaggerated in consequence of ancient prejudices. (*Desault's Journal, Vol.* 2.) But, making every allowance for the influence of prejudice, a man must be very sceptical indeed, who does not consider the wound of so large a joint as the knee, attended with real cause for the apprehension of danger. See Case 2. in my *Treatise on the Diseases of the Joints.* At the end of Mr. Ford's case, (*Med. Obs. and Inquiries, Vol.* 5.) we read on the subject of cutting loose cartilages out of the knee: "The society have been informed of

several cases, in which the operation has been performed; some, like this, have healed up, without any trouble; others have been followed with violent inflammation, fever, and death itself."

As the disorder is often attended with a degree of heat and tenderness in the articulation; as the danger of the operation is, in a great measure, proportioned to the subsequent inflammation; and, as much of the danger is at once removed, if the wound unite by the first intention: the advice, to keep the patient in bed, a few days before operating, to apply leeches, and cold saturnine lotions to the knee during the same time, and to exhibit beforehand a saline purgative, is highly prudent.

I shall next introduce an account of the plan of operating, as described by several of the best modern surgeons.

"As these loose bodies cannot always be found, no time can be fixed for the operation; but the patient, who will soon become familiar with his own complaint, must arrest them when in a favourable situation, and retain them there till a surgeon can be sent for.

"Before the operation, the limb should be extended upon a table in an horizontal position, and secured by means of assistants; the loose cartilages are to be pushed into the upper part of the joint above the patella, and then to one side; the inner side is to be preferred, as in that situation only the vastus internus muscle will be divided in the operation. Should there be several of these bodies, they must be all secured, or the operation should be postponed till some more favourable opportunity, since the leaving of one will subject the patient to the repetition of an operation, not only painful, but attended with some degree of danger.

"The loose bodies are to be secured in the situation above mentioned by an assistant, a task not easily performed while they are cut upon, from their being lubricated by the synovia; and if allowed to escape into the general cavity, they may not readily, if at all, be brought back into the same situation.

"The operation consists in making an incision upon the loose cartilage, which it will be best to do in the direction of the thigh, as the wound will more readily be healed by the first intention. If the skin is drawn to one side, previously to making the incision, the wound through the parts underneath will not correspond with that made in the skin, which circumstance will favour their union. The incision upon the cartilage must be made with caution, as it will with difficulty be retained in its situation if much force is applied. The assistant is to endeavour to push the loose body through the opening, which must be made sufficiently large for that purpose; but as this cannot always be done, the broad end of an eyed probe may be passed under it, so as to lift it out, or a sharp-pointed instrument may be stuck into it, which will fix it to its situation, and bring it more within the management of the surgeon.

"The cartilages being all extracted, the cut edges of the wound are to be brought together, and, by means of a compress of lint, not only pressed close to one another, but also to the parts underneath, in which situation they are to be retained by sticking plaster, and the uniting bandage.

"As union by the first intention is of the utmost consequence after this operation, to prevent an inflammation upon the joint, the patient should remain in bed with the leg extended, till the wound is perfectly united, or at least all chance of inflammation at an end." *Home, in Med. and Chir. Transactions, Vol.* 1. *p.* 239, *&c.*

In one instance, Desault proceeded in the following manner: the surgeon, after relaxing the capsular ligament by extending the leg, brought the extraneous body on the inside of the articulation against the attachment of the capsular ligament, and secured it in this situation, between the index finger and thumb of the left hand, whilst an assistant drew the integuments forwards towards the patella. All the parts that covered this extraneous body were now divided by a longitudinal incision, one inch in length, and its extraction accomplished by pushing it from above downwards, and raising it inferiorly with the end of the knife. This substance, on examination, was found similar in colour to the cartilages that cover the articular surfaces: it was three quarters of an inch in length, six lines and an half in width, and three lines in thickness; its surfaces were smooth, one concave and the other convex; its circumference irregular, disseminated with red points, forming small depressions; the inside was ossified, the outside of a cartilaginous texture. As

soon as the substance was extracted, the assistant let go the integuments which he had drawn forwards; they consequently returned to their natural situation, on the inner side of the knee-joint, in such a manner, that the external wound in the integuments was situated more inwards than the one in the capsular ligament. Two advantages were procured by this means: on the one hand, air was prevented from penetrating into the articulation; and on the other, the floating portion of capsular ligament, retained inwards by the skin, was more likely to attach itself to the condyle, in case it did not unite to the other portion of the capsule divided near its attachment. The edges of the wound were brought in contact by means of a uniting bandage; dry lint and compresses were applied, and retained on the part by a slight bandage; the limb was kept in a state of extension. (*Desault's Plan as described by Brochier in Desault's Journal, Tom.* 2.)

"The inner surface of the internal condyle of the os femoris presents an extensive and nearly plain surface, which terminates in front at its upper part by an edge which forms a portion of a circle. If the points of the finger be firmly pressed upon this edge so as to form a kind of line of circumvallation round these (cartilaginous) bodies, they cannot pass into the joint in this direction, nor can they recede in any other, on account of the tense state of the internal lateral ligament. Here these substances are near the surface, and may be distinctly felt; and there is nothing to be divided in order to expose them, but the integuments, fascia, and the capsule of the joint."

In an interesting case, which Mr. Abernethy relates, he observes: "The operation was done in the following manner. Sir Charles Blicke, who assisted me, pressed the integument of the knee, gently towards the internal condyle, and then applied his fingers in the manner I have described, round the circular edge of the bone. I also drew the integuments gently towards the inner ham-string, and divided them longitudinally, immediately over the loose substance, to the extent of an inch and an half. This withdrawing of the integuments from their natural situation was designed to prevent a direct correspondence in the situation of the external wound, and that of the capsule of the joint; for when the integuments were suffered to regain their natural position, the wound in them was nearer to the patella, than the wound which was made in the capsule. The fascia which covers the joint being exposed by the division of the integuments, it was divided in a similar direction, and nearly to the same extent. The capsule was now laid bare, and I gently divided it to the extent of half an inch, where it covered one of the hard substances, which suddenly slipped through the opening, and by pressing gently upon the other, it also came through at the same part. The bodies which were thus removed, were about three quarters of an inch in length, and half an inch in breadth. They had a highly polished surface, and were hard like cartilage. The fluid contained in the joint was pressed toward the wound, and about two ounces of synovia were discharged. I then drew the wound of the integuments gently towards the patella, pressed the two sides together, and closed it accurately with sticking plaster, enjoining the patient to keep the limb as free from motion as possible." *Surgical Observations*, 1804.

HYDROPS ARTICULI.

This signifies a collection of serous fluid in the capsular ligament of a joint. The complaint is attended with more or less swelling, and a fluctuation, but, there is, in general, but little pain. The affection is sometimes situated in the bursæ mucosæ. The knee is more subject, than other joints, to dropsical disease. The complaint is frequently preceded by severe rheumatic affections, and a local injury of the part. When the fluid is not so copious as to produce very great distention of the capsule, a fluctuation is easily distinguishable. Also, if the limb be extended, so as to relax the ligament of the patella, pressing the collection of fluid causes a rising of that bone, and a fullness on each side of it. The disease, though unattended with much pain, produces a degree of rigidity in the joint.

Mr. Russell has adopted the opinion, that some cases of this kind are venereal, and others scrophulous; but, he has not supported the doctrine on any solid foundation. Hydrops articuli sometimes follows fever.

The cure of the above described dropsical affection of the joints depends

upon the absorption of the effused fluid. Such absorption is sometimes altogether spontaneous, and the event may always be excited, and promoted, by mere friction, by rubbing the joint with camphorated mercurial ointment, by repeatedly applying leeches, and particularly, by the employment of a perpetual blister.

The operation of a blister may always be very materially assisted by a bandage, applied with moderate tightness. Among other effectual means of cure, we may enumerate frictions with flannel impregnated with the fumes of vinegar; electricity; and the exhibition of mercurial medicines to open the bowels. When hydrops articuli occurs during the debility, consequent to typhoid, and other, fevers, the complaint can hardly be expected to get well before the patient has regained some degree of strength.

Circumstances do not often justify making an opening into the joint; but, excessive distention, in some neglected cases, might certainly be an urgent reason for performing such an operation. Also, if the complaint should resist all other plans of treatment, and the irritation of the tumour greatly impair a weak constitution, the practice would be justifiable. An interesting example of this kind is related by Mr. Latta. *System of Surgery, Vol. 2. p.* 490.

It is best to make the opening in such a way, that the wound in the capsular ligament after the operation, will not remain directly opposite the wound in the skin. For this purpose, the integuments are to be pushed to one side, before the surgeon makes an incision through them. (*Encyclopédie Méthod. Part. Chir. Art. Hydropisie des Jointures.*)

COLLECTION OF BLOOD IN JOINTS.

Most systematic writers speak of this kind of case, though it is certainly a very uncommon one. Tumours, about the joints, composed of blood, and set down in numerous surgical works, as extravasation within the capsular ligaments, are generally on the outside of them.

Certainly, were a collection of fluid to take place in a joint very suddenly, after a sprain, or contusion, and to continue to increase gradually, for sometime afterwards, there would be reason for believing most of the contents of the tumour to be blood. The production of an abscess, and the secretion of any fluid, would have required a longer time.

Were blood known to be undoubtedly effused in a large articulation, no man would be justified in making an opening for its discharge. No bad symptoms are likely to result from its mere presence, and the absorbents will, in the end, take it away. Should an incision be made into the joint, the coagulated state of the extravasated blood would frequently not allow such blood to be discharged.

The best plan is to apply discutient remedies; a lotion of vinegar and sal ammoniac is the best application for the first three or four days, and, afterwards, frictions with camphorated liniments may be safely had recourse to.

Mr. Hey has related a case, in which the knee-joint was wounded, and blood insinuated itself into the capsular ligament; yet, though the occurrence could not be hindered, no alarm resulted from the extravasation which was absorbed, without having created the smallest inconvenience. (*Practical Observations in Surgery, p.* 354.)

WHITE SWELLING.

The white swelling, or spina ventosa, as it is not unfrequently called, in imitation of the Arabian writers, Rhazes, and Avicenna, is in this country a peculiarly common, and an exceedingly terrible, disease. As I have stated in my *Treatise on the Diseases of the Joints*, the people of the continent are, unquestionably, as subject, as we are, to chronic enlargements of the knee-joint. Foreign surgeons describe numerous varieties of a disease, which many English surgeons would term, *rheumatic white swellings*; but, they acknowledge, that the scrophulous species of this disorder does not commonly occur to their notice. *Kortum de Vitio Scrophuloso, Vol. 2. p.* 333. *Brambilla in Acta Acad. Med. Chir. Vindobonensis, Vol.* 1. *p.* 20. *Petit sur les Maladies des Os. Vol. 2. p.* 359. *Edit.* 1749.

Wiseman was the first who used the term White Swelling; and, the expression is not very unapt, because it conveys an idea of one mark of the distemper, which is, that notwithstanding the increase of size in the joint, the skin is

not inflamed, but retains its natural colour. *Pott.*

The varieties of white swellings are very numerous, and might usefully receive particular appellations. Systematic writers have generally been content with a distinction into two kinds, viz. *rheumatic* and *scrophulous*.

The last species of the disease they also distinguish into such tumours as primarily affect the bones, and then the ligaments and soft parts; and into other cases, in which the ligaments and soft parts become diseased, before there is any morbid affection of the bones.

These divisions of the subject, as I have explained in my *Treatise on the Diseases of the Joints*, are not comprehensive enough; and the propriety of using the term, *rheumatic*, seems very questionable.

Sometimes, the bones, ligaments, and cartilages, are hardly at all diseased. The whole disease of the joint appears to arise from an extravasation of glutinous lymph, which is intimately adherent to the most subtile layers of the cellular substance, and to the surface of the tendons, ligaments, and capsule of the articulation. This distemper has been named by Brambilla, *Fungus Articulationis Acta Acad. Medico-Chirurg. Vindob. p.* 1.

Sometimes, the bones are not in the least diseased, though the ligaments and cartilages are much altered, the joint is immensely enlarged, and the severity of the disease has even rendered amputation indispensable.

Sometimes, the ligaments, cartilages, and bones are not the parts, which are chiefly distempered. In the instances, alluded to, the articulation is greatly increased in size, but, most of the swelling originates from a diseased state of the parts on the outside of the capsular ligament. The disease does not consist of a thick kind of lymph, diffused throughout the structure of the parts on the outside of the joint; but, of a morbid change, in which such parts become at once enlarged, thickened, and bereft of all their original firmness. Very frequently, the texture of the heads of the bones is softened, the ligaments are distempered, the cartilages absorbed, and the bones carious.

Sometimes, the surfaces of the diseased bones are rendered rough and irregular by the secretion of a kind of substance like spermaceti in appearance, but, containing a proportion of phosphate of lime.

It has been too commonly inculcated, that the bones are always carious in this disease. But, as I have explained, caries only comes on in an advanced stage of the malady. The idea of there being invariably a carious affection of the bones led the old surgeons into the most unwarrantable practices, with a view of promoting the process of exfoliation.

In numerous cases, in which the articulation is considerably enlarged, the head of the bones are entirely free from distemper. Mr. Russell has noticed how much the soft parts frequently contribute to the swelling. He describes the appearances on dissection thus: "The great mass of the swelling appears to arise from an affection of the parts, exterior to the cavity of the joint, and which, besides an enlargement in size, seem also to have undergone a material change in structure. There is a larger, than natural, proportion of a viscid fluid, intermixed with the cellular substance; and the cellular substance itself has become thicker, softer, and of a less firm consistence, than in a state of health." (*On the Morbid Affections of the Knee, p.* 30.)

We may infer from what Mr. Russell states, that he is inclined to believe, that the disease always begins in the ligaments and membranes of the articulation, and he even asserts, that *he had never heard, or known of an instance, in which the tibia was enlarged from an attack of white swelling. P.* 37. As I have explained in my *First Lines of the Practice of Surgery*, and, also, in my *Treatise on the Diseases of the Joints*, it is still a very prevailing notion, that, in white swellings, the heads of the bones are preternaturally enlarged.

Deceived by the feel of many diseased joints, and influenced by general opinion, I once imbibed the idea, that there is very frequently a regular expansion of the heads of scrophulous bones. But, excepting an occasional enlargement, which arises from spiculæ of bony matter, deposited on the outside of the tibia, ulna, &c. and which alteration cannot be called an expansion of those bones, I have never been an eye-witness of the head of a bone being of preternaturally large dimensions, in consequence of the disease known by the name of white swelling. I have

often been in the habit of inspecting the state of the numerous diseased joints, which are every year amputated at St. Bartholomew's Hospital, and though I have long been attentive to this point, my searches after a really enlarged scrophulous bone have always been in vain. The change, which the head of the tibia undergoes in many cases, is first a partial absorption of the phosphate of lime throughout its texture, while a soft kind of matter seems to be secreted into its substance. In a more advanced stage, and, indeed, in that stage, which most frequently takes place before a joint is amputated, the head of the bone has deep excavations, in consequence of caries, and its structure is now so softened, that when an instrument is pushed against the carious part, it easily penetrates deeply into the bone.

A cursory examination of a diseased joint, even when it is cut open, will not suffice to shew, that the heads of the bones have not acquired an increase of size. In making a dissection of this kind, in the presence of a medical friend, I found, that, even after the joint had been opened, the swelling had every appearance of arising from an actual expansion of the bones. The gentleman with me felt the ends of the bones after the integuments had been removed, and he coincided with me, that the feel, which was even now communicated, seemed to be caused by a swelling of the bones themselves. But, on cleaning them, the enlargement was demonstrated to arise entirely from a thickening of the soft parts. I am glad to find, that Mr. Crowther is among those, who now disbelieve in the doctrine of expanded scrophulous bones. (See *Practical Observations on White Swelling, &c. Edit.* 2. *p.* 14. 1808.)

The soft parts undergo a material change; they are both thickened and softened; and there is a large quantity of a viscid fluid, intermixed with the cellular substance. In short, the whole texture of the cellular membrane becomes thicker and softer, than in the healthy state.

In the cavity of the joint, we sometimes find a quantity of curdy matter and the cartilages absorbed in various places, but, more particularly round the edges of the articular surfaces.

The knee, ankle, wrist, and elbow, are the joints most subject to white swellings. As the name of the disease implies, the skin is not at all altered in colour. In some instances the swelling yields in a certain degree to pressure; but it never pits, and is almost always sufficiently firm to make an uninformed examiner believe, that the bones contribute to the tumour. The pain is sometimes vehement from the very first; in other instances, there is hardly the least pain in the beginning of the disease. In the majority of scrophulous white-swellings, let the pain be trivial, or violent, it is particularly situated in one part of the joint; viz. either the centre of the articulation, or the head of the tibia. Sometimes, the pain continues without interruption; sometimes there are intermissions; and, in other instances, the pain recurs at regular times, so as to have been called by some writers, periodical. Almost all authors describe the patient, as suffering more uneasiness in the diseased, part, when he is warm, and, particularly, when he is in this condition in bed.

At the commencement of the disease, in the majority of instances, the swelling is very inconsiderable, or there is even no visible enlargement whatever. In the little depressions, naturally situated on each side of the patella, a fulness first shews itself, and gradually spreads all over the affected joint.

The patient, unable to bear the weight of his body on the disordered joint, in consequence of the great increase of pain, thus created, gets into the habit of only touching the ground with his toes, and the knee being generally kept a little bent in this manner, soon loses the capacity of becoming completely extended again. When white-swellings have lasted a good while, the knee is almost always found in a permanent state of flexion. In scrophulous cases of this kind, pain constantly precedes any appearance of swelling; but the interval between the two symptoms differs very much in different subjects.

The morbid joint, in the course of time, acquires a vast magnitude. Still the integuments retain their natural colour, and remain unaffected. The enlargement of the articulation, however, always seems greater than it really is, in consequence of the emaciation of

the limb both above and below the disease.

An appearance of blue distended veins, and a shining smoothness, are the only alterations to be noticed in the skin covering the enlarged joint. The shining smoothness seems attributable to the distention, which obliterates the natural furrows and wrinkles of the cutis. When the joint is thus swollen, the integuments cannot be pinched up into a fold, as they could in the state of health, and even in the beginning of the disease.

As the distemper of the articulation advances, collections of matter form around the part, and at length burst. The ulcerated openings sometimes heal up; but, such abscesses are generally followed by other collections, which pursue the same course. In some cases these abscesses form a few months after the first affection of the joint; on other occasions, several years elapse, and no suppuration of this kind makes its appearance.

Such terrible local mischief must necessarily produce constitutional disturbance. The patient's health becomes gradually impaired, he loses both his appetite and natural rest and sleep; his pulse is small and frequent; an obstinate debilitating diarrhœa, and profuse noctural sweats, ensue. Such complaints are, sooner or later, followed by dissolution, unless the constitution be relieved in time, either by the amendment, or removal of the diseased part. In different patients, however, the course of the disease, and its effects upon the system, vary very much in relation to the rapidity with which they occur.

Rheumatic White-Swellings are very distinct diseases from the scrophulous distemper of the large joints. In the first, the pain is said never to occur without being attended with swelling. Scrophulous white-swellings, on the other hand, are always preceded by a pain, which is particularly confined to one point of the articulation. In rheumatic cases, the pain is more general, and diffused over the whole joint.

It seems probable, that all cases, in which the structure of the bones is found quite undiseased, and in which all the mass of disease seems to be confined to the soft parts, are not scrophulous white-swellings. Few persons, who have attained the age of five and twenty, without having had the least symptom of scrophula, ever experience, after this period of life, a first attack of the white-swelling of the strumous kind. All cases, in which the internal structure of the heads of the bones becomes softened, are probably scrophulous.

Mr. Russell has noticed the frequent enlargement of the lymphatic glands in the groin, in consequence of the irritation of the disease when in the knee; but, he justly adds, that this secondary affection never proves long troublesome.

When the bones are diseased, the head of the tibia always suffers more than the condyles of the thigh-bone. (*Russell*) The articular surface of the femur sometimes has not a single rough or carious point, notwithstanding that of the tibia may have suffered a great deal. The cartilaginous coverings of the heads of the bones are generally eroded first at their edges, and, in the knee, the cartilage of the tibia is always more affected than that covering the condyles of the thigh-bone. Indeed, when white-swellings have their origin in the bones, and the knee is the seat of the disorder, there is some ground for supposing, that it is in the tibia, that the morbid mischief first commences.

The ligaments of the knee are occasionally so much weakened, or destroyed, by this terrible malady, that the tibia and fibula become, more or less, dislocated backward, and drawn towards the tuberosity of the ischium by the powerful action of the flexor muscles of the leg.

I have seen a curious species of white swelling, in which the leg could be bent to each side in a very considerable distance, both when the knee was extended and bent. Such a state implies a preternatural looseness of the ligaments of the articulation.

With respect to the particular causes of all such white-swellings, as come within the class of rheumatic ones, little is known. External irritation, either by exposure to damp or cold, or by the application of violence, is often concerned in bringing on the disease; but, very frequently, no cause of this kind can be assigned for the complaint. As for scrophulous white-swellings, there can be no doubt, that they are under the influence of a particular kind of constitution, termed a *scrophulous* or *strumous habit*. In this sort

of temperament, every cause capable of exciting inflammation, or any morbid and irritable state of a large joint, may bring on such disorder as may end in the severe disease of which we are now speaking.

In a man of a sound constitution, an irritation of the kind alluded to, might only induce common healthy inflammation of the affected joint.

In scrophulous habits, it also seems probable, that the irritation of a joint is much more easily produced than in other constitutions; and no one can doubt, that when once excited in the former class of subjects, it is much more dangerous, and difficult of removal, than in other patients.

The doctrine of particular white-swellings being scrophulous diseases, is supported by many weighty reasons, the opinions of the most accurate observers, and the evidence of daily experience. Wiseman (*Book* 4, *chap.* 4.) calls the *spina ventosa* a species of scrophula, and tells us, that infants and children are generally the subjects of this disease. The disorder is said by Severinus to be exceedingly frequent in young subjects. Petrus de Marchettis has observed both male and female subjects affected with what are called strumous diseases of the joints, as late as the age of five and twenty; but not afterwards, unless they had suffered from scrophula before that period of life, and had not been completely cured. R. Lowerus also maintains a similar opinion. Even though a few persons may have scrophulous diseases of the joints, for the first time, after the age of twenty-five, this occurrence, like the first attack of scrophula after this period, must be considered as extremely uncommon.

Another argument, in favour of the doctrine, which sets down particular kinds of white-swellings as scrophulous, is founded on the hereditary nature of such forms of disease.

Numerous continental surgeons, particularly Petit and Brambilla, have noticed how very subject the English are both to scrophula and white-swellings of the joints. We every day see, that young persons afflicted with the present disease, are generally manifestly scrophulous, or have once been so. Very often enlarged lymphatic glands in the neck denote this fatal peculiarity of constitution; very often the patients are known to have descended from parents who had strumous disorders. (*Crowther.*)

Besides the general emblems of a scrophulous constitution, which we shall notice in the article *Scrophula*, we may often observe a shining, coagulated, flaky substance, like white of egg, blended with the contents of such abscesses as occur in the progress of the disease. This kind of matter, is almost peculiar to scrophulous abscesses, and forms another argument in support of the foregoing observations relative to the share which scrophula frequently has in the origin and course of many white-swellings.

TREATMENT OF WHITE-SWELLINGS.

In practice we meet with all these cases, both scrophulous and rheumatic ones, in two very opposite states; sometimes the diseased joint is at the same time affected with a degree of acute inflammation; in other instances, the malady is entirely chronic.

The imprudence of patients in walking about, and disturbing the diseased part, is very often the occasion of a degree of acute inflammation, which is denoted by the tenderness of the joint when handled by the surgeon, and also by the integuments feeling hotter than those of the healthy knee. Acute inflammation is itself a frequent forerunner of the most inveterate diseases of the joints.

When such state exists, there can be no doubt, that topical bleeding, and cold saturnine lotions, are means which may be eminently serviceable. The antiphlogistic regimen is now strongly indicated. Cooling purges of the saline kind should also be exhibited. Blood may be taken from the diseased part, either by means of leeches or cupping. Mr. Latta gives the preference to the latter method, whenever it can be employed; and he very properly remarks, that little advantage can be expected from topical bleeding of any kind, unless the quantity of blood taken away be considerable. Ten or twelve ounces by cupping should be taken away at a time, and the operation should be repeated at proper intervals, till the tenderness and heat of the skin have entirely subsided. When leeches are used, the number ought to be considerable, and Mr. Latta recommends the application of at least sixteen or twenty. (*System of Surgery, Vol.* 1. *chap.* 6.)

When the diseased joint is very tense, painful and inflamed, the pressure of cupping glasses is too irritating.

Though such antiphlogistic means are judiciously put into practice, when acute inflammation prevails; yet such practitioners as lose weeks and months in the adoption of this treatment, are highly censurable. While the skin is hot and tender, while the joint is affected with very acute and general pain, and while the patient is indisposed with the usual symptoms of inflammatory fever, great benefit may be rationally expected from the above plan. When, however, this stage of the disorder is over, and the disease is a truly chronic one, the method becomes ridiculously inert, and, as preventing the employment of a proper plan of treatment may be considered, in a certain degree, conducive to the augmentation of a most cruel distemper. Every conscientious surgeon would shudder to be guilty of recommending inactive measures to oppose an inveterate disease, were he only to have a proper idea of the vast number of lives and limbs which are continually falling sacrifices to such slovenly practice.

Although I am not fortunate enough to coincide with Mr. Crowther on this point, who employs bleeding for a much longer time, than is recommended in my book on diseased joints, yet I am content to let general experience determine which of us is right. There are some cases, I know, (and one such I have now under my care in private practice) which require topical bleeding and cold applications much longer than others. There are other instances, which will never bear the irritation of blisters and the savine cerate, but are exasperated by this treatment. Such, however, is not the nature of the disease in general, when the acute inflammation, accidentally present, has been removed by antiphlogistic means. Having seen numerous white-swellings in St. Bartholomew's Hospital invariably unretarded by a long recourse to that universal panacea, *white-wash*, aided by topical bleeding, I must feel satisfied that the censures I have passed on delaying the application of perpetual blisters, or issues, are not altogether unfounded. It is curious, that, after criticising my advice not to lose weeks and months in trusting to such treatment, when the acute symptoms have ceased, Mr. Crowther should remark: "If Mr. Cooper means by really efficacious measures, the application of blistering plaster, and dressing the surface, after the cuticle is removed, with the savine cerate, or establishing caustic issues on each side of the diseased joint, *I congratulate myself, as having been the means of ascertaining the salutary effect of this treatment ! !*" *P.* 68.

Some other passages of my works are noticed by this unfortunate critic, with similar inconsistency, as I shall take future opportunities of explaining.

It is quite unnecessary to expatiate further on the mode of treating white-swellings complicated with acute inflammation. The most eligible plan of arresting the morbid process in the bones, ligaments, cartilages, and soft parts surrounding the articulation, and the most successful method of lessening the chronic enlargement of the joint, are subjects, now demanding our earnest investigation.

The works of Hippocrates, Celsus, Rhazes, Hieron, Fabricius, &c. compared with modern surgical books, will soon convince us, that the practice of the ancients, in the treatment of diseased enlarged joints, does not much differ from the plan now pursued by the best modern surgeons. Mr. Crowther remarks, that the ancients used local and general blood-letting, the actual and potential cautery, with vesicating and stimulating applications to the skin. They further maintained, that sores, produced by these means, should have their discharge promoted, and continued for a considerable length of time."

Topical applications, consisting of strong astringents of the mineral and vegetable kingdom, suffice for the cure of some mild descriptions of white-swellings. A decoction of oak bark, containing alum, is what is recommended for this purpose by Mr. Russell.

My own experience will not allow me to say much in favour of electricity, as an application for the relief of white-swellings. Upon the whole, I must rank electricity among inactive measures; for, though, in a few cases, it has appeared to do good; in others it has done harm, by making the disease more irritable and rapid in its progress; while in most instances, its effects have been so insignificant, as to make it difficult to decide, whether

they were of a favourable or an unfavourable nature.

Cases occur, in which a lotion, composed of sea-water, is productive of benefit. I mean to say, that this application frequently diminishes the enlargement of the joint; but it hardly ever accomplishes a perfect cure.

The conjoined operation of sea-air and sea-bathing has undoubtedly a most powerful influence over scrophulous diseases of the joints, as well as most other strumous disorders; but the application of sea-water alone, in the form of a lotion, cannot be greatly praised, because it prevents the surgeon from having recourse to a better plan of treatment. Even the trial of sea-air and bathing unitedly can only be recommended as an auxiliary plan, to be adopted in conjunction with other more certainly efficacious measures.

Poultices, made of sea-weeds deserve the same kind of praise as has been given to the sea-water lotion.

Every one is well acquainted with the efficacy of friction in exciting the action of the absorbents. To this principle we are to impute the great benefit, which arises from what is termed, *dry rubbing*, in cases of white-swellings. This kind of friction is performed by the mere hands of an attendant, without using at the same time any kind of liniment, or other application whatsoever, and the rubbing is continued for several hours every day. At Oxford, many poor persons earn their livelihood by devoting themselves to this species of labour, for which they are paid a stipulated sum per hour.

I look upon all mere emollient applications, such as fomentations and poultices, as quite destitute of real efficacy, and, though they serve to amuse the patient, they ought not to be recommended. That surgeon, who merely strives to please his patient's fancy, without doing any real good to him, in regard to his affliction, may be considered as doing harm, because the semblance of something being done too often hinders other really useful steps from being pursued. The French surgeons are particularly liberal in the praises which they bestow on such warm emollient remedies, as poultices, steam of hot water, fomentations, &c. and they adduce instances of white-swellings being cured in this manner But, whoever has had opportunities of observing the inveterate nature of the disease in this country, will hardly be inclined to recommend the imitation of French practice.

As I have explained in my *Treatise on the Diseases of the Joints*, "the only method of treatment, which my own personal experience enables me strongly to recommend, consists in keeping up a discharge from the surface of the diseased joint. The opportunities which I have had of observing the effects of blisters, and caustic issues, rather incline me, however, to prefer the former to the latter. I have seen great good derived from both; but more from blisters, than the other kind of issue. There are instances in which I should employ vesicating applications; there are others in which I should prefer making an eschar with caustic." I have seen many instances in which the application of a blister could never be endured, in consequence of the general inflammatory affection, which it occasioned throughout the diseased joint.

The blister should always be large. Many surgeons, instead of following Mr. Crowther's plan, prefer blistering first one side of the joint, and then the other alternately, for a considerable length of time. "Blisters, (says Mr. Latta,) may be put upon each side of the patella, and ought to be of such a size and shape, as to cover the whole of the swelling, on the inside, from the hinder part of the joint, at the edge of the hollow of the thigh, to the edge of the patella, over the whole extent of the swelling above and below. As soon as the blister is taken off from one side, it ought to be applied to the other, and thus repeated alternately, until both swelling and pain be completely removed. When this is the case, the patient ought to be directed to rub the joint well with a liniment, composed of half an ounce of camphor, dissolved in two ounces of oil, with the addition of half an ounce of spir. sal-ammon. caust. or, as it is now called, aqua ammoniæ. This is to be used three times a day; and this way, (continues Mr. Latta,) I have successfully treated many cases of white-swellings." (*System of Surgery, Vol.* 1. *chap.* 6.)

In the beginning, caustic issues are even more painful, than blisters; but, they afterwards become more like indolent sores, and are more easily kept open, for a length of time, than blisters. Such issues are commonly made on each

side of the diseased joint, and of about the size of a half crown. The manner of making the eschars, and keeping these issues open, will be explained, in the article *Vertebræ*.

The question has been contested, among the surgical writers and practitioners, whether blisters and issues produce benefit, upon the principle of counter-irritation, or in consequence of the discharge, which they occasion. They probably operate efficaciously in both ways; for there is no doubt, that mere rubefacients possess the power of rousing the action of the absorbents, and they also may modify the vascular action of diseased parts. These applications can obviously only act upon the principle of counter-irritation, and, they have not been here recommended particularly for white-swellings, because, it seems to me, that whenever some good might be derived from their employment, much more benefit could always be obtained from blisters and issues. This sentiment is confirmed by experience, and we must, therefore, impute a great degree of efficacy to the maintenance of a prudent discharge from the vicinity of the diseased part.

We have noticed the efficacy of friction, in exciting the action of the absorbents, by which the thickened state of parts, around the affected joint, may be considerably lessened, and, on this principle, the utility of dry-rubbing arises. We have now to notice the method of producing the same effect by pressure, a plan, which yet seems to merit a more extensive trial. I have lately seen some cases in St. Bartholomew's Hospital, in which the swelling of the joints was most materially diminished, by encircling the morbid articulation with strips of adhesive plaster, applied with moderate tightness.

My particular friend, Mr. Clement Wilson Cruttwell, of Bath, sent me, some time ago, a very excellent case, illustrative of the efficacy of treatment by pressure. He remarks, that, "After cupping the part, and endeavouring to quiet the inflammation, I used blisters; but, they excited such intolerable pain, and produced so great a degree of swelling and inflammation, that I was under the necessity of healing them immediately. After two months strict confinement to bed, and the use of leeches and refrigerant washes, the inflammation having again subsided, and the pain being removed, I again ventured to apply one small blister, and again a similar attack of pain, swelling, and inflammation, was produced. The joint became distended with fluid, of which it had always contained a large quantity, and the irritation of the constitution was excessive. By the liberal use of opium, I once more succeeded in quieting the disturbance, and, convinced of the hazard of using blisters in such a subject, I applied moderate pressure, by means of a roller, together with a wash, containing a large proportion of spirit, in order to keep up a constant evaporation. The skin, which was before much inflamed, and hard, has become natural and flaccid, the pain has ceased, the swelling has diminished, and I have every prospect of effecting a cure, with the preservation of tolerably free motion in the joint."

Mr. Cruttwell tells me, in a late letter; that this case got completely well, by the treatment with pressure, and has remained so for upwards of six months, under full and free exercise.

This example clearly evinces the impropriety of using blisters in certain constitutions. In some remarks, annexed to the above case, Mr. Cruttwell expresses his conviction, that absolute rest, cold applications, and pressure, would succeed in very many cases, without local counter-irritation. Pressure, he adds, succeeds best, when fluid is effused, and the disease is indolent; but, he is convinced that it may be used with advantage in later stages, when abscesses have formed, and sinuses already exist. Mr. Cruttwell, with his usual accuracy of observation, next reminds me, how very serviceable continued pressure is to the scrophulous finger-joints of children.

From what has been stated, I am firmly of opinion, that all impartial practitioners will be disposed to give pressure a more extensive trial, as a means of relieving a disease which too frequently foils every effort of the most skilful surgeon.

We have noticed, that when the knee is affected, there is a great tendency in the limb to become permanently bent. It might undoubtedly be very judicious to oppose the occurrence of this position, by means of splints, which would also serve to prevent all motion of the diseased joint, an object of the very highest importance. Were the disease to end in anchylosis, the advantage of

having the limb in a state of extension need scarcely be mentioned.

Numerous diseased joints are undoubtedly connected with a kind of constitution, called scrophulous. Hence, it seems rational to combine, with the local treatment, the employment of such internal remedies, as have been known to do good in other scrophulous diseases. Hectic symptoms are those, which we commonly have to palliate in these cases. When the appetite is impaired, and the stomach will bear bark, this medicine should be given with the aromatic confection. Above all internal remedies, opium claims the highest recommendation, as it at once tends to keep off and relieve a debilitating diarrhœa, which too frequently prevails, at the same time that it alleviates pain, and procures sleep. The objection, made against its exhibition, on the ground that it increases perspiration, seems exceedingly frivolous, when the above important benefits are taken into consideration.

Too often, however, the terrible disease of which we are now treating baffles all human skill, and judgment, and the unhappy patient's health having declined to the lowest state, he is necessitated to submit to amputation, as the only chance of preserving life. It has been explained in the article *Amputation* that the condition of the patient's health, and not of the diseased joint, can form the only solid reason for recurring to the severe operation of removing the limb. If the patient's constitution be equal to a longer struggle, no man can pronounce, that every prospect of saving the limb is at an end. Many diseased joints, apparently in the most hopeless condition, frequently take a favourable turn, and, after all, allow the limb to be saved. The state of the health is the chief consideration, in forming a judgment respecting the propriety of amputation.

The proposal of cutting out diseased joints has been considered in the article *Amputation*.

DISEASE OF THE HIP-JOINT.

This complaint is very analogous in its nature to the white-swelling of other articulations. In the same way, as the latter disorder, it seems probable that the disease of the hip has its varieties, some of which may be connected with scrophula, while others cannot be suspected to have any concern with a strumous habit. The present complaint is most frequently seen attacking children under the age of fourteen; but, no age, no sex, no rank, nor condition of life is exempt from the possibility of being afflicted, so that though children form a large proportion of those subjects, who are attacked; yet the number of adults, and even of old persons, is considerable.

The approach of the disease of the hip-joint is much more insidious, than that of a white-swelling. Severe pains generally precede the latter affection; but, the only forerunner of the former is frequently a slight weakness, and limping of the affected limb. These trivial symptoms are very often not sufficiently urgent to excite much notice, and, when observed by superficial practitioners, are commonly neither understood, nor treated according to the dictates of surgical science. As there is, also, very often an uneasiness in the knee, when the hip is affected, careless practitioners frequently mistake the seat of disease, and I have many times seen patients, on their entrance into an hospital, having a poultice on their knee, while the wrong state of the hip was not at all suspected.

This mistake is extremely detrimental to the patient, not on account of any bad effect, resulting from the applications so applied; but, because it is only in the incipient period of the complaint, that a favourable prognosis can be made. In this stage of the disease, mere rest and repeated topical bleeding, will do more good in the course of a fortnight, than large painful issues will afterwards generally accomplish in the long space of a twelvemonth.

The symptoms of the disease of the hip-joint, when only looked for in the situation of that articulation, are not very obvious to the surgical examiner. Though the attention of the surgeon is, in some instances, soon called to the right situation of the disease, by the existence of a fixed pain behind the trochanter major; yet, it is too often the case, that mere pain about an articulation, entirely destitute of visible enlargement and external alteration of colour, is quite disregarded, as a complaint of no importance in young subjects, and as a mere rheumatic, or gouty affection, in adults. Patients frequently

complain of most of their painful sensations being in the groin, and all accurate observers have remarked, that in the hip-disease, the pain is not confined to the real seat of disease, but shoots down the limb, in the course of the vastus externus muscle to the knee.

The early symptoms of disease in the hip-joint are only strongly delineated to such practitioners, as have acquired the necessary information relative to this part of surgery, from careful study, and extensive experience.

We shall next trace those characters of the present disease, which serve to denote its existence.

It is a curious circumstance, that when the functions of a limb are obstructed by disease, the bulk of the member generally diminishes, and the muscles become emaciated. Nearly as soon as the least degree of lameness can be perceived, the leg and thigh have actually wasted, and their circumference has become less.

If the surgeon make pressure on the front of the joint, a little on the outside of the femoral artery, after it has descended below the os pubis, great pains will be experienced.

The limping of the patient is a clear proof that something about the limb is wrong, and, if such limping cannot be imputed to diseased vertebræ, or some recent accident, and if, at the same time, the above mentioned emaciation of the limb exists, there is great cause to suspect, that the hip is diseased, particularly, when the pain is augmented by pressing the front of the acetabulum.

Diseased vertebræ, perhaps, always produce a paralytic affection of both legs at once, and they do not cause painful sensations about the knee, as the hip-disease does.

The increased length of the limb is a very remarkable and curious symptom, in the early stage of the present disease. This occurrence is easily detected by a comparison of the condyles of the os femoris, the trochanter major, and malleoli, of the diseased limb, with those parts of the opposite member, taking care that the patient's pelvis is evenly situated. The thing is the more striking, as the increased length of the member is frequently as much as four inches. The rationale of this fact, John Hunter used to explain by the diseased side of the pelvis becoming lower, than the other. (*Crowther, p.* 266.)

The same thing was noticed by Falconer, before Mr. Crowther. (*On Ischias, p.* 9.)

Mr. Ford has very accurately called the attention of surgeons to the alteration, with respect to the natural fulness and convexity of the nates, that part appearing flattened, which is usually most prominent. The gluteus magnus becomes emaciated, and its edge no longer forms so bold a line, as it naturally does at the upper and back part of the thigh, in the sound state of the limb.

Though there may be more pain about the knee, than the hip, at some periods of the malady in its incipient state, yet, the former articulation may be bent and extended, without any increase of uneasiness; but, the os femoris cannot be moved about, without putting the patient to immense torture.

The patient soon gets into the habit of bearing the weight of his body chiefly upon the opposite limb, while the thigh of the affected side is bent a little forward, that the ground may only be partially touched with the foot. This position is found to be the most comfortable, and every attempt to extend the limb occasions an increase of pain.

This is the first stage of the disease, or the one, which is unaccompanied with suppuration.

The symptoms which precede the formation of pus, vary in different cases, according as there is acute, or chronic inflammation present. When the diseased joint is affected with acute inflammation, the surrounding parts become tense and extremely painful; the skin is even reddish; and symptoms of inflammatory fever prevail. When the severity of the pain abates, a swelling occurs in the vicinity of the joint, and a pointing quickly follows.

When the abscess is a chronic one, there is no particular increase of pain preceding the collection of matter.

Startings and catching during sleep are said to be among the most certain signs of the formation of matter, in this stage of the disease.

We have noticed the lengthened state of the limb, in the first periods of the hip-disease. This condition is not of very long duration, and is sooner, or later succeeded by a shortening of

the affected member. When the retraction is very considerable, it arises from nothing less, than an actual dislocation of the head of the thigh-bone, in consequence of the destruction of the cartilages, ligaments, and articular cavity. This retraction sometimes comes on long before any suppuration takes place. The head of the bone is sometimes dislocated, and the disease terminates in anchylosis, without any abscess whatever.

The hip-disease generally induces hectic symptoms, after it has existed a certain time. In some subjects, such symptoms soon come on; in others, the health remains unaffected a very considerable time.

When abscesses of the above description burst, they continue, in general, to emit an unhealthy thin kind of matter for a long time afterwards.

With respect to the morbid anatomy of the disease in its incipient state, little is known. Two dissections related by Mr. Ford are, perhaps, the only ones throwing light upon this point. In one, there was a tea-spoonful of matter in the cavity of the hip-joint. The head of the thigh-bone was a little inflamed, the capsular ligaments a little thickened, and the ligamentum teres united in its natural way to the acetabulum. The cartilage lining the cotyloid cavity was eroded in one place, with a small aperture, through which a probe might be passed, underneath the cartilage, into the internal surface of the os pubis, on one side, and, on the other, into the os ischii; the opposite, or external part of the os innominatum shewing more appearance of disease, than the cotyloid cavity. In the other instance, the disease was more advanced. These examples are important, inasmuch as they prove that the hip-complaint primarily affects the cartilages, ligaments, and bones, and not the surrounding soft parts, as De Haen, and some others, would lead one to believe.

As the disorder advances, the portions of the os ischium, os ilium, and os pubis, composing the acetabulum, together with the investing cartilage, and synovial gland, are destroyed. The cartilage covering the head of the os femoris, the ligamentum teres, and capsule of the joint, suffer the same fate, and caries frequently affects not only the adjacent parts of the ossa innominata, but also the head and neck of the thigh-bone. The bones of the pelvis, however, are always more diseased than the thigh bone, a fact, which displays the absurdity of ever thinking of amputation in these cases. Mr. Ford observes, "In every case of disease of the hip-joint, which has terminated fatally, I have remarked, that the os innominatum has been affected by the caries in a more extensive degree, than the thigh-bone itself." (*Observations on the Disease of the Hip-Joint, p.* 107.)

Sometimes, however, the head and neck of the thigh-bone are annihilated, as well as the acetabulum.

External violence; lying down on the damp ground in summer time; and all kinds of exposure to damp and cold; are the causes to which the disease may sometimes be referred. Scrophula, no doubt, has frequently, some concern in the origin of the malady; but, oftentimes, no rational cause of the complaint can be assigned.

TREATMENT OF THE DISEASE OF THE HIP-JOINT.

Hippocrates, Celsus, Cælius Aurelianus, &c. convince us in their writings, that the ancients treated the present disease much in the same way, as the moderns. Forming an eschar, and keeping the sore open; topical bleeding; cupping; fomenting the part, &c. were all proceedings adopted in the earliest periods of surgery. Drs. Charlton, Oliver, and Falconer, have extolled Bath water, as a most efficacious application to diseased hip-joints, previous to the suppurative stage. However, had not their accounts been exaggerated, all patients of this kind would long ago have flocked to Bath, and the surgeons in other places would never have had further occasion to adopt a more painful mode of treatment.

The plan pursued at Bath, is to put the patient in a warm bath, two or three times a week, for fifteen or twenty-five minutes.

In the early period of the disease, entire rest, the application of fomentations, and the employment of topical bleeding, particularly cupping, are highly proper. Such practice, also, is invariably judicious, whenever the case is attended with symptoms of acute inflammation. When the fomentations are not applied, the lotio aquæ lithargyri acetati may be used.

This method of treatment ought never to be employed, unless there are

manifest marks of active inflammation present. When no such state exists, this plan can only be regarded as preventing the adoption of a more efficacious one, and, therefore, censurable.

As far as morbid anatomy can inform us, the hip-disease consists of the same alteration of the bones, ligaments, and cartilages, as takes place in the majority of white-swellings. Hence, both diseases should be treated on the same principles. *Quibus diuturno dolore*, says Hippocrates, *ischiadico vexatis coxa excidit, iis femur contabescit et claudicant, nisi urantur.* Forming an eschar, or issue, is the most efficacious plan of treating the disease even now known.

A caustic issue seems to me more beneficial than a blister, in cases of diseased hips. The depression, just behind and below the trochanter major, is the situation, in which surgeons usually make the issue, and the size of the eschar should be nearly as large as a crown piece. It is, in general, necessary to keep the issue open a very long time. When the thigh-bone is dislocated, the case mostly ends in anchylosis.

For further information, the author begs leave to refer to his "*Treatise on the Diseases of the Joints,*" *being the observations for which the prize for* 1806 *was adjudged by the Royal College of Surgeons, London. Mr. Ford's Observations on the Disease of the Hip-Joint* are particularly excellent. See also *Crowther on White-Swelling, &c. Edit.* 2, 1808. *Latta's System of Surgery. B. Bell's Surgery. Falconer on Ischias. The authors quoted throughout this article, both ancient and modern, may all be consulted with advantage.*

ASTRINGENTS (from *astringo*, to bind.) In medicine, are those substances which possess a power of making the living fibres become contracted, condensed, and corrugated. They are employed in the practice of surgery chiefly as external applications, either for restoring diminished tonic power, or checking various discharges. They are also deemed very eligible local remedies for phlegmonous inflammation.

ATHEROMA (from αθηρα, pap) An encysted tumour, so named from its paplike contents. (See *Tumours Encysted.*)

B

BALSAMUM COPAIVÆ. Exhibited by surgeons principally in cases of gonorrhœa, gleet, and piles. A dram may be given thrice a day.

BANDAGE. (*Deligatio. Fascia.*) An apparatus, consisting of one or several pieces of linen, or flannel, and intended for covering, or surrounding parts of the body for surgical purposes.

The use of bandages is to keep such compresses, remedies, &c. in their proper situation, as are applied to any particular part; to compress blood-vessels, so as to restrain hemorrhage; to rectify certain deformities by holding the deranged parts in a natural position; and to unite parts, in which there is a solution of continuity.

As the application of bandages is a very important branch of surgery, authors have not neglected it. Much has been written on the subject, and almost every writer has devised new bandages, perhaps without much benefit to surgery. Unfortunately, it is next to impossible to give very clear ideas of the numerous sorts of bandages by description. The surgeon can only acquire all the necessary instruction and information from the experience and habit resulting from practice. Hence, we shall confine ourselves to a general account of the subject.

Bandages should be made of such materials as possess sufficient strength to fulfil the end proposed in applying them, and they should, at the same time, be supple enough to become accommodated to the parts to which they are applied.

Bandages are made of linen, cotton, or flannel. If possible, they should be without a seam, and linen is woven for this purpose; but the selvage is always harsh, and, as the edges are necessarily covered by the next round, they are sometimes inconvenient. We prefer, therefore, old linen, and more readily submit to the inconvenience of the edges unravelling, than to the irregularity which any stitching would produce.

There are cases, in which the bandage should have a degree of firmness, that does not belong to the materials

usually made use of. This circumstance is obvious in cases of hernia, and in all those in which there is occasion for elastic bandages. As we have already observed, linen, flannel, and cotton (calico,) are the common materials. The first employment of flannel bandages is imputed to the Scotch surgeons, who preferred them to linen ones, in consequence of their being better calculated for absorbing moisture, while, being more elastic, they yield in a greater degree in cases requiring this property; as in the swelling subsequent to dislocations, fractures, &c. It has been asserted, that linen is better than flannel, because more cleanly; but neither one nor the other will continue clean, unless care be taken to change it very often.

The employment of cotton or calico bandages is a more recent method, and many advantages are attributed to the softness and elasticity of this material.

In applying a bandage, care must be taken, that it be put on tight enough to fulfil the object in view, without running any risk of stopping the circulation, or doing harm in any other way. If it be not sufficiently tight to support the parts in a proper manner, it is useless; if it be too tense, it will produce swelling, inflammation, and even mortification.

To apply a roller skilfully, the part which it is to cover, must be put in its proper situation; the head of the roller held in the surgeon's hand, and only so much unrolled as is requisite for covering the part.

In general the bandage should, if possible, be applied in such a manner as will admit of its being removed with the most ease, and allow the state of the parts beneath to be examined, as often as occasion requires.

For this reason, in fractures of the leg and thigh, the eighteen-tailed bandage is generally preferred to a simple roller. The former may be loosened and tightened, at pleasure, without occasioning the smallest disturbance of the affected limb; a thing which could not be done, were a common roller to be employed.

As soon as a bandage has fulfilled the object for which it is applied, and it has become useless, its employment should be discontinued; for, by remaining too long on parts, it may obstruct the circulation, diminish the tone of the compressed fibres, and thus do harm.

Bandages are either *simple* or *compound*. They are also sometimes divided into *general* and *particular*. The latter often derive their names from the parts to which they are usually applied.

A simple bandage is a long piece of linen or cotton, of an indefinite length, and from three to six inches in breadth. When about to be applied, it is commonly rolled up, and the rolled part is termed its *head*. When rolled up from each end, it is called a *double-headed roller* or *bandage*.

The chief of the simple bandages are the *circular*, the *spiral*, the *uniting*, the *retaining*, the *expellent*, and the *creeping*.

The *circular* bandage is the simplest; the rolls cover each other, and it is seldom long, as two or three turns are generally enough.

The *spiral* bandage is the most frequently used of all; for, it is this which we see in such common employment on the limbs, in cases of ulcers, &c. In applying a common roller to the whole of a limb, the bandage must be carried round the part spirally, or else it is obvious that the whole member could never be covered. When the leg is the part, the surgeon is to begin by surrounding the foot with a few turns. Then carrying the head of the bandage over the instep, he is to convey it backward, so as to make the bandage unroll, and apply itself just above the heel. The roller may next be brought over the inner ancle; thence again over the instep, and under the sole; and the surgeon then brings the bandage spirally upward once more to the outer part of the leg. After this, every circle of the roller is to be applied, so as to ascend up the limb in a gradual, spiral form, and so as to cover about one third of the turn of the roller immediately below. The increasing and diminishing diameter of the limb, is one great cause, which brings into view the unskilfulness of a surgeon in this common operation; for, it prevents the roller from lying smoothly, although spirally applied, unless a particular artifice be dexterously adopted. The plan alluded to, is to double back the part of the roller that would not be even, were the application to be continued in the common spiral way, with-

out this manœuvre. When the bulk of the limb increases very suddenly, it is sometimes necessary to fold, or, as it is termed, *reverse*, every circle of the bandage in the above manner, in order to make it lie evenly on the limb. It is manifest, that the pressure of the roller will be greatest where the duplicatures are situated, and hence, when it is an object to compress any particular part, the surgeon should contrive to reverse the turns of the bandage just over the situation where most pressure is desirable.

When a roller is to be applied to the forearm, it is best to make the few first turns of the bandage round the hand.

Care must be taken not to make the bandage very tight, if it be intended to wet it afterwards with any lotion; for, it is always rendered still more tense by moisture.

Mr. John Bell describes the principal purposes for which a roller is employed, as follows: "Although in recent wounds, it is with plasters and sutures that we unite the parts point to point, yet it is with the bandage that we support the limb, preserve the parts in continual and perfect contact with each other, and prevent any strain upon the sutures, with which the parts are immediately joined, and we often unite parts by the bandage alone. (This is called the *Uniting Bandage*, and will be presently described.) But it is particularly to be oberved, that in gunshot wounds, and other bruised wounds, though it would be imprudent to sew the parts, since it is impossible that they should altogether unite, yet the gentle and general support which we give by a compress and bandage, prevents them from separating far from each other, unites the deep parts early, and lessens the extent of that surface, which must naturally fall into suppuration.

"In the hemorrhagy of wounds, we cannot always find the artery; we dare not always cut parts for fear of greater dangers; we are often alarmed with bleedings from uncertain vessels, &c. or from veins as well as arteries: these hemorrhages are to be suppressed by the compress; which compress or even the sponge itself, is but an instrument of compression, serving to give the bandage its perfect effect. Frequently, in bleedings near the groin, or the arm-pit, or the angle of the jaw, wherever the bleeding is rapid, the vessels uncertain, the cavity deep, and the blood not to be commanded by a tourniquet, and where the circumstances forbid a deliberate and sure operation, we trust to compress and bandage alone.

"Bandage is very powerful in suppressing bleeding. At one period of surgery, it took place of every other method, &c. If a compress be neatly put upon the bleeding arteries, if there be a bone to resist the compress, or even if the soft parts be firm below, and the bandage be well rolled, the patient is almost secure. But such a roller must be rolled smoothly from the very extremity of the fingers or toes; the member must be thoroughly supported in all its lower parts, that it may bear the pressure above. It is partial stricture alone that does harm, creates intolerable pain and anxiety, or brings on gangrene. Hemorrhagy requires a very powerful compression, which must therefore be very general, &c. It must not be made only over the bleeding arteries, which is all that the surgeon thinks of in general, &c.

"In abscesses, where matter is working downwards along the limb, seeking out, as it were, the weak parts undermining the skin, and wasting it, insulating and surrounding the muscles, and penetrating to the bones, the bandage does every thing. The expelling bandage, the propelling bandage, the defensive bandage, were among the names, which the older surgeons gave to the roller, when it was applied for these particular purposes; and these are properties of the roller, which should not be forgotten." (*Principles of Surgery, Vol.* 1.)

Soon after this description of some of the chief surgical uses of the roller, Mr. John Bell proceeds to explain, in what manner this most simple of all bandages may be put on a limb.

"Practice will convince you, that the firmness and neatness of a bandage depend altogether upon these two points; first, upon the turns succeeding each other in a regular proportion; and, secondly, upon making reverses, wherever you find any slackness likely to arise from the varying form of the limb. Thus, in rolling from the foot to the ankle, leg, and knee, you must take care, first, that the turns, or, as the French call them, *doloires*, of the roller lie over one another by just one third of the breadth of the bandage; and, secondly, that at every difficult part, as

over a joint, you turn the roller in your hand, make an angle, and lay the roller upon the limb, with the opposite flat side towards it; you must turn the bandage so as to reverse it, making, what the French call, a *renversée* of the roller at the ankle, at the calf of the leg, and at the knee. You must be careful to roll your bandage from below upwards, and support the whole limb by a general pressure. That you may be able to support the diseased part with a particular pressure, you must lay compresses upon the hollows and upon the bed of each particular abscess, and change the place of these compresses from time to time, so as now to prevent matter sinking into a particular hollow, now to press it out from a place where it is already lodged, and again to reunite the surface of an abscess already completely formed, from which the matter has been discharged." (*Principles of Surgery, Vol.* 1.)

In the article *Articulation*, we have taken notice of the good effects of the pressure of a roller in the cure of white-swellings. Here we shall just introduce Mr. John Bell's sentiments upon the subject: "In a diseased bursa, as in a relaxation of the knee-joint, that disease, which, with but a little indulgence, a very little encouragement of fomentation, poultices, bleeding, and low diet, would end in white-swelling of the knee; may be stopped even by so simple a matter as a well-rolled bandage." (*Vol.* 1. *p.* 127.)

The *uniting bandage*, or *spica descendens*, used in rectilinear wounds, consists of a double-headed roller, with a longitudinal slit in the middle, of three or four inches long. The roller, having one head passed through the slit, enables the surgeon to draw the lips of the wound together. The whole must be managed, so that the bandage may act equally. When the wounds are stitched, this bandage supports the stitches, and prevents their tearing through the skin. When the wound is deep, writers advise a compress to be applied on each side, in order to press the deeper part of its sides together. When the wound is very long, two or three bandages should be employed, and great care must be taken, that the pressure is perfectly equable.

Henkel and Richter recommend a uniting bandage, which allows the surgeon to see the wound, over which only narrow tapes cross. The reader, if he should ever wish to employ this contrivance, may read a description of it in Rees's Cyclopædia, or Motherby's Medical Dictionary, though I confess I could not understand it from the description in those works, until I looked at the plate in Richter's Anfangsgr. der Wundarzn. Band. 1.

When we make use of a single-headed roller, as a *retentive bandage* only, we should always remember to begin the application of it on the side opposite the wound. The obvious reason for so doing is to prevent a farther separation of the lips of the wound, as the contrary manner of applying the roller would tend directly to divide them. (*Gooch. Vol.* 1. *p.* 143.)

The intention of the *expellent bandage* is to keep the discharge sufficiently near the orifice of the wound to prevent the formation of sinuses. In general, a compress of unequal thickness is necessary; the thinner part of the compress being placed next, and immediately contiguous to, the orifice of the wound; the thicker part below. Before the bandage is applied, the pus must be completely pressed out, and the rolling begin with two, or three, circular turns on the lower part of the compress. The bandage must then be carried spirally upwards, but not quite so tightly, as below. It is afterwards to be rolled downwards to the place, where it began.

The *creeping* is a simple bandage, every succeeding turn of which only just covers the edge of the preceding one. It is employed in cases, in which the object is merely to secure the dressings, and not to make any considerable, or equable pressure.

A bandage is termed *compound*, when several pieces of linen, cotton, or flannel, are sewed together in different directions, or when the bandage is torn or cut, so as to have several tails. Such are the T bandage, the suspensory one, the capistrum, &c.

The *eighteen-tailed bandage* is one of the most compound. It is now in general use for all fractures of the leg and thigh, sometimes for those of the forearm, and, frequently, for particular wounds. Its great recommendations are the facility, with which it can be undone, so as to allow the parts to be examined, and its not creating, on such an occasion, the smallest disturbance of the disease, or accident.

The eighteen-tailed bandage is made by a longitudinal portion of a common roller, and by a sufficient number of transverse pieces, or tails, to cover as much of the part as is requisite.

Each of the cross pieces is to be proportioned in length to the circumference of the part of the limb, to which it is to be applied; so that in making this sort of bandage for the leg, or thigh, the upper tails will be twice as long as the lower ones. After laying the long part of the bandage on a table, fix the upper end of it in some way or other. Then begin laying the upper tails across it, and proceed with placing the rest. Each tail must be long enough to extend about two inches beyond the opposite one, when they are both applied. The tails, being all arranged across the longitudinal band, they are to be stiched in this position with a needle, and thread. When the bandage is intended for the leg, a piece of the longitudinal part of the roller below, is to extend beyond the tails. This is usually brought under the sole of the foot, and then applied over the inner ankle in the first instance, after the bandage has been put under the limb. Then the surgeon lays down the first of the lower tails, and covers it with the next one above. In this way, he proceeds upward, till all the cross pieces are applied, the uppermost one of which he fastens with a pin. This bandage has a very neat appearance. The tails are said to lie better, when placed across the longitudinal piece a little obliquely. (*Pott.*)

The *T bandage* is, for the most part, used for covering parts of the abdomen and back, and, especially, the scrotum, perinæum, and parts about the anus. Its name is derived from its resemblance to the letter T, and it is, as Mr. John Bell remarks, the peculiar bandage of the body. If the breast, or belly, be wounded, we make the transverse piece, which encircles the body, very broad, and having split the tail-part into two portions, one of these is to be conveyed over each side of the neck, and pinned to the opposite part of the circular bandage, so as to form a suspensory for the latter, and prevent its slipping down. But, says Mr. John Bell, if we have a wound, or disease, or operation, near the groin, or private parts, the tail-part then becomes the most important part of the bandage; then the transverse piece, which is to encircle the pelvis, is smaller, while the tail-part is made very broad. When the disease is in the private parts, perinæum, or anus, we often split the tail according to circumstances; but, when the disease is in one groin, we generally leave the tail-part of the bandage entire and broad.

The *linteum scissum*, or *split-cloth*, is a bandage applied occasionally to the head, and consists of a central part, and six, or eight tails, or heads, which are applied, as follows:

When the cloth has six heads, the middle, or unsplit part of the cloth is applied to the top of the head. The two front tails go round the temples, and are pinned at the occiput; the two back tails go also round the temples, and are pinned over the forehead, the two middle tails are usually directed to be tied under the chin; but, as Mr. John Bell observes, this suffocates and heats the patient, and it is better to tie them over the top of the head, or obliquely, so as to make pressure upon any particular point. (*Principles of Surgery, Vol.* 1. *p.* 131.)

The old surgeons usually split this middle tail into two parts, a broad and narrow one. In the broad one, they made a hole to let the ear pass through. This broad portion was tied under the chin, while the narrow ends were tied obliquely over the head. As Mr. John Bell has observed, though this gave the split-cloth the effect of eight-tails, yet, the ancient surgeons did not name it the split-cloth with eight tails. When they split the cloth into eight-tails, and especially, when they tied the eight-tails in the following particular manner, they called the bandage *cancer*, as resembling a crab in the number of its legs. The *cancer*, or *split-cloth of eight-tails*, was laid over the head, in such a manner, that four tails hung over the forehead and eyes, while the other four hung over the back of the head. They were tied, as follows: first, the two outermost tails, on each side in front, were tied over the forehead, while the two middle tails in front were left hanging over the knot. Then the two outermost, or lateral tails behind were tied round the occiput. Next the middle tails were tied, the two anterior ones being made to cross over each other, and pass round the temples to be pinned at the occiput; while the two middle tails behind, were made to cross each other, and pass

round the temples, so as to be pinned over the ears, or near the forehead. (See *John Bell's Principles, p.* 132.)

The *triangular bandage* is generally a handkerchief doubled in that form. It is commonly used on the head, and, now and then, as a support to the testicles, when swelled. The French term it *couvre-chef en triangle.*

The *nodose bandage*, called also *scapha*, is a double-headed roller, made of a fillet four yards long, and about an inch and a half broad. It must be reversed two, or three times, so as to form a knot upon the part, which is to be compressed. It is employed, when a hemorrhage from a wound is to be stopped, or for securing the compress, after bleeding in the temporal artery.

The most convenient bandage in general for the forehead, face, and jaws, is the *four-tailed one*, or *single split-cloth.*

It is composed of a strip of cloth, about four inches wide, which is to be torn at each end, so as to leave only a convenient portion of the middle part entire. This unsplit middle portion is to be applied to the forehead, if the wound be there, and the two upper tails are carried backward, and tied over the back part of the head, while the two lower ones are to be tied either over the top of the head, or under the chin, as may seem most convenient.

When the wound is on the top of the head, the middle of the undivided part is to be applied to the dressings. The two posterior tails are to be tied forward, and the two anterior ones are to be carried backward, so as to be tied behind the head. This is sometimes called *Galen's bandage.* It is curious, that writers on bandages should use the terms *head*, and *tail*, synonymously, and hence this *four-tailed bandage* is often called the *sling* with *four heads.* Such confusion of language is highly reprehensible, as it contributes, in a very great degree, to obstruct the comprehension of any, the most simple subject.

If the upper lip be cut, and a bandage needed, which is seldom the case, it is almost superfluous to say, that this bandage will serve the purpose. It serves also in cuts of the lower lip, though there, also, we trust rather to the twisted suture, than a bandage.

The single split-cloth is particularly useful in supporting a fractured lower jaw, and, in such cases, is the only one employed in modern surgery. This bandage, when used for this particular purpose, namely, supporting the lower jaw, is named *capistrum*, or *bridle*, because it goes round the part somewhat like a horse's halter.

"In some cases, (says Mr. John Bell) the circumstances require us to support the chin particularly, and then the unslit part of the bandage is applied upon the chin, with a small hole to receive the point; but, where the jaw is broken, we pad up the jaw-bone into its right shape, with compresses pressed in under the jaw, and secured by this bandage. When we are in fear of hemorrhagy after any wound, or operation, near the angle of the jaw, we can give the sling a very remarkable degree of firmness. For this purpose, we tear the band into three tails on each side, and we stitch the bandage at the bottom of each split, lest it should give way, when drawn firm," &c. (*Principles of Surgery, Vol.* 1.)

We have already described one way of applying a handkerchief, as a bandage to the head, when we noticed the *triangular one*, or *couvre-chef en triangle.* The other manner of applying the handkerchief, called the *grand couvre-chef*, is as follows:

You take a large handkerchief, and fold it, not in a triangular, but a square form. You let one edge project about three finger-breadths beyond the other, in order to form a general border for the bandage. You lay the handkerchief upon the head, so as to make the lower fold, to which the projecting border belongs, lie next the head; while the projecting border itself is left hanging over the eyes, till the bandage is adjusted. The two corners of the outermost fold are first to be tied under the chin; the projecting border is then to be turned back, and pinned in a circular form round the face, while the corners of the fold next the head are to be carried backward, and tied.

After the outer corners of this bandage have been tied under the chin; after the inner corners have been drawn out and carried round the occipat; and after the border has been turned back and pinned; the doubling of the handkerchief over each side of the neck hangs in a loose awkward manner. It remains, therefore, to pin this part of the handkerchief up above the ear, as

neatly as can be contrived. (See *J. Bell's Principles.*)

The grand couvre-chef has certainly nothing to recommend it, either in point of utility, or elegance. A common night-cap must always be infinitely preferable to it. In the event, however, of a cap not being at hand, it is proper that the surgeon should know, what contrivances may be substituted to fulfil the objects in view.

Having, in the numerous articles of this Dictionary, noticed the mode of applying bandages in particular cases, and allotted a few separate descriptions for such bandages, as are not here mentioned, but which are often mentioned in books, we shall conclude for the present, with referring the reader to *Motherby's Medical Dictionary; Rees's Cyclopædia; and John Bell's Principles for further information. Galen and Vidus Vidius are reckoned the best of the old writers on the subject. M. Sue, Thillaye, Heister Lombard, and Bernstein; of the modern ones. The latter are said, however to be all too prolix.* See *Rees's Cyclopædia, art. Bandage.*

BELLADONNA. *Deadly Nightshade.* Is violently narcotic. The leaves were first used externally for discussing scirrhous swellings, and they have been subsequently given internally, in scirrhous and cancerous diseases, amaurosis, &c. Five grains are reckoned a powerful dose.

BINOCULUS, (from *binus* double, and *oculus* the eye.) A bandage for keeping dressings on both eyes. Its application will easily be understood by referring to *Monoculus.*

BISTOURY, (*Bistoire*, French.) Any small knife for surgical purposes.

BLADDER, PUNCTURE OF. This is an operation, to which we are obliged to have recourse, after having in vain employed all the other means indicated for preventing the bad, and even fatal consequences of a stoppage of the evacuation of the urine, and distention of the bladder. Various accidents, and diseases, both acute and chronic, may occasion this dangerous state, as we shall more particularly notice in the article, *Urine, Retention of.*

The bladder, which can conveniently hold about a pint and a half of urine, is no sooner dilated, so as to contain two pints, than uneasy sensations are experienced. The desire of discharging the water now becomes very urgent, and if the inclination be not gratified, and the bladder be suffered to be dilated beyond its natural state, it loses all power of contraction, and becomes paralytic. The desire, indeed, continues, and the efforts are renewed in painful paroxysms; but, the power is lost, and the bladder becomes more and more distended. When this viscus is dilated in the utmost degree, and neither its own structure, nor the space in the abdomen can allow a further distention; either the bladder must be lacerated, which it never is, so equally is it supported by the pressure of the surrounding parts; or its orifice must expand, and the urine begin to flow. After the third day of the retention, the urine often really begins to flow, and, whatever descends from the kidneys is evacuated in small quantities from time to time, and at this period, the bladder is distended in as great a degree, as it ever can be, however long the patient survive. This dribbling of the urine, which begins, when the bladder is dilated to the utmost, and continues till the eighth, or tenth day, or till the bladder sloughs, has long been understood, and is named by the French, "*uriné par régorgement.*" To practitioners, who do not understand it, the occurrence is a most deceitful one. The friends felicitate themselves, that the urine begins to flow; the surgeon believes it, basins and cloths, wet with urine, are easily produced; but, the patient lies unrelieved. The continued distention of the bladder is followed by universal inflammation of the abdomen. The insensibility, and low delirium of incipient gangrene, are mistaken for that relief, which was expected from the flow of urine, till either hiccough comes on, and the patient dies of fever, and inflammation, or the urine gets through an aperture, formed by mortification into the abdomen. Let no surgeon, therefore, trust to the reports of nurses and friends, but, lay his hand upon the hypogastric region, and tap with his finger, that he may distinguish the distended bladder, and the fluctuation of urine. As the bladder suffers no further distention, after the third day, why should it burst? Not from laceration; for, it is supported by the uniform pressure of the surrounding viscera; not by yielding suddenly, for it is distended to its utmost on the third day of the retention, and yet seldom gives way before the tenth; not

by attenuation, for it becomes thickened. The term *laceration* was never more wrongly applied, than in this instance; for when there is a breach in the bladder, it is found, on dissection, to be a small round hole, such as might be covered with the point of the finger. The rest of the viscus, and the adjacent bowels, are red and inflamed, while this single point is black, and mortified! Delay is more dangerous, than even the worst modes of making an opening into the bladder, and, while life exists, the patient should have his chance.—(See *John Bell's Principles of Surgery, Vol.* 2. *Part* 1. *p.* 262. *&c.*

It is now acknowledged, that the frequently fatal result of puncturing the bladder, is entirely owing to the operation being too long delayed. Hence, when relief cannot be obtained by the treatment described in the article, *Urine, Retention of*; when no urine has come away, before the end of the third day: when it only does so in a dribbling manner after this period, while the bladder continues distended, and no catheter can be introduced; the operation should not be delayed. In urgent cases, one should rather operate, as soon as forty eight hours have elapsed. We shall next describe the three modes of puncturing the bladder.

1. *Puncture through the Perinæum.*

The manner of doing this, as described by most writers, is by pushing a common trocar into the cavity of the bladder, from the place, where the external wound is made, in the old way of cutting for the stone, and thus letting out the urine, through the cannula. Others, refining upon this practice, have ordered an incision to be carried on from the same part into the bladder, and the cannula to be then introduced. *Sharp on the Operations, chap.* 15. The cannula is to be fixed, and left in, as long as necessary, and through it the urine is to be let out, as often as requisite, by removing the substance employed as a stopper. The chief advantages, imputed to this mode of operating, are, that it produces a more complete evacuation of the urine, and is attended with less danger of an effusion of urine in the cellular substance, than the puncture above the pubes. The operation, however, we have just described, is justly considered by the most eminent practitioners in this country, as by no means so eligible, as the two following methods: it is unnecessary, therefore, to say more concerning it.

2. *Puncture above the Pubes.*

To this way of operating, Mr. Sharp was partial, and Mr. Abernethy has more recently recommended it, under certain circumstances. The former celebrated surgeon remarks, that it is an operation of no difficulty to the surgeon, and of little pain to the patient, the violence done to the bladder being at a distance from the parts affected. It is equally applicable, whether the disorder be in the urethra, or prostate gland, and when there are strictures, the use of bougies may be continued, while the cannula remains in the bladder. *Critical Inquiry, p.* 125. *edit.* 4.

Some writers recommend making an incision, about two inches long, through the linea alba, a little way above the pubes, and then introducing a trocar into the bladder. Others deem this preliminary incision quite useless, asserting, that the operation may be performed with equal safety, and less pain to the patient, by puncturing at once the skin, the linea alba, and the bladder. When the trocar has been introduced, the stilette must be withdrawn, and the cannula kept in its position by a ribbon, passed through two little rings, with which it should be constructed, and fastened round the body. The orifice of the cannula should be stopped up with a little plug, so as to keep the urine from dribbling away involuntarily, and taken out as often as occasion requires. (*Encyclopédie Méthodique; Part. Chirurg. Art. Paracentese de la Vessie.*)

The trocar should be introduced in a direction obliquely downward and backward; for as this corresponds with the axis of the bladder, the instrument is less likely to injure the opposite side of that organ. (*Sabatier de la Médicine opératoire.*)

Nearly all writers advise the puncture to be made an inch, or an inch and a half, above the pubes. The reasons for so doing are the following: "If the puncture be made close to the os pubis, the bladder in that part, often rising with an almost perpendicular slope, leaves a chasm between it and the abdominal muscles, or, to speak more strictly, a certain depth of membrana cellularis only, so that, if the trocar pe-

netrate but a little way, it possibly may not enter into the bladder. If it penetrates considerably, it may pass through the bladder into the rectum, or, if not in the operation itself some days afterwards, when by the course of the illness and confinement the patient is more wasted. For, the abdominal muscles, shrinking and falling in, occasion the extremity of the cannula to press against the lower part of the bladder, and, in a small time, to make a passage into the rectum." *Sharp in Critical Inquiry, p.* 127. Though the reasons here adduced seem at first as formidable, as they are numerous, does not the danger of injuring the peritoneum form an objection to plunging in a trocar at the above distance from the pubis. Certain it is, peritonitis would be more apt to be induced by such practice, than by introducing the instrument immediately above the pubis. Some of Mr. Sharp's objections are also done away, by taking care to pass the trocar into the bladder in the axis of this viscus, and employing one which, has a cannula with an end somewhat curved, as Hunter advised, the latter part not exceeding two inches in length. Mr. Sharp confirms the danger of using too long a cannula, by mentioning an accident, which occurred in his own practice. Though he introduced the instrument more, than an inch and a half above the os pubis, yet having pushed it full two inches and a half, below the surface of the skin, its extremity in six, or seven days insinuated itself into the rectum. *Critical Inquiry, p.* 127.

A catheter left in the bladder, longer, than ten days, may possibly gather such an incrustation from the urine, as not only to render the extraction of it painful, but even impracticable. This should caution us, therefore, never to leave the cannula in the bladder quite a fortnight. If necessary to leave one in so long, Mr. Sharp advises a second one to be introduced, made with an end, like that of a catheter. *Critical Inquiry, p.* 129.

Mr. Abernethy first made an incision, between the pyramidales muscles, passed his fingers along the upper part of the symphysis pubis, so as to touch the distended bladder, and introduced a common trocar, of the middle size, in a direction obliquely downwards. On withdrawing the stilette, he passed a middle-sized hollow elastic catheter, through the cannula, into the bladder. The cannula was withdrawn, and the catheter left in, till the urine passed through the urethra. After a week, as the instrument was stopped up with mucus, it was taken out, and a new one introduced. *Surgical Observations,* 1804. It might be objected to this plan of employing a hollow bougie, that, as it is smaller, than the wound, the urine is not kept from passing between the instrument, and parts, into which it is introduced, as well as through the tube itself. This happened in Mr. Abernethy's case, and, though no urine in this instance, got into the cellular membrane; yet, it would probably do so sometimes, because it is not till after inflammation has taken place, that the cavities of the cellular substance are closed by coagulating lymph. After a time, however, the cannula of the trocar might be withdrawn, and the hollow bougie employed, if preferred though it seems difficult to discover a reason for choosing it.

The following is one of Mr. Home's conclusions: (*Med. and Chir. Trans. Vol.* 2.)—"When the puncture is made above the pubis, the cannula which incloses the trocar is not to be removed, till the surrounding parts have been consolidated by inflammation, so as to prevent the urine in its passage out from insinuating itself into the neighbouring parts; for wherever the urine lodges, mortification takes place. Any advantage, therefore, which may arise from a more flexible instrument remaining in the bladder, is more than counterbalanced by its not filling completely the aperture through the coats of the bladder, and allowing the urine to escape into the cellular membrane."

There is much truth in the following passage: "The abdomen is inflamed; the preliminary incisions, which prepare for the introduction of the trocar, sometimes pass through several inches of fat, and cellular substance; the incisions must be wide in proportion to their depth; the cannula is no sooner lodged here, than it is displaced, in some degree, by the contraction of the bladder, which, when emptied, subsides under the pubis. The cannula stands so obliquely, that the urine never flows with ease, but, by running out upon the wound, and by being injected among the cellular substance, it causes the wound to inflame; the wound by its proximity to the inflamed peritonæum soon mortifies, and thus, not-

withstanding the temporary relief, produced by the emptying of the bladder, the patient dies on the third or fourth day. (*John Bell's Principles of Surgery, Vol.* 2. *p.* 271.)

It is to be hoped, that, surgeons in future will only perform the puncture above the pubes, in cases in which the enormous enlargement of the prostate gland prevents a puncture from being safely made from the rectum.

3. *Puncture from the Rectum.*

This method is more generally applicable, than either of the two plans above related. It is not, like the puncture in the perinæum, liable to the objection, that the wound is made on diseased or inflamed parts, which afterwards become gangrenous. The enlargement of the prostate gland, is, perhaps, the only solid reason against its being uniformly preferred.

When the bladder is to be tapped from the rectum, two fingers should be introduced into the intestine, instead of one, as has been directed. In this manner, the cannula can be more conveniently guided, and held in a proper position, while the trocar is introduced with the other hand. The stilette, however, must never be introduced into the cannula, except when this is properly placed, with its extremity against the part, where it is intended to make the puncture.

We read in the *Philosophical Transactions* of a case of total retention of urine, from strictures, where the bladder was successfully punctured from the rectum. Mr. Hamilton, who did the operation, thought of the plan, in consequence of feeling the bladder exceedingly prominent in the rectum, on introducing his finger into the anus.

The patient was placed in the same position, as that in lithotomy; a trocar was passed along the finger into the anus, and pushed into the lowest, and most projecting part of the swelling, in the direction of the axis of the bladder. A straight catheter was immediately introduced through the cannula, lest the bladder by contracting should quit the latter, which was taken away, and, as soon as the water was discharged, the catheter was also removed. Notwithstanding the puncture, the bladder retained the urine as usual, until a desire to make water occurred. Then the opening, made by the instrument seemed to expand, and the water flowed in a full stream from the anus. The urine came away, in this manner, two days, after which it passed the natural rout, with the aid of a bougie, which had been passed, through the urethra, into the bladder, and which was used, till all the disease in this canal was cured.

The method is said to have been originally proposed in 1750, by M. Fleurant, surgeon of the hospital *La Charité*, at Lyons, and Pouteau, in 1760, published an account of it, and three cases in which Fleurant had operated. It was also the feel of the bladder, on the introduction of a finger *intra anum*, which led the latter surgeon to choose making a puncture in this situation, The urine was immediately discharged, and the cannula supported in its place with the T bandage, until the natural passage was rendered pervious again. But the cannula, being allowed to remain in the rectum, became incommodious to the patient when he went to stool, and, the inconvenience was vastly increased by the continual dribbling of the urine from the mouth of the instrument. Hamilton avoided both these inconveniences, by withdrawing the cannula at first. In another instance, however, Fleurant left the cannula in the anus and bladder, thirty-nine days, without the least inconvenience.

In the first volume of the *Mem. of the Medical Society of London*, two cases are related, in which, after tapping the bladder from the rectum, the cannula was immediately withdrawn, without any bad effect. Another similar fact is recorded in the *Medical Communications, Vol.* 1.

A long, curved, cylindrical trocar, is the best for performing the operation, and was the one recommended by Pouteau. It should be introduced a little beyond the prostate gland, exactly in the centre of the front of the rectum. In this way the vesiculæ seminales cannot be injured: and, even were they so, no serious consequences would follow.

It is not necessary to retain the cannula in the puncture, after the inflammation has consolidated the sides of the wound, and there is no danger of the aperture closing up, till there is another passage made for the urine. Mr. Home thinks, after about thirty-seven hours, the cannula may be properly taken out. *Med. and Chir. Trans. Vol.* 2. Indeed, I am not acquainted

with any fact, shewing the ill effect of removing the cannula at once; for, here the urine has only to pass through a mere opening, without any longitudinal extent, as after puncturing above the pubes. The safety and simplicity of tapping the bladder from the rectum, will always recommend this method with impartial practitioners. The wound is made at a distance from the peritoneum, passes through no thickness of parts, and is quite unattended with any chance of the urine becoming extravasated in the cellular substance. Whether the bladder be morbidly contracted and thickened; whether the neck of the bladder be inflamed; it is equally applicable: the diseased enlargement of the prostate gland, can alone warrant the puncture above the pubes being ever preferred.

Women seldom require the bladder being punctured; but, when the operation is necessary in them, it is more safely and easily performed from the vagina, than in any other way. If it should be proper to leave in the cannula, this must be long enough to allow its orifice to be situated on the outside of the labia, where it must be fixed with a T bandage.

Consult particularly *Sharp on the Operations, and his Critical Inquiry. L'Encyclopédie Méthodique, Partie Chirurgicale; art. Paracentése de la Vessie. Sabatier's Médicine Opératoire, Tom.* 2. *Med. and Chir. Transactions, Vol.* 2. *Abernethy's Surgical Observations*, 1804. *John Bell's Principles of Surgery, Vol.* 2.

BLEEDING. By this operation is understood the taking away of blood for the relief of diseases. Bleeding is called *general*, when practised with a view of lessening the whole mass of circulating blood; *topical*, when performed in the vicinity of the disease, for the express purpose of lessening the quantity of blood in a particular part.

General Blood-letting is performed with a lancet, and is subdivided into two kinds; viz. the opening of a vein, termed *phlebotomy*, or *venesection*; and the opening of the temporal artery, or one of its branches, termed *arteriotomy*.

Topical Blood-letting is performed, either by means of a cupping-glass and scarificator, by leeches, or by dividing the visibly distended vessels with a lancet. The latter is frequently done in cases of ophthalmy.

PHLEBOTOMY.

The mode of bleeding most frequently practised is opening a vein; and this has been done in the arm, ankle, jugular vein, frontal vein, veins under the tongue, on the back of the hand, &c. In whatever part, however, venesection is performed, it is always necessary to compress the vein, between the place where the puncture is made, and the heart. Thus the return of blood through the vein is stopped, the vessel swells, becomes conspicuous, and, when opened, bleeds much more freely than it would otherwise do. Hence, according to the situation of the part of the body where the vein is to be opened, with regard to the heart, the fillet for making the necessary pressure must be applied, either above or below the puncture.

All the apparatus essential for blood-letting, on the part of the patient, is a bandage, or fillet, two or more pieces of folded linen, for compresses, a basin to receive the blood, and a little clean water and a towel. The bandage ought to be about a yard in length, and near two inches broad, a common ribbon or garter, being frequently employed. The compresses are made by doubling a bit of linen rag, about two inches square. On the part of the surgeon, it is necessary to have a good lancet, of proper shape. He should never bleed with lancets with which he has been in the habit of opening any kind of abscesses, as very troublesome complaints have been the consequence of doing so. The shape of the instrument is also a matter of some importance. If its shoulders are too broad, it will not readily enter the vein, and when it does enter, it invariably makes a large opening, which is not always desirable. If the lancet be too spear-pointed, an incautious operator would often run a risk of transfixing the vein, and wounding the artery beneath it. More, however, certainly depends on the mode of introducing the lancet, than on its shape.

In blood-letting, the patient may lie down, sit down, or stand up, each of which positions may be chosen according to circumstances. If the patient be apt to faint from the loss of a small quantity of blood, and such fainting can answer no surgical purpose, it is best to bleed him in a recumbent posture.

But, when the person is strong and vigorous, there is little occasion for this precaution, and a sitting posture is to be preferred, as the most convenient, both for the surgeon and patient. This, indeed, is the common position. In some cases, however, particularly those of strangulated hernia, it is frequently an object to produce fainting, in order that the bowels may be more easily reduced. In this circumstance the patient may be bled in an erect posture, and the wound made large, as a sudden evacuation of blood is particularly apt to bring on the wished-for swoon. For the same reason, if we wish to avoid making the patient faint, we should then make only a small puncture.

Every operator should be able to use the lancet with either hand, which will enable him to bleed the patient in his right or left arm, as circumstances may render most eligible.

The blood is next to be all washed off the arm, the sides of the wound placed in contact, and the compresses applied and secured with the fillet, put round the elbow in the form of a figure of 8, and regularly crossing just over the compresses.

The patient should be advised not to move his arm much, till the fillet is removed, which may be done after twenty-four hours.

In order to open the external jugular vein, the patient's head is to be laid on one side, and properly supported. Then the operator is to press upon the lower part of the vein with his thumb, so as to make the part above swell, and then the lancet is to be pushed at once into the vessel, with the cautions already stated.

There is commonly no difficulty in stopping the bleeding, after the pressure is removed. Some practitioners have directed a scalpel to be used for dividing the integuments, before opening the vein itself; but, this is quite unnecessary.

Blood-letting in the feet is executed on the same principle as in other parts; but, the blood from the veins in this situation, in general not flowing with much celerity, it is customary to immerse the feet in warm water, in order to promote the bleeding.

[The use of the German fleame, or, as it is oftener called, the spring lancet, has in some parts of the United States, almost entirely superseded that of the lancet; it certainly possesses some advantages over the latter, although I am not disposed to deny that it is in some respects inferior. In a country situated like the United States, where every surgeon, except those residing in our largest cities, is compelled to be his own cutler, at least so far as to keep his instruments in order, the spring lancet has a decided preference over the lancet; the blade of this can with great ease be sharpened by any man of common dexterity, and if not very keen it does no mischief, whereas a dull lancet is a most dangerous instrument, and no one can calculate with certainty the depth to which it will enter: to sharpen a lancet, is regarded by the cutler, as one of his nicest and most difficult jobs; it is one to which few surgeons are competent.

The *safety* of using the fleame is demonstrated by daily experience; there is no country in which venesection is more frequently performed than in the United States, and *perhaps no one where fewer accidents from the operation* have occurred, of these few, I beg leave to state, that all the aneurisms produced by bleeding, which I have seen, have been in cases where the lancet was used.

The manner of using the spring lancet differs in nothing from the operation described by Mr. Cooper, excepting that the surgeon must place the instrument in such a situation over the vein, that when the spring is touched, the orifice into the vein will have a proper size and direction. Dexterity in this is very readily and speedily acquired. In point of *facility* in its use it has a great advantage over the lancet.

Among the advantages of the spring lancet *economy* is not the least. A country practitioner, who is constantly employing the English lancets, and who is particular in using none but the best, must necessarily consume half the emolument derived from the operation, in the purchase of his instruments. One spring lancet, with an occasional new blade, will serve him all his life.]

ARTERIOTOMY.

The only arteries from which blood is ever taken in practice, are the trunk and branches of the temporal artery, which lie in such a situation, that they may easily be compressed against the subjacent bones, and the bleeding stop-

ped. When the vessel which the surgeon chooses to open, lies very near the surface, or may be ascertained by feeling, or even seeing, its pulsation, it may be opened at once with a lancet. But, in many instances, it is so deeply situated, that it becomes necessary, in the first place, to make a cut in the skin, and then puncture the vessel.

The bleeding generally stops without any trouble; and may always be suppressed by a compress and bandage. In a very few cases, the blood bursts forth from time to time, and more is lost than is necessary. When this happens, notwithstanding pressure, it is recommended to divide the vessel completely across, which facilitates the process of nature in closing the end of the vessel.

TOPICAL BLEEDING.—CUPPING.

This is done by means of a scarificator, and a glass, shaped somewhat like a bell. The scarificator is an instrument, containing a number of lancets, sometimes as many as twenty, which are so contrived, that when the instrument is applied to any part of the surface of the body, and a spring is pressed, they suddenly start out, and make the necessary punctures. The instrument is also so constructed, that the depth to which the lancets penetrate, may be made greater, or less, at the option of the practitioner. As only small vessels can be thus opened, a very inconsiderable quantity of blood would be discharged, were not some method taken to promote the evacuation. This is commonly done with a cupping-glass, the air within the cavity of which is rarified by the flame of a little lamp, containing spirit of wine, or as some choose, by setting on fire a piece of tow, dipped in this fluid, and put in the cavity of the glass. When the mouth of the glass is placed over the scarifications, and the rarefied air in it becomes condensed, as it cools, the glass is forced down on the skin, and a considerable suction takes place.

Trials have been made of syringes, calculated for exhausting the air from cupping-glasses; but the plan is not found so convenient as the one we have described.

When the glass becomes moderately full, and it is desirable to take away more blood, it is best to remove it and put on another one.

A common pledget is usually applied as a dressing for the punctures made with the scarificator.

LEECHES.

Leeches are often preferible to cupping, which is attended with more irritation than many surfaces, in particular circumstances can bear, especially when the topical bleeding is to be frequently repeated.

Leeches occasionally cannot easily be made to fix on the particular part we wish; but, they will do so, if the place be first cooled with a cloth dipped in cold water, or if it be moistened with cream or milk, and they are confined in the situation with a small glass. When they fall off, the bleeding may be promoted, if necessary, by fomenting the part.

SCARIFICATION WITH A LANCET

is mostly done in cases of inflamed eyes. An assistant is to raise the upper eyelid, while the surgeon himself depresses the lower one, and makes a number of slight scarfications, where the vessels seem most turgid, trying particularly to cut the largest completely across.

DRY-CUPPING.

We may here mention this simple operation, performed by rarefying the air in a cupping-glass, as above, and then applying the vessel to the part affected. A cupping-glass, furnished with a syringe, might answer for this purpose. I think this operation is now not much used in this country: a proof that it is not a very efficacious one.

ILL CONSEQUENCES SOMETIMES FOLLOWING BLEEDING IN THE ARM.

1. *Ecchymosis.*

The most common is a thrombus, or ecchymosis, a small tumour around the orifice, and occasioned by the blood insinuating itself into the adjoining cellular substance, at the time when this fluid is flowing out of the vessel. Changing the posture of the arm will frequently hinder the thrombus from increasing in size, so as to obstruct the evacuation of blood. But, in some instances, the tumour suddenly becomes

so large, that it entirely interrupts the operation, and prevents it from being finished. In these cases, however, the most effectual method of preventing the tumour from becoming still larger, is to remove the bandage. By allowing the bandage to remain, a very considerable swelling may be induced, and such as might be attended with great trouble. If more blood be required to be taken away, it ought to be drawn from another vein, and, what is still better, from a vein in the other arm.

The best applications for promoting the absorption of these tumours, are those containing spirit, vinegar, or sal-ammoniac. Compresses, wetted with any lotion of this sort, may be advantageously put on the swelling, and confined there by a slack bandage.

2. *Inflammation of the Integuments and subjacent cellular substance.*

Mr. Abernethy says, that the inflammation and suppuration of the cellular substance, in which the vein lies, is the most frequent occurrence. On the subsidence of this inflammation, the tube of the vein is free from induration. Sometimes it is more diffused, and partakes of the erysipelatous nature. On other occasions, the affecton is of the phlegmonous kind.

When the lancet has been bad, so as rather to have lacerated, than cut the parts; when the constitution is irritable, and, especially, when care is not taken to unite the edges of the puncture, and the arm is allowed to move about, so as to make the two sides of the wound rub against each other; inflammation will most probably ensue. The treatment of this case consists in keeping the arm perfectly at rest in a sling, applying the saturnine lotion, and giving one or two mild saline purges. When suppuration takes place, a small poultice is the best local application.

3. *Absorbents inflamed.*

Sometimes, particularly when the arm is not kept properly quiet after bleeding, swellings make their appearance about the middle of the arm, over the large vessels, and on the fore-arm, about the mid-space, between the elbow and wrist, in the integuments covering the flexor muscles. The swelling at the inner edge of the biceps is sometimes as large as an egg. Before such swellings take place, the wound in the vein often inflames, becomes painful and suppurates, but without any perceptible induration of the venal tube, either at this time, or after the subsidence of the inflammation. Pains are felt shooting from the orifice in lines, up and down the arm, and upon pressing in the course of this pain, its degree is increased. On examining the arm attentively, indurated absorbents may be plainly felt leading to the tumour at the side of the biceps muscle.

The pain and swelling often extend to the axilla, where the glands also sometimes enlarge. Chord-like substances, evidently absorbents, may sometimes be felt, not only leading from the puncture to the swelling in the middle of the arm, but also from this latter situation up to the axillary glands, and from the wound in the vein down to the enlarged glands of the mid space between the elbow and wrist, over the flexor muscles of the hand.

The enlarged glands very often proceed to suppuration, and the patient suffers febrile symptoms. Some may suspect that the foregoing consequences may arise from the lancet being envenomed, and from the absorption of the virulent matter; but the frequent descent of the disease to the inferior absorbents militates against this supposition.

When the absorbents become inflamed, they quickly communicate the affection to the surrounding cellular substance. These vessels, when indurated, appear like small chords, perhaps of one eighth of an inch in diameter; this substance cannot be the slender sides of the vessels, suddenly increased in bulk, but an induration of the surrounding cellular substance.

The inflammation of the absorbents, in consequence of local injury, is deducible from two causes: one, the absorption of irritating matter; and the other, the effect of the mere irritation of the divided tube. When virulent matter is taken up by the absorbents, it is generally conveyed to the next absorbent gland, where its progress being retarded, its stimulating qualities give rise to inflammation, and, frequently, no evident disease of the vessel, through which it has passed, can be distinguished.

When inflammation of the absorbents happens in consequence of irritation, the part of the vessel nearest the irritating cause, generally suffers most,

while the glands, being remotely situated, are not so much inflamed.

The treatment of the preceding case consists in keeping the arm perfectly quiet in a sling, dressing the puncture of the vein with any mild simple salve, covering the situation of the inflamed lymphatics with linen wet with the saturnine lotion, and giving some gently purging medicine.

When the glandular swellings suppurate, poultices should be applied, and if the matter does not soon spontaneously make its way outward, the surgeon may open the abscess. (See *Mr. Abernethy's Essay on this subject*.)

4. *Inflammation of the Vein.*

The vein itself is very likely to inflame, when the wound does not unite. This affection will vary in its degrees, extent, and progress. One degree of inflammation may only cause a slight thickening of the venal tube, and an adhesion of its sides. Abscesses, more or less extensive, may result from an inflammation of greater violence, and the matter may sometimes become blended with the circulating fluids, and produce dangerous consequences, or the matter may be quite circumscribed, and, make its way to the surface. When the vein is extensively inflamed, a good deal of sympathetic fever is likely to ensue, not merely from the excitement, which inflammation usually produces, but also in consequence of the irritation continued along the membranous lining of the vein to the heart. If, however, the excited inflammation should fortunately produce an adhesion of the sides of the vein to each other, at some little distance from the wounded part, this adhesion will form a boundary to the inflammation, and prevent its spreading further. The effect of the adhesive inflammation in preventing the extension of inflammation along membranous surfaces has been ably explained by Mr. Hunter. In one case, Mr. Hunter applied a compress to the inflamed vein, above the wounded part, and he thought that he thus succeeded in producing an adhesion, as the inflammation was prevented from spreading further. When the inflammation does not continue equally in both directions, but descends along the course of the vein, its extension in the other direction is probably prevented by the adhesion of the sides of the vein to each other. (See *Mr. Hunter's Paper in the Med. and Chirurg. Transactions, Vol.* 1.)

Mr. Abernethy mentions his only having seen three cases, in which an inflammation of the vein succeeded venesection. In neither of these did the vein suppurate. In one, about three inches of the venal tube inflamed both above and below the puncture. The integuments over the vessel were very much swollen, red, and painful, and there was a good deal of fever, with a rapid pulse, and furred tongue. The vein did not swell, when compressed above the diseased part. In another instance, the inflammation of the vein did not extend towards the heart, but only downward, in which direction it extended as far as the wrist.

The treatment is to lessen the inflammation of the vein, by the same means, which other inflammations require, and to keep the affection from spreading along the membranous lining of the vessel, towards the heart, by placing a compress over the vein, a little way above the puncture, so as to make the opposite sides of the vessel adhere together.

Mr. Abernethy can conceive a case, in which the vein may suppurate, and a total division of the vessel might be proper, not merely to obviate the extension of the local disease, but to prevent the pus from becoming mixed with the circulation.

Might it not be better to put a ligature under the suppurating vein, above the affected part of the vessel? This plan would be quite effectual, without the objection of hemorrhage.

[We beg leave to recommend in this place, the application of a blister over the puncture as the most valuable remedy for this complaint; it should be applied as early as possible after the discovery of the disease; a blister as large as the palm of the hand will be sufficient, and in a number of instances it has succeeded in removing immediately all the unpleasant symptoms. If the orifice in the vein be not closed, a dossil of lint may be applied over it to defend it from the flies, but commonly this caution is unnecessary.]

5. *Inflammation of the Fascia of the Forearm.*

Sometimes, in consequence of the inflammation arising from the wound of the lancet in bleeding, the arm becomes very painful, and can hardly be moved.

The puncture often remains unhealed, but, without much inflammation of the surrounding integuments. The fore-arm and fingers cannot be extended without great pain. The integuments are sometimes affected with a kind of erysipelas; being not very painful, when slightly touched, but when forcibly compressed, so as to affect the inferior parts, the patient suffers a good deal. The pain frequently extends towards the axilla and acromion; no swelling, however, being perceptible in either direction. These symptoms are attended with considerable fever. After about a week, a small superficial collection of matter sometimes takes place, a little below the internal condyle: this being opened, a very little pus is discharged, and there is scarcely any diminution of the swelling or pain. Perhaps, after a few days more, a fluctuation of matter is distinguished below the external condyle, and this abscess being opened, a great deal of matter gushes from the wound, the swelling greatly subsides, and the patient's future sufferings are comparatively trivial.

The last opening, however, is often inadequate to the complete discharge of the matter, which is sometimes originally formed beneath the fascia, in the course of the ulna, and its pointing at the upper part of the arm depends on the thinness of the fascia in this situation. The collection of the pus descends to the lower part of the detached fascia, and a depending opening for its discharge becomes necessary. This being made, the patient soon gets well.

In these cases, neither the vein, nor the absorbents, appear inflamed. The integuments are not much affected, and the patient complains of a tightness of the fore-arm. Matter does not always form, and the pliability of the arm, after a good while, gradually returns again.

Mr. Watson relates a case, which was followed by a permanent contraction of the fore-arm. Mr. Abernethy is of opinion, that a similar contraction of the fore-arm, from a tense state of the fascia, may be relieved by detaching the fascia from the tendon of the biceps, to which it is naturally connected. Mr. Watson seems to have obtained success in his first case, by having cut this connexion.

The treatment of an inflamed fascia, in consequence of venesection, has in it no peculiarity. General means for the cure of inflammation should be employed. The limb should be kept quiet, and the inflamed part relaxed. As soon as the inflammation abates, the extension of the fore-arm and finger ought to be attempted, and daily performed, to obviate the contraction, which might otherwise ensue. (*Abernethy.*)

Mr. Charles Bell objects to calling the affection an inflammation of the fascia, because he sees no proof of this part being inflamed; and he conceives that the symptoms proceed from the inflammation spreading in the cellular membrane, and passing down among the muscles, and under the fascia. The fascia acts as a bandage, and, from the swelling of the parts beneath, it binds the arm, but is not itself inflamed, and contracted. When necessary to divide the fascia, Mr. Charles Bell thinks it would be better to begin an incision near the inner condyle of the humerus, and to continue it some inches down the arm, rather than perform the nice, if not dangerous operation, of cutting the fascia, at the point, where the expansion goes off from the round tendon of the biceps.

When the elbow-joint and fore-arm continue stiff after all inflammation is over, Mr. C. Bell recommends frictions with camphorated mercurial ointment, &c. and the arm to be gradually brought into an extended state by placing a splint on the fore part of the limb. (*Operative Surgery, Vol. I. p. 65.*)

6. *Ill Consequences of a Wounded Nerve.*

Mr. Abernethy informs us, that Mr. Pott used to mention two cases, in which the patients had suffered distracting pains, followed by convulsions and other symptoms, which could only be ascribed to nervous irritation, arising from a partial division of the nerve, and he recommended its total division, as a probable remedy. Dr. Monro is said to relate similar cases, in which such treatment has proved successful.

Hence, it is highly necessary to know the characteristic symptoms of the case particularly, as all the foregoing ones would be exasperated by the treatment just now alluded to. It is to Mr. Abernethy that we are indebted for several valuable remarks elucidating this subject. He informs us, that the two cutaneous nerves are those, which are exposed to injury. Most frequently

all their branches pass beneath the veins, at the bend of the arm; but, sometimes, although the chief rami go beneath these vessels, many small filaments are detached before them, which it is impossible to avoid wounding in phlebotomy.

Mr. Abernethy thinks the situation of the median nerve, renders any injury of it very unlikely. If, however, a doubt should be entertained on this subject, an attention to symptoms will soon dispel it. When a nerve is irritated at any part, between its origin and termination, a sensation is felt, as if some injury were done to the parts, which it supplies. If, therefore, the cutaneous nerves were injured, the integuments of the fore-arm would seem to suffer pain; if the median nerve, the thumb, and two next fingers, would be painfully affected. (*Abernethy.*)

What are the ills likely to arise from a wounded nerve? If it were partially cut, would it not, like a tendon, or any other substance, unite? It seems probable that it would do so, as nerves, as large as the cutaneous ones of the arm, are very numerous in various situations of the body, and are partially wounded in operations, without any peculiar consequences usually ensuing. The extraordinary pain sometimes experienced in bleeding, may denote that a cutaneous nerve is injured. The situation of the nervous branches is such, that they must often be partially wounded in the operation, though they probably unite again, in almost all cases, without any ill consequences. Yet, says Mr. Abernethy, it is possible that an inflammation of the nerve may accidentally ensue, which would be aggravated, if the nerve were kept tense, in consequence of its partial division. Mr. Abernethy thinks the disorder arises from inflammation of the nerve, in common with the other wounded parts. Every one will admit that an inflamed nerve would be very likely to communicate dreadful irritation to the sensorium, and that a cure would be likely to arise from intercepting its communication with that organ.

The general opinion is, that the nerve is only partially divided, and that a complete division would bring relief. Mr. Pott proposed enlarging the original orifice. It is possible, however, that the injured nerve may be under the vein, and, if the nerve be inflamed, even a total division of it, at the affected part, would, perhaps, fail in relieving the general nervous irritation, which the disease has occasioned. To intercept the communication of the inflamed nerve with the sensorium, does, however, promise perfect relief. This object can only be accomplished by making a transverse incision above the orifice of the vein. The incision need not be large, for the injured nerve must lie within the limits of the original orifice, and it need only descend as low as the fascia of the fore-arm, above which all the filaments of the cutaneous nerves are situated. As the extent of the inflammation of the nerve is uncertain, Mr. Abernethy suggests even making a division of the cutaneous nerve still further from the wound made in bleeding.

In the foregoing account, the various ill consequences occasionally arising, after venesection, are represented separately; no doubt, in some cases, they may occur together.

(See *Essay on the Ill Consequences sometimes following Venesection, by J. Abernethy, F. R. S. Medical and Chirurgical Transactions, Vol.* 1. *Medical Communications, Vol.* 2.

BLEEDING. Effusion of blood from accidental wounds. (See *Hemorrhage.*)

BLEPHAROPTOSIS, (from βλεφαρον, the eyelid, and πτωσις, a falling down.) Called also *ptosis.* An inability to raise the upper eyelid. (See *Ptosis.*)

BLISTERS. Topical applications, which, when put on the skin, raise the cuticle in the form of a vesicle, filled with a serous fluid. Various substances produce this effect on the skin; but, the powder of cantharides is what operates with most certainty and expedition, and, is now invariably made use of for the purpose. The blister plaster is thus composed: ℞ *Cantharidum* ℔j, *Emplastri ceræ* ℔ij, *Adipis suillæ præp.* ℔ss. The wax plaster and lard being melted, and allowed to become nearly cold, the powdered cantharides are afterwards to be added.

When it is not wished to maintain a discharge from the blistered part, it is sufficient to make a puncture in the cuticle to let out the fluid; but, when the case requires keeping up a secretion of pus, the surgeon must remove the whole of the detached cuticle with a pair of scissars, and dress the excoriated surface in a particular manner. Practitioners used formerly to mix powder of cantharides with an ointment,

and dress the part with this composition. But, such a dressing not unfrequently occasioned very painful affections of the bladder, a scalding sensation in making water, and very afflicting stranguries. An inflammation of the bladder, ending fatally, has been thus excited. The treatment of such complaints consists in removing every particle of cantharides from the blistered part, making the patient drink abundantly of mucilaginous drinks, giving emulsions, and some doses of camphor.

These objections to the employment of salves, containing cantharides, for dressing blistered surfaces, led to the use of mezereon, euphorbium, and other irritating substances, which, when incorporated with ointment, form very proper compositions for keeping blisters open, without the inconvenience of irritating the bladder, like cantharides.

The favourite application, however, for keeping open blisters, is the powder of savine, which was brought into notice by Mr. Crowther, in the first edition of his book on the White Swelling. In the late edition, this gentleman remarks, that he was led to the trial of different escharotic applications, in the form of ointment, in consequence of the minute attention, which caustic issues demand; and among other things, he was induced to try powdered savine, from observing its effects in the removal of warts. Some of the powder was first mixed with white cerate, and applied as a dressing to the part, that had been blistered; but, the ointment ran off, leaving the powder dry upon the sore, and no effect was produced. Mr. Crowther next inspissated a decoction of savine, and mixed the extract with the ointment, which succeeded better, for it produced a great and permanent discharge. At last, after various trials, he was led to prefer a preparation analogous to the unguentum sambuci P. L. and he now offers the following formula, as answering every desirable purpose: ℞ *Sabinæ recentis contusæ* ℔ij, *Ceræ flavæ* ℔j, *Adipis suillæ* ℔iv. *Adipe et cerâ liquefactis, incoque sabinam et cola.*

The difference of this formula from the one, which Mr. Crowther published in 1797, only consists in using a double proportion of the savine leaves. The ceratum sabinæ of Apothecary's Hall, he says, is admirably made: the fresh savine is bruised with half the quantity of lard, which is submitted to the force of an iron press, and the whole is added to the remainder of the lard, which is boiled until the herb begins to crisp; the ointment is then strained off, and the proportion of wax, ordered, being previously melted, is added. On the use of the savine cerate, immediately after the cuticle, raised by the blister, is removed, it should be observed, says Mr Crowther, that experience has proved the advantage of using the application lowered by a half, or two-thirds of the unguentum ceræ. An attention to this direction will produce less irritation, and more discharge, than if the savine cerate were used in its full strength. Mr. Crowther says also, that he has found fomenting the part with flannel wrung out of warm water, a more easy, and preferable way of keeping the blistered surface clean, and fit for the impression of the ointment, than scraping the part, as has been directed by others. An occasional dressing of the unguentum resinæ flavæ, he has found, a very useful application for rendering the sore free from an appearance of slough, or rather dense lymph, which has sometimes been so firm in its texture, as to be separated by the probe, with as much readiness, as the cuticle is detached after blistering. As the discharge diminishes, the strength of the savine dressing should be proportionally increased. The ceratum sabinæ must be used, in a stronger, or weaker degree, in proportion to the excitement produced on the patient's skin. Some require a greater stimulus, than others, for the promotion of the discharge, and this can only be managed by the sensations, which the irritation of the cerate occasions.

Mr. Crowther has used ointments, containing the flowers of the clematis recta, the capsicum, and the leaves of the digitalis purpurea. The two first produced no effect: the last was very stimulating; and Mr. Crowther mentions his intention to take the first convenient opportunity to determine its qualities more accurately. He has also used kali purum, rubbed down with spermaceti cerate, in the proportion of one dram to an ounce: it proved very stimulating, but produced no discharge. He has tried one dram of the hydrargyrus muriatus mixed with two ounces of the above cerate; but, the application was so intolerably painful, that

Mr. Crowther was sent for at the end of two hours, and found it necessary immediately to remove the dressing. The patient was attacked with the most severe ptyalism Mr. Crowther ever witnessed. (*Practical Observations on the White Swelling, &c. a New Edition, by B. Crowther*, 1808.)

BOIL. See *Furunculus*.

BOUGIE (French for Wax Candle.) This signifies an instrument somewhat resembling a straight piece of wax-taper, and the chief use of which is to remove, obstructions in the urethra, by being introduced into this canal. The composition, of which they are made, ought, in particular, to possess a certain degree of suppleness, combined with a good deal of firmness.

The making of bougies has now become so distinct a trade, that there is no occasion to enter into any particular account of it in this work. The composition for bougies is now very simple, as modern surgeons place no confidence in the medicated substances, formerly extolled so much by the famous Daran. The linen, which may be considered as the basis of the bougie, is impregnated with the composition alluded to, and which is generally made of wax and oil, rendered somewhat firmer by a proportion of resin. Some saturnine preparation is generally added, as the urethra is in an irritable state, and the mechanical irritation might otherwise increase it. Of whatever composition bougies are made, they must be of different sizes, from that of a knitting-needle to that of a large quill, and even larger. The common ones are made in the following manner. Having spread any composition, chosen for the purpose, on linen rag, cut this into slips, from six to ten inches long, and from half an inch, to an inch, or more in breadth. Then dexterously roll them on a glazed tile into the proper cylindrical form. As the end of the bougie, which is first introduced into the urethra, should be somewhat smaller than the rest, the slips must be cut rather narrower in this situation, and, when the bougies are rolled up, that side must be outward, on which the plaster is spread.

Mons. Daran, and some others, attributed the action of their bougies to the composition used in forming them. Mr. Sharp apprehended that their efficacy was chiefly owing to the pressure, which they made on the affected part; and Mr. Aikin adds, that as bougies of very different compositions succeed equally well in curing the same diseases in the urethra, it is plain, that they do not act from any peculiar qualities in their composition, but, by means of some common property, probably, their mechanical form.

There certainly is a great objection to making bougies of very active materials: because the healthy, as well as the diseased, parts are exposed to their action. Hence, surgeons now prefer the common bougies, made of a simple unirritating composition.

Plenck recommended bougies of catgut, which may be easily introduced even into a urethra greatly contracted, as their size is small, their substance firm, and they dilate with moisture. It is objected to catgut, however, that it dilates very much beyond the stricture, and gives great pain on being withdrawn.

The elastic resin has been employed for this purpose with great success, as it unites firmness and flexibility. The resin is moulded on catgut by some secret method. Elastic gum bougies are in many cases highly serviceable, though their surface soon becomes rough, and they are expensive.

Mr. Smyth, apothecary, of Tavistock-street, has discovered a metallic composition, of which he forms bougies, to which some practitioners impute very superior qualities. These bougies are flexible, have a highly polished surface, of a silver hue, and possess a sufficient degree of firmness for any force, necessary in introducing them for the cure of strictures in the urethra. The advocates for the metallic bougies assert, that the short time they have been employed has convinced them, that such instruments exceed any bougies, which have yet been invented, and are capable of succeeding in all cases, in which the use of a bougie is proper. They are made either solid, or hollow, and answer extremely well as catheters; for, they not only pass into the bladder with ease, but, may also be continued there for any convenient space of time, and hence produce the most essential benefit, The bougies certainly do not swell with moisture, but they do not break, nor bend.

See Sharp's Critical Inquiry, ch. 4. Aikin on the external use of Lead. Bell's Surgery, Vol. 2. 20, &c. White's Surgery, 371.

The bougie, with its application, says Mr. Hunter, is perhaps one of the greatest improvements in surgery, which these last thirty, or forty years have produced. When I compare the practice of the present day, with what it was in the year 1750, I can scarcely be persuaded, that I am treating the same disease. I remember, when, about that time, I was attending the first hospitals in the city, the common bougies were, either a piece of lead, or a small wax candle, and, although the present bougie was known then, the due preference was not given to it, nor its particular merit understood, as we may see from the publications of that time.

Daran was the first, who improved the bougie, and brought it into general use. He wrote professedly on the diseases, for which it is a cure, and also of the manner of preparing it; but, he has introduced so much absurdity in his descriptions of the diseases, the modes of treatment, and of the powers and composition of his bougies, as to create disgust.

When Daran published his observations on the bougie, every surgeon set to work to discover the composition, and each conceived that he had found it out, from the bougies he had made producing the effects described by Daran. It never occurred to them, that any extraneous body, of the same shape and consistence, would do the same thing.

(*Treatise on the Venereal Disease, p.* 116, *by John Hunter*, 1788.)

Of armed bougies, and of the manner of using bougies in general, we shall speak in the article, *Urethra, Strictures of.*

BRACHERIUM. A truss or bandage for hernia. A word used by the barbarous Latin writers, and said to be derived from *brachiale*, a bracelet.

BRAIN. (For concussion, compression of, &c. see *Head, Injuries of;* for the hernia of, see *Hernia Cerebri.*)

BREAST. (See *Mammary Abscess; Mamma, Removal of; Cancer;* &c.)

BRONCHOCELE, (from βρογχος, the windpipe, and κηλη, a tumour.) Also called *botium*, or *bocium*. The Swiss call the disease *gotre*. Some have called it *hernia gutturis, guttur tumidum*, and *trachelophyma, gossum, exechebronchos; gongrona, hernia bronchialis.* Heister thought it should be named *tracheocele*. Prosser, in his late publication on this disorder, from its frequency on the hilly parts of Derbyshire, calls it, with others, the *Derbyshire neck;* and, not satisfied respecting the similitude of this tumour to that observed on the necks of women on the Alps, the *English Bronchocele*.

Modern surgeons constantly mean by *bronchocele*, an enlargement of the thyroid gland. This sometimes attains such a magnitude, that it not only occupies all the space from one angle of the jaw to the other, but also, forms a considerable projection on each side of the neck, advancing forward a good way beyond the chin, and forming an enormous mass, which hangs down over the chest. The swelling, which is more or less unequal, is commonly not very hard, especially when the disease is not in a very advanced state; however, no fluctuation is perceptible, and the patients suffer no pain. The skin retains nearly its ordinary colour; but, when the tumour is of very long standing, and great size, the veins of the neck become more or less varicose.

It is this disease, to which the term *gotre*, or *goitre*, has been particularly applied, and which is so common in some of the valleys of the Alps. Indeed, there are certain places, where the disease is so frequent, that hardly an individual is totally exempt from it. In many the swelling is so enormous, that it is impossible to conceal it by any sort of clothing. A state of idiotism is another affliction, which is sometimes combined with the *goitre*, in countries, where the latter affection is endemic. However, all, who have the disease, are not idiots, and in Switzerland, and elsewhere, it is met with in persons who possess the most perfect intellect and faculties. The bronchocele seems to be endemic in several mountainous countries, particularly, Switzerland, Savoy, Tyrol, Derbyshire, &c. and it occurs particularly often in young subjects, and much more frequently in the female, than the male sex. In women, it usually makes its appearance at an early age, generally between the eighth and twelfth year, and it continues to increase gradually for three, four, or five years, and is said sometimes to enlarge more, during the last half year, than for a year, or two, before. It does not generally rise so high as the ears, as in the cases mentioned by Wiseman, and it is rather in a pendulous form, not unlike, as Albucasis says, the flap, or dewlap of a turkey-cock, the bottom

being the largest part of the tumour. It is soft, or rather flabby to the touch, and somewhat moveable, but, after a few years, when it has ceased enlarging, it becomes firmer, and more fixed. When the disease is very large, it generally occasions a difficulty of breathing, which is increased on the patient's catching cold, or attempting to run. In some subjects, the tumour is so large, and affects the breathing so much, that a loud wheezing is occasioned; but, there are many exceptions to this remark. Sometimes, when the swelling is of great size, patients suffer very little inconvenience; while others are greatly incommoded, though the tumour is small. In general, the inconvenience is trivial. The voice is occasionally rendered hoarse. In some instances, only one lobe of the thyroid gland is affected.

The causes of the bronchocele are little known, and the observations of different writers, with regard to this part of the subject, are of very little practical utility. The disease is sometimes seen in scrophulous subjects; but, it may be quite independent of the other disorder. On the mountainous parts of Genoa and Piedmont, they attribute the bronchocele to drinking water cooled with ice. Dr. Leake thinks, that tumours of this sort, may be owing to the severity of the cold damp air, as they generally appear in winter, and hardly ever in the warm dry climates of Italy and Portugal. Mr. Prosser is inclined to consider the bronchocele, as a kind of dropsy of the thyroid gland, similar to the dropsy of the ovary, and he mentions, that Dr. Hunter dissected one thyroid gland, which had been considerably enlarged, and contained many cysts filled with water. These, he erroneously concludes, must have been hydatids. Dr. Baillie remarks, that when a section is made of the thyroid gland, affected with this disease, the part is found to consist of a number of cells, containing a transparent viscid fluid.

The ordinary bronchocele is, in all probability, entirely a local disease, patients usually finding themselves, in other respects, perfectly well. The tumour itself frequently occasions no particular inconvenience, only deformity. There is no malignancy in the disease, and the swelling is not prone to inflame, or suppurate, though, as Dr. Hunter remarks, abscesses do occasionally form in it. Bronchoceles never become cancerous. Mr. Gooch never knew life to be endangered by this sort of tumour, however large; but, he saw great inconvenience arise from it, when combined with quinsy. Dr. Hunter says, that the bronchocele appears two, or three years before, or after the commencement of the menstruation, and that it sometimes spontaneously disappears, when this evacuation goes on in a regular manner. Mr. Prosser thinks, that this change in the constitution hardly ever affects the tumour.

It is a curious fact, that the inhabitants of the valleys of the Alps are particularly liable to bronchocele, while those, who live in higher situations on the mountains, escape the disease.

TREATMENT OF BRONCHOCELE.

A blister, kept open, has put a stop to the growth of the tumour; but, this method is not much followed at present, as a better plan of treatment has been discovered. The most famous mode of curing the bronchocele is by giving internally burnt sponge, and occasionally, a calomel purge, at the same time, employing frictions to the tumour itself.

The efficacy of burnt sponge is said to be most conspicuous, when this medicine is exhibited in the form of a lozenge, composed of ten grains of this substance, ten of burnt cork, and the same quantity of pumice-stone. These powders are to be made into the proper form with a little syrup, and the lozenge is then to be put under the tongue and allowed to dissolve there. To this latter circumstance much importance is attached. Other practitioners give a scruple of the burnt sponge alone, thrice every day, while some add a grain of calomel to each dose. A purge of calomel should be ordered about once a week, or fortnight, as long as the patient perseveres in the use of the calcined sponge; but, if mercury be combined with each dose of this medicine, no occasional purgative will be requisite.

External means may very materially assist the above internal remedies. Frequently rubbing the swelling with a dry towel; bathing the part with cold water; rubbing the tumour two, or three times a day, with the aq. ammon. acet. or the camphor liniment; are the best steps of this kind the surgeon can take.

A whole volume might be written on the various remedies, and plans of treatment, of the bronchocele. The limits of this work, however, demand conciseness, and, having detailed the most approved practice, we shall be very brief on other proposals.

Mr. Wilmer, credulously imputing great influence to the changes of the moon, used to begin with an emetic, the day after the full moon, and to give a purge the day after that. The night following, and seven nights successively, he directed the above mentioned lozenge to be put under the tongue at bed-time, and administered every noon a bitter stomachic powder. On the eighth day, the purge is to be repeated, and, in the wane of the succeeding moon, the whole process, except the emetic, was renewed. (*Cases in Surgery, Appendix.*) This famous Coventry plan of treatment is said to be greatly assisted, by rubbing the tumour, with an ointment, containing tartar emetic.

Mr. Prosser succeeded with his medicines, though the patient was nearly twenty-five years old, and the swelling had existed more than twelve years. It is said, that no instance of cure has been known, after the patient was twenty-five.

Mr. Prosser orders one of the following powders to be taken, early in the morning, an hour, or two after breakfast, and, at five, or six o'clock in the evening, every day, for a fortnight, or three weeks. The powder may be taken in a little syrup, or sugar and water, or any thing else, so that none may be lost.

℞ Cinnab. ant. op. levigat. milleped. ppt. et. pulv. a a gr. xv. Spong. calcin. ℈ M.

These powders should be taken for two, or three weeks, and left off for a week or nine days, before a repetition. At bed time, every night, during the second course of the powders, some purgative pills, composed of mercury, the extractum colocynthid. comp. and rhubarb, are to be administered. In general, it will be proper to purge the patient with manna, or salts, before beginning with the powders. Mr. Prosser puts no faith in external applications.

Some have recommended giving two scruples of calcined egg-shells, every morning, in a glass of red wine; half a dram of the kali sulphuratum, every day, dissolved in water; or ten, or fifteen drops of the *tinct. digit. purpur.* twice a day, the dose to be gradually increased. Muriated Barytes; cicuta; and belladonna, have also been exhibited.

A proposal has been made to extirpate the enlarged thyroid gland; but, the numerous large arteries distributed to this part, the dilated state of these vessels, when the gland is much enlarged, and the vicinity of the carotid arteries, render this operation exceedingly dangerous, especially when the swelling is very large, the only instance, in which a patient would submit to this mode of cure. In doing it, one would be obliged to cut arteries large enough to pour forth a vast quantity of blood in a very short time, and so situated, that it would be difficult to tie, or effectually compress them. Mr. Gooch relates two cases, which do not encourage practitioners to have recourse to the excision of enlarged thyroid glands. In one of these instances, so copious an hemorrhage took place, that the surgeon, though equally bold and experienced, was obliged to stop in the middle of the operation. No means availed in entirely suppressing the bleeding, and the patient in a few days died. In the other example, the same event nearly took place, the patient's life only being saved by compressing the wounded vessels with the hand, day and night, for a whole week, by persons who relieved each other in turn. The surgeon found this the only way of stopping the hemorrhage, after many fruitless attempts to tie the vessels.

Certainly, these cases are well calculated to deter prudent men from undertaking the hazardous operation of cutting out an enlarged thyroid gland. The practice is the less proper for imitation, for, inconvenient as a bronchocele may be, it scarcely ever endangers life.

It must be noticed, however, that there are a very few cases of enormous bronchoceles, every now and then occurring, which obstruct respiration, deglutition, and the return of the blood from the head, in so serious a degree, that every enterprising surgeon would feel greatly inclined to make any rational attempt to relieve his patient, even though it might be one of a bold description. The extirpation of the whole gland, thus enlarged, is entirely out of the question. In case of the existence of urgent symptoms, however, it seems warrantable to expose, and

tie, the superior thyroideal arteries, just as is done in cases of aneurisms. When the quantity of blood, flowing into a tumour, is, suddenly, and, greatly lessened, the size of the swelling commonly very soon undergoes a considerable diminution. This operation has been actually practised, and though a fatal hemorrhage succeeded, the great decrease in the size of the gland before death, is a sufficient encouragement to repeat the trial, particularly, as the mode of tying arteries is now better understood. If the femoral, and even the external iliac, arteries will heal, when tied in Mr. Abernethy's method, there can be no doubt, that the superior thyroideal is capable of doing so.

Recent bronchoceles may often be cured by proper medicines and applications; inveterate ones may generally be diminished, but, they hardly ever can be entirely removed.

Albucasis gave the first good account of the bronchocele. His remarks are translated in Friend's Hist. of Physic, and James's Med. Dict. See also *Turner's Surgery, Vol.* 1. *p.* 164. *Wilmer's Cases and Remarks in Surgery. Prosser on Bronchocele, Edit.* 3. *Gooch's Med. Observations. Bell's Surgery, Vol.* 5. *White's Surgery. Memoirs of the Med. Society of London*, 217.

BRONCHOTOMY, (from βρογχος, the windpipe, and τεμνω, to cut.) This is an operation, by which an opening is made into the larnyx, or trachea, either for the purpose of making a passage for the air into, and out of, the lungs, when any disease prevents the patient from breathing through the mouth and nostrils; or of extracting foreign bodies, which have accidentally fallen into the trachea; or, lastly, in order to be able to inflate the lungs, in cases of sudden suffocation, drowning, &c.

The operation is also named *tracheotomy*, or *laryngotomy*. Its practicableness, and little danger, are founded on the facility, with which certain wounds of the wind-pipe, even of the most complicated kind, have been healed, without leaving any ill-effects whatever, and on the nature of the parts cut, which are not furnished with any vessel of consequence.

This operation is proper in several cases, and requires being differently practised, according to a variety of circumstances. It is not at all a dangerous proceeding, *dummodo* (says Fabricius ab Aquapendente) *qui secat sit anatomes peritus, quia sub hoc metlico et artifice, omnia tutissimè et felicissimè peraguntur.*

1. Bronchotomy, we have said, is occasionally performed, to enable the patient to breathe, when respiration through the mouth and nostrils is impeded by disease.

Quinsy is an affection sometimes creating a necessity for the operation; but, of all those cases which Boerhaave has described, and on which his learned commentator has said so much, there is only that, which is named *strangulans*, for which bronchotomy is indispensable. This species of quinsy presents no visible symptom, neither in the throat nor the pharynx. The examination of the dead subject proves, that the disease is situated in the edges of the rima glottidis, which opening becomes so contracted as scarcely to leave the smallest space. For this reason, and on account of the tension of the ligaments of the glottis, the voice is rendered excessively acute, and hissing as it were. The suffocation is imminent; the lungs not being expanded, the blood accumulates in these organs, and there is an impediment to the return of the blood from the head through the jugular veins. Hence, a plethoric state of the brain is occasioned. Considering all these circumstances, some have inferred that many of the patients, who have thus perished, might have been saved by making a timely opening into the trachea. All writers, who have treated of bronchotomy in cases of quinsy, have invariably regarded this operation as the ultimate resource. Both the Greeks and Arabians were of this sentiment. In such cases, Avicenna only recommends bronchotomy in violent quinsies, when medicines have failed, and the patient must evidently die from the unrelieved state of the affection. Rhases also advised the operation only when the patient was threatened with death. Thus we see, that bronchotomy, which was proper in regard to the object intended, became hurtful from the way in which it was executed.

It was doubtless in consequence of the ill success of the operation, that Paulus Ægineta observed: *In synanchisis quidem chirurgiam improbamus, cùm inutilis sit præcisio.* Bronchotomy, says M. Louis, will always be done too late, when only allowed as an extreme measure. The danger of perishing by suf-

focation, in cases of quinsy, M. Louis remarks, has been known from the very dawn of medicine. The advice of Hippocrates, to remedy this urgent, symptom, is a proof of it, and he observes, that the danger is evinced when the eyes are affected and prominent, as in persons who have been strangled, when the face, the throat, and neck burn, without any thing appearing to be wrong on inspection. He recommends *fistulæ in fauces ad maxillas intrudendæ, quo spiritus in pulmonem trahatur.* No doubt, he would have advised more, had it not been for the doctrine of his time, that the wounds of cartilages were incurable.

This method, defective as it was, continued till Asclepiades, to whom we owe the invention of bronchotomy, if we may believe Galen. Since Asclepiades, this operation has always been recommended, and practised in cases of quinsy, threatening suffocation, notwithstanding the inculcation of Cælius Aurelianus, who treated it as fabulous. The mode of doing it, however, has not been well detailed by any who put it in practice, except by Paulus Ægineta, who is very precise and clear. "We must (says he) make the incision in the trachea, under the larynx, about the third or fourth ring. This situation is the most eligible, because it is not covered with any muscle, and no vessels are near it. The patient's head must be kept backward, in order that the trachea may project more forward. A transverse cut is to be made between two of the rings, so as not to wound the cartilage, only the membrane." The knowledge of this method, and its advantages in cases of the *angina strangulans*, when practised in time, ought to have rendered its performance a general practice.

The convulsive angina of Boerhaave, which particularly affects those, who can only breathe well in an upright posture, also demands the prompt performance of bronchotomy. Mead, in his *Præcepta et Monita Medica*, relates a case. The patient had been bled very copiously twice in the space of six hours, but he died notwithstanding this large evacuation. The same author took notice in Wales, especially, on the seacoast, of an epidemic catarrhal quinsy, which carried the patients off in two or three days. In these instances, bleeding was not of much use, and bronchotomy, which was not performed, was the only means of saving the patients.

The compression of the trachea by foreign bodies, lodged in the pharynx, or by tumours, formed outwardly, and of sufficient size to compress the windpipe, is an equal reason for operating, more or less expeditiously, according to the symptoms. Mr. B. Bell mentions two instances of suffocation from bodies falling in the pharynx. Respiration was only stopped for a few minutes; but, the cases were equally fatal, notwithstanding the employment of all the usual means. This author thinks, there was every reason to believe, that bronchotomy would have been attended with the greatest success, if it had been performed in time, before the effects of the suffocation had become mortal. The operation should also be done, when the trachea is compressed by tumours. The author of the article *Bronchotomie*, in *l'Encyclopédie Méthodique*, says, that about twenty years ago, he opened a man, who died of an emphysema, which came on instantaneously. He had had, for a long while, a bronchocele which was of an enormous magnitude towards the end of his life. The cavity of the trachea was so obliterated, that there was scarcely room enough to admit the thickness of a small piece of money. Doubtless, bronchotomy, performed before the emphysema made its appearance, would have prolonged this man's days.

M. Habicot, in a treatise, intitled, *Question Chirurgicale sur la Possibilité et la Necessite de la Bronchotomie*, mentions his having successfully performed this operation on a lad fourteen years old, who, having heard say, that gold, when swallowed, did no harm, attempted to swallow nine pistoles, wrapped up in a piece of cloth, to hide them from thieves. The packet, which was very large, could not pass the narrow part of the pharynx; and here it lodged, so that it could neither be extracted, nor forced down into the stomach. The boy was on the point of being suffocated by the pressure, which the foreign body made on the trachea; and his neck and face were so swollen and black, that he could not have been known. M. Habicot, to whose house the patient was brought, attempted in vain, by different means, to dislodge the foreign body. At length, perceiving the patient in evident danger of being suffocated, he resolved to per-

form bronchotomy. This operation was no sooner done, than the swelling and lividity of the face and neck disappeared. M. Habicot pushed the pieces of gold down into the stomach with a leaden probe, and the pistoles were, at different times, discharged from the anus, eight or ten days afterwards. The wound of the trachea very soon became quite well.

2. We have said, that foreign bodies in the trachea, may render it necessary to practise bronchotomy. M. Louis, in an excellent memoir, on extraneous substances in the trachea, has proved, more convincingly than all other writers, the necessity of the operation, in circumstances of this kind. The proofs are adduced in a case, which fell under his own observation, and which we shall quote.

On Monday, the 19th of March, 1759, a little girl, seven years old, playing with some dried kidney-beans, threw one into her mouth, and thought she had swallowed it. She was immediately attacked with a difficulty of breathing, and with a convulsive cough, which was very afflicting. The little girl said, she had swallowed a bean, and such assistance as was thought proper, was given her. Want of success was the cause of several surgeons being successively sent for, who vainly employed the different means, prescribed by art, for extracting foreign bodies from the œsophagus, or forcing them into the stomach. A fine sponge, cautiously fastened to the end of a whale-bone probang, was repeatedly introduced through the whole extent of the œsophagus. The little girl, who made a sign with her finger, that the foreign body was situated in the middle of the neck, thought that she felt some relief, when the sponge was conveyed below the place which she pointed out. She had, every now and then, a violent cough, the efforts attending which produced convulsions in all her limbs. Deglutition was unobstructed; and warm water and oil of sweet almonds had been swallowed without difficulty. Two whole days had passed in sufferings, when the relations called M. Louis to render his assistance. The little girl, with all possible fortitude and sense, was several times held in her friend's arms, ready to die of suffocation. M. Louis, well aware of what had happened, came into the room where the patient was. She was sitting up in her bed, suffering no other symptom, than a very great difficulty of breathing. M. Louis inquired where she felt pain, and she made such a sign in reply, as left no doubt concerning the nature of the accident. She put the index finger of her left hand on the trachea, between the larynx and sternum. The fruitless attempts which had been made in the œsophagus, with a view of dislodging the foreign body; the nature and the smallness of this body, which was not such as would be stopped in the passage for the food; and the facility of swallowing, were negative proofs that the bean was not in the œsophagus. Respiration was the only function disturbed; it was attended with difficulty, and a rattling in the throat. The little girl expectorated a frothy fluid, and she pointed out so accurately the painful point where the object producing all her sufferings was situated, that M. Louis did not hesitate to declare to the relations, from this single inspection, that the bean was in the wind-pipe, and that there was only one way of saving the child's life, which was to make an incision, for the purpose of extracting the foreign body. He apprised them that the operation was neither difficult nor dangerous, that it had succeeded as often as it had been practised, and that the very pressing danger of the case only just allowed time to take the opinion of some other well-informed surgeons, respecting the indispensable necessity for such an operation. M. Louis thought this precaution necessary, in order to acquire the confidence of the parents, and to shelter himself from all reproach, in case the event of the case should not correspond with his hopes. M. Louis went home to prepare all the requisites for bronchotomy, and, in two hours, he was informed the surgeons, who were consulted, waited for him. Since M. Louis went away, the child had become quiet, and was lying on its side asleep. The opinion he had delivered, had been ill explained by the friends and attendants, and had been discussed, before his return. They, who had been rendering their assistance, on the supposition, that the foreign body was in the œsophagus, evinced surprise at the proposal of extracting, by an operation, a substance, the presence of which, in any part of this tube was not obvious. M. Louis explained his advice, in regard to bronchotomy, and he did not expect a doubt

to be set up against so positive a fact. The investigation of truth may authorize objections, to which those who make them, only give the value which is due; but M. Louis was asked concerning the possibility of the case. It was objected, that a substance as large as a bean could not insinuate itself into the trachea. He brought every one into his sentiment, by a short explanation of cases of this sort with which he was himself acquainted. The little girl was examined, she was better than when M. Louis saw her before, and a very palpable emphysema was seen above the clavicle, on each side of the neck, a symptom which did not exist two hours previously. This swelling made M. Louis conclude, that the urgency for the operation was still greater. The friends, whose confidence had been shaken by the opposition he had experienced in bringing about unanimity, were in the greatest embarrassment, when they were told, that the child might die of an operation, which he had represented as only a simple incision, free from all danger. M. Louis was repeatedly asked, if he would be responsible for the child's life during the operation, and he in vain replied, that if there were any thing to fear during the operation, it would be from the accident itself, and not from the assistance rendered. This distinction was not perceived, and M. Louis withdrew, at the same time refusing his consent to the exhibition of two grains of emetic tartar, the effect of which would be useless, and might be dangerous. The medicine was given in the night: the child was fatigued with its operation, and quite unbenefited. On Tuesday morning, M. Louis found the little girl very quiet, and they who had paid their visits before him, found her wonderfully well. The respiration, however, continued to be still attended with a rattling noise, which M. Louis had observed in the evening, when the breathing was much more laborious. The child was nearly suffocated several times in the course of the day, and died in the evening, three days after the accident.

M. Bordenave, who had seen the patient, informed M. Louis of the child's death on Friday. The body was opened, before a numerous assembly of persons. After making a longitudinal incision through the skin and fat, along the trachea, between the sterno-hyoidei muscles, M. Bordenave slit open the trachea, cutting three of its cartilages. This very instant, every one could see the bean, and M. Louis took it out with a small pair of forceps. It was manifest, from the ease, with which this foreign body was extracted, that the operation would have had, on the living subject, the most salutary effect. The relations had to regret having sacrificed a child, which was dear to them, to an irresolution and a timidity, which the most persuasive arguments could not remove. (*Mem. de l'Acad. Royale de Chirurgie.*)

This case evinces, in the most decided manner, the symptoms, which result from the presence of foreign bodies in the trachea, and shews the only one surgical proceeding, which can be of use. But, among the phenomena, apparently difficult of explanation, is the calm, which, at different intervals, followed the afflicting cough. Anatomy, however, has dispelled much of the doubt on this matter. It is known, that the whole canal of the trachea is much less sensible, than the rima glottidis. A foreign body, like a bean, may remain a certain time in that canal without much inconvenience, the passage being only somewhat obstructed, according to the position of the substance. It may even remain several days, months, or years, without producing any symptom of its presence, except a trivial sensation of obstruction, and this is what happens, when the body lodges in one of the ventricles of the larynx. Facts of this kind are to be found in Tulpius, Bartholine, and many other observers. But, when the extraneous substance quits its situation, and is carried into the trachea, the irritation, which it produces there, and, particularly, about the larynx, occasions coughing, and if, in the fits, the foreign body should become fixed between the lips of the glottis, it may cause instantaneous death, as probably has happened in many of the cases of suffocation from extraneous substances.

Another remarkable circumstance which deserves more attention, as it confirms the presence of a foreign body in the trachea, is the emphysema, which appeared about the clavicle, towards the termination of the case. M. Louis did not believe, that any of the persons, who saw the patient, could entertain a just idea of the origin of

this symptom. It might be imagined, that the obstruction, which the foreign body caused, for two days, to the free passage of the air, might have occasioned a forcible distention of the trachea, and a rupture of the membranes, which connect together the cartilaginous rings of this tube; but this error was dispelled by the examination after death. The windy tumour had not originated in the circumference of the trachea; here its limits were only seen. The very substance of the lungs, and the mediastinum, were emphysematous. The air, which was confined by the foreign body, must have ruptured the air-cells, during the violent fits of coughing, and thus insinuated itself into the interlobular cellular substance of the lungs. Thence the air must have passed into the cellular substance of the lungs. Thence it must have passed into the cellular substance connecting the pleura pulmonalis with the outer surface of these organs, and by the communication of the cells with each other, it produced a prodigious swelling of the cellular substance, separating the two layers of the mediastinum. The emphysema, in its progress, at length made its appearance above the clavicles. The swelling of the lungs, and the circumjacent parts, in consequence of the insinuation of air into the cellular substance, is a manifest cause of suffocation. The tumefaction appears to be so natural an effect of the presence of a foreign body in the trachea, that one can hardly believe it is not an essential symptom, though before M. Louis, no author made mention of it.

Foreign bodies in the trachea, however, do not always cause death so suddenly, which may be owing to their smallness, their smoothness, or the situation in which they are fixed. An example is related in *les Ephémérides des Curieux de la Nature, Decad.* 2. *Ann.* 10. A monk, in swallowing a cherry precipitately, made the stone of the fruit pass into the trachea. A violent cough, and excessive efforts, as it were, to vomit, were the first symptoms of the accident, and of these the patient thought he should have died. A sleep of some hours followed this terrible agitation, and the patient afterwards did not feel the least inconvenience during a whole year. At the end of this time, he was attacked by a cough, attended with a fever. These symptoms became worse and worse, every day. At length the patient evacuated a stone as large as a nutmeg. It was externally composed of tartareous matter, to which the cherry stone had served as a nucleus. A copious purulent expectoration followed the discharge of the foreign body, and the patient died consumptive some time afterwards. No mention is made of the body being opened; but, from the symptoms, there is every reason to believe, that an abscess must have arisen in the substance of the lungs, from the presence of the foreign body.

Bronchotomy has been proposed in cases, in which the tongue is so enlarged, as totally to shut up the passage through the fauces. Richter mentions an inflammation of the tongue, which became four times larger than natural. Valescus had made the same observations: *Ego aliquando vidi ita magnificatam, linguam propter humores, ad ejus substantiam venientes, et ipsam imbibentes, quod quasi totum os replebat, et aliquando ex ore exibat. Lib.* 2. *cap.* 66. Such prodigious swellings of the tongue are said sometimes to occur in malignant fevers, and the small-pox. They are also sometimes quite accidental, as the cases which happen from some stings of insects, or the unskilful employment of mercury. Mr. B. Bell gives an instance of the latter sort. He says, that the patient had taken, in a very short time, so large a quantity of mercury, that the glands became alarmingly swollen in a few hours, and, though all the usual remedies were tried, none had the least effect. Bronchotomy was delayed till the patient was nearly suffocated; but he was restored as soon as an opening was made in the trachea. Some have objected to this practice, alleging, that scarifying the tongue will bring relief in time. (*Encyclopédie Méthodique.*) M. Malle's observations on the swelling of the tongue, and the most effectual means of relieving it, seem to confirm the latter sentiment. (*Mem. de l'Acad. de Chirurgie, Tom.* 5.)

Bronchotomy has been proposed, when both the tonsils are so enlarged that they quite impede respiration. Here, the inflammatory swelling is not meant; this commonly soon suppurates, and the spontaneous bursting of the tumour, or the opening of it with a pharyngotomus, always does away the necessity for so extreme a measure. It is the chronic enlargement now alluded

to, that case mentioned in the article *Tonsils*, and which sometimes acquires an immense size. From our remarks on the disease, it will be seen, that more is to be expected from the excision of the tonsils, than from the operation now in question. Besides, before the glands are so large as to threaten suffocation, they should be cut away, in preference to performing bronchotomy, which would relieve the urgency, but not the cause. In general, there is here only a fear of suffocation, when the swelling is such as not only to shut up the posterior aperture of the mouth, but also the posterior openings of the nostrils, which is exceedingly rare. Nor is it common for a polypus to make this operation necessary. Boerhaave, however mentions a case, in which the patient was suffocated, as the surgeon was going to extirpate a tumour of this kind: no doubt, this patient might have been saved, if bronchotomy had been previously performed.

Lastly, bronchotomy has been recommended to be done on persons recently suffocated or drowned. Detharding is the first author who has treated of the necessity of this operation, in the latter case, in a letter addressed to Schroeck, intitled, *De Methodo subveniendi submersis per laryngotomiam. Hactenus recte*, says Haller, *si spuma quâ pulmo in submersis offercitur eâ administratione repelli quiret*, This writer maintains, that drowned persons have no water in their chests, or air-vessels of the lungs, and that they perish suffocated, for want of air and respiration, and that, while the person is under water, the epiglottis applies itself so closely over the glottis, that not one drop of water can pass. But, these assertions are quite contrary to the numerous experiments made by M. Louis, who drowned animals in coloured fluids, and proved that they who are drowned, inspire water, with which the air vessels and cells are quite filled. M. Louis has also opened men, who have perished under water, but, in them, he never found the epiglottis applied to the glottis, as Detharding says it is, and anatomy proves the impossibility of its being so. Detharding's theories were wrong, and, as he did not use any power to distend the lungs with air, his mere practice of bronchotomy must have been useless. When there is a free communication between the cells of the lungs and the atmosphere, the air will not expand these organs, if the inspiratory muscles can no longer act. Hence, after opening the trachea, and letting as much water run out of this tube as possible, the pipe of a pair of bellows should be introduced, and the air forcibly introduced into the lungs.

Detharding's opinion, that drowning is a species of suffocation, was right, and that the privation of oxygen gas is the cause of death. Hence, we see the propriety of introducing this air into the lungs, as speedily as possible, whenever we think, that animation has not been so long suspended, that every hope of restoration is over. Indeed, it is proper to distend the lungs with air, in all cases in which animation has been recently suspended by suffocation, immersion under water, or by noxious vapours and gases. This measure is highly proper, in conjunction with electricity, the communication of warmth to the body, the application of strong volatiles to the nostrils, and the injection of any fluid, like warm wine and water, into the stomach, through a hollow bougie. Tobacco clysters, which even have had the sanction of the Royal Humane Society, should, however, be reprobated, as the qualities of this plant are peculiarly destructive of the vital principle, and not simply stimulating.

DESCRIPTION OF THE OPERATION.

No preparation is necessary, as delay only increases the danger. The patient being seated in an arm-chair, or, what is better, laid on a bed with his head hanging backwards, an incision is to be made, which is to begin below the cricoid cartilage, and to be continued downward, about two inches, along the space between the sternothyroidei muscles. Care should be taken not to cut the lobes of the thyroid gland, lest a troublesome and dangerous bleeding should be occasioned, and, as the left subclavian vein lies a little below the upper part of the first bone of the sternum, the incision should on no account ever extend in the least below the top of this bone. The knife must not be carried either to the right or left, in order to avoid all risk of injuring the large blood-vessels situated at the sides of the trachea. The incision in the integuments being made, the sternothyroidei muscles are to be pushed a little toward the side of the neck, so as to bring the trachea fairly

into view. Most authors recommend the point of the knife to be then introduced between the third and fourth cartilage of the trachea, and the opening to be enlarged transversely. It is true, that, in this way, an opening may be safely made, large enough to allow of the introduction of a small cannula. It is safer, however, in all cases, to enlarge the opening in the perpendicular direction, by cutting from within outward. There is no advantage in avoiding a wound of the cartilages of the trachea, and this was the only reason for cutting the membrane between two of them, in a transverse direction; while a sufficiently large opening could not thus be safely obtained in cases in which it is necessary to introduce the muzzle of a pair of bellows, in order to inflate the lungs. In short, it is safer and better, in every instance, to make the wound in the trachea in a perpendicular manner.

When bronchotomy is performed for the purpose of inflating the lungs, the cut in the windpipe must be made somewhat larger than when only an opening is required to enable the patient to breathe through a small cannula. The larger size of the pipe of the bellows, is the reason of this circumstance.

When a cannula is to be introduced, care must be taken not to pass it too far into the wound, lest it should injure the opposite side of the trachea. This is a caution, on which Fabricius ab Aquapendente dwells very strongly, and with good reason.

Small as the vessels may be, which are divided in bronchotomy, they occasionally bleed so much, as to create apprehension, and even prevent the process of the operation. There is a case in Van Swieten's Commentaries, confirming this remark. A Spanish soldier, aged twenty-three, was in the most urgent danger from an inflammation of his throat. It was thought nothing could save him, except bronchotomy. After the longitudinal cut in the skin, and the separation of the muscles, the trachea was opened between two of the cartilages; but the blood insinuated itself into this canal, and excited so violent a cough, that the cannula could not be kept in by any means, though it was replaced several times. M. Louis remarks, that, in this instance, the patient's head should have been turned downward, in order to keep the blood from flowing backward into the trachea. It is asserted, that the opening of this tube was not always opposite the external wound, in consequence of the convulsive action of the muscles, and that the patient on this account could hardly breathe. Hence M. Vigili was induced to slit open the trachea, down to the sixth cartilaginous ring; and it was only then that he inclined the patient's head forward. The bleeding now ceased, the patient breathed with ease, and, on the second day, the inflammation was so much better, that respiration could go on without the aid of the opening in the trachea.

To obviate the preceding accident, a proposal has been made to adapt a cutting blade to a cannula, of a suitable size, and proper for remaining in the wound, and sufficiently compressing the orifice of such vessels as might be opened. In Richter's *Observationes Chirurgicæ*, a description of some instruments of this kind may be seen. Mr. Bell has described one, somewhat like a flattened trocar, only not quite so long. The patient's head being inclined backward, as far as possible, the point of the instrument is to be introduced between two of the cartilages; between the lower margin of the thyroid, and the upper edge of the cricoid, is said to be the best situation, being more extensive, less vascular, and, after the division of the skin, there being only the crico-thyroid ligament to be divided. When the instrument has entered, the lancet is to be withdrawn, and the cannula fixed, by means of a ribbon, which is tied to each wing of the instrument, and must be fastened at the back of the patient's neck. Should the instrument be too long, it should be passed through two or three little compresses, before being put into the windpipe, which artifice will make it answer as well as a shorter one. The piece of gauze is then to be tied once on the outward orifice of the cannula.

Sometimes, though very seldom, the cannula becomes obstructed with mucus, or clots of blood. Such an accident nearly suffocated a patient at Edinburgh. A man of genius, who was at hand, suggested the introduction of a second cannula into the first; the second one being taken out, and cleaned, as often as necessary, and then replaced. Monro, the father, used to recommend this plan. It is better, however, to have at once a double cannula, to fit the stilette.

The use of the cannula must be continued as long as the causes, obstructing respiration, remain.

When respiration is suspended by the presence of a foreign body in the trachea, and the extraneous substance does not make its appearance at the opening made, a trial may be made to discover its situation by means of a bent probe. When it lies downward, the wound in the trachea may be enlarged in this direction, and the body may be extracted with a small pair of forceps. When it cannot be immediately found, some practitioners (Heister and Raw) have succeeded by keeping the lips of the wound asunder with pieces of sheet-lead, by which means, the force of the air in expiration has, in a few hours, expelled the foreign body.

If there were reason to think the substance to be situated in the ventricles of the larynx, it would be proper to make the opening, between the thyroid and cricoid cartilages.

Richter thinks he has perfected bronchotomy, by using a curved cannula; but, the inconveniences, which he attaches to the straight one, hardly ever occur. A curved cannula cannot be so conveniently introduced into another one similarly shaped.

From the manner, in which the epiglottis covers the top of the larynx, it is obviously very difficult to introduce the muzzle of a pair of bellows into the rima glottidis, even though the pipe be curved. Were the surgeon at last to succeed, the time lost in effecting the object, would create much more peril by far, than would arise from bronchotomy. It is much wiser, to have recourse at once to a very safe and simple operation. In fact, the parts to be divided are not at all important ones, and the operation is as easy, as it is little likely to occasion of itself any ill consequences. *In summâ*, (says Fabricius ab Aquapendente) *tres tantùm partes concurrunt ad hujusmodi chirurgiam, cutis, musculi, et aspera arteria. Musculi non inciduntur, sed manubrio scalpelli invicem diducuntur, et seperantur, ut arteria appareat; quâ apparente nullo negotio inciditur, in quâ neque sanguis obstaculo esse potest, quòd cutis cum exiguo sanguine inciditur, arteria verò nullo.*

BUBO, (βουβών The groin.) Modern surgeons mean, by this term, a swelling of the lymphatic glands, particularly of those in the groin, and axilla.

The disease may arise from the mere irritation of some local disorder; from the absorption of some irritating matter, such as the venereal poison; or from constitutional causes.

Of the first kind of bubo, that, which is named the *sympathetic*, is an instance.

For an account of the *venereal bubo*, see *Venereal Disease*.

The *pestilential bubo*, which is a symptom of the plague, and the *scrophulous* swellings of the inguinal and axillary glands; may be regarded, as examples of buboes from constitutional causes. See *Scrophula*.

SYMPATHETIC BUBOES.

The inguinal glands often become affected with simple phlegmonous inflammation, in consequence of irritation in parts, from which the absorbent vessels, passing to such glands, proceed. These swellings ought to be carefully discriminated from others, which arise from the absorption of venereal matter. The first cases are simple inflammations, and only demand the application of leeches, the cold saturnine lotion, and the exhibition of a few saline purges; but, the latter diseases render the administration of mercury indispensable.

Sympathetic is the epithet usually given to inflammation of glands from mere irritation; and, we shall adopt it, without entering into the question of its propriety.

The sympathetic bubo is mostly occasioned by the irritation of a virulent gonorrhœa. The pain, which such a swelling gives, is very trifling, compared with that of a true venereal bubo, arising from the absorption of matter, and it seldom suppurates. However, it has been contended, that the glands in the groin do sometimes swell and inflame from the actual absorption of venereal matter from the urethra, in cases of gonorrhœa, and which swellings must consequently be venereal. (*Hunter on the Venereal, p. 57.*)

The manner in which buboes form from mere irritation, will be better understood by referring to the occasional ill consequences of venesection, in the article *Bleeding*. The distinguishing characters of the venereal bubo are noticed in the article *Venereal Disease*.

PESTILENTIAL BUBO.

A pestilential bubo, at its commencement, is a small, hard, round tumour, readily perceptible to the touch, about the size and shape of a pea; it is moveable under the skin, the appearance of which is not altered at an early period, the bubo lying more or less deeply, and the swelling not appearing externally. As the tumefied gland enlarges, it changes from a round to an oval shape, becoming, at the same time, less moveable. The integuments now begin to thicken, and the swelling to appear externally. The appearance of the bubo is often preceded by a sense of tightness and pain, sometimes of a lancinating kind, or by an itching in the part, where it is about to appear, and, now and then, the disease is preceded by shivering. In many cases, however, the small swelling, just described, comes on, without being preceded by any peculiar symptoms.

Some buboes are indolent and insensible, others very sensible and rapid in their progress. When the tumour advances quickly to suppuration, the circumstance is generally regarded as favourable. Cases, however, in which the matter soon forms, are frequently fatal, and there are many histories of other cases, which terminated favourably, though the buboes were extremely indolent, and ended in resolution.

It is difficult to foresee in what way a bubo will terminate. The fluctuation is often scarcely perceptible, where suppuration has taken place, and buboes are sometimes resolved, after there has been a very evident fluctuation. Their progress, indeed, is almost always, more or less, irregular, especially, after the first week. At one time, they seem advancing to suppuration; at another time, they shew a tendency to resolution. But, these variations, Dr. Russell remarks, chiefly respected the integuments; for, the gland itself, when carefully explored, was seldom found to alter; and, when the tumour actually dispersed, it was not suddenly, but, by slow degrees. Thus, from the alteration in the integuments alone, the whole tumour, on a superficial view, seemed to lessen, or increase, though the gland remained the same; and Dr. Russel was inclined to think, that this deception was often the cause of the bubo being said to fluctuate, or to vanish in appearance, and again return. However, he is far from thinking, that this fluctuation was never real. Chenot observes: *Vidimus quoque abruptam suppurationem in his resuscitari, ac demum per effusionem puris absolvi.*

The bubo, as it increases in size, becomes somewhat flat; and, generally about the second week, the skin over it grows tense, and painful, and begins to be inflamed. In some cases, the inflammation is moderate; in others, considerable; but, it seldom terminates in gangrene, although the skin, now and then, assumes a blueish colour.

Sometimes, however, the bubo suppurates, without the skin seeming to be at all inflamed; and in this circumstance, as the tumour is generally harder, than a suppurated venereal bubo, it is often difficult to determine, whether suppuration has taken place, or not. When buboes break spontaneously, it generally happens in the third week; sometimes at a later period.

The buboes most frequently appear in the groin, or a little lower, among the lowest cluster of inguinal glands. They also frequently appear among the axillary glands; sometimes, though more rarely, they have their seat in the parotid, and the disease is then by many reckoned more dangerous, than when the buboes appear in the groins, or armpits. Still more rarely, they appear in the maxillary, or cervical glands. These latter, Dr. Russell remarks, were seldom observed to swell, without either the parotid swelling at the same time, or soon afterwards, or a carbuncle protruding near them. They never were the sole pestilential eruptions; and he recollects few instances of their coming to maturation. It has been remarked by others, that the parotid bubo seldom appears unaccompanied by one, or more, in the axilla, or groin.

Axillary buboes, generally speaking, suppurate more frequently than those about the fauces, and the inguinal more frequently than the axillary.

Buboes often make their appearance on the first day of the complaint; sometimes, indeed, they are among the first symptoms. It has been observed, that when they appear later, than the third, or fourth day, they are generally preceded by an exacerbation of the febrile symptom. Those, which come out at so late a period, however, are not, for the most part, the first, which appear in the course of the complaint; for, a

succession of buboes sometimes takes place, till three or four have made their appearance.

Sometimes, no buboes appear, and these cases are, upon the whole, the most fatal. This is a circumstance, which particularly demands attention, as the cases, unattended with buboes, and other pestilential eruptions, generally make their appearance at the commencement of the epidemic, and have often, in consequence of the absence of the eruptions, been mistaken for other complaints. In other cases, particularly, towards the decline of the epidemic, the buboes, and other eruptions, often form the principal part of the complaint, which is then unattended with danger; from which it would appear, that the eruptions in the plague are to be regarded as favourable symptoms.

When the inflamed gland advances to suppuration more rapidly, than the integuments; troublesome fistulous ulcers are sometimes formed, if an artificial opening has not been made in the skin. This accident, however, is rare: in general, the buboes, when left to themselves, do not prove troublesome.

When they do not suppurate, and the patient recovers, they gradually disperse, generally in the space of a few weeks. In some cases, they are succeeded by an induration of the gland, which remains for many months. Even when suppuration has taken place, if the cure proves tedious, either in consequence of the matter having been discharged by too small an opening, or the opening having repeatedly closed in the progress of the cure, a similar induration sometimes succeeds; which, in like manner, sooner or later disappears.

In the plague, buboes, termed spurious, sometimes form. Spurious buboes differ from the true ones, in appearing indiscriminately on every part of the body; while the latter are confined to the groin, axilla, and parts about the fauces. Spurious ones were observed, says Dr. Russell, on the head, the forehead, the throat, the shoulder, above the clavicle, the neck, on, or above, the scapulæ, the back, the side, under the breast, on the belly, the hip, hind-part of the thigh, near the ham, the leg, the scrotum, the arm near the usual place of issues, inside of the arm near the elbow, outside of the fore-arm, and near the wrist.

Some of these buboes, if not lanced at a proper time, grow to a great size, particularly, those on the scapulæ, or back. In other parts, however, they seldom much exceed the size of a hen's egg. They generally appear about the second, or third day, after true buboes, or carbuncles; and usually suppurate, though not so quickly, as true pestilential buboes do. (See *Wilson on Febrile Diseases.*)

BUBONOCELE, (from βουβων, the groin, and κηλη, a tumour.) A species of hernia, in which the bowels protrude at the abdominal ring. The case is often called an *inguinal hernia*, because the tumour takes place in the groin. Every thing, necessary to be known on this subject, will be found in the article, *Hernia.*

BURNS. A burn is an injury, more or less superficial, occasioned by the contact of some substance, heated beyond what the body can bear, without its fibres and organization being hurt.

Burns present different appearances, according to the degree of violence, with which the causes producing them have operated, and according to the kind of cause of which they are the effect. Burns, which only irritate the surface of the skin, are essentially different from those, which destroy it; and these latter have a very different aspect from what others present, which have attacked parts more deeply situated, such as the muscles, tendons, ligaments, &c. Scalds, which are the effect of heated fluids, do not exactly resemble burns, occasioned by the direct contact of very hot metallic bodies, or some combustible substance on fire. As fluids are not capable of acquiring so high a temperature, as many solid things, scalds are generally less violent than burns, in the injury which they produce; but, in consequence of liquids often flowing about with great rapidity, and being suddenly thrown in large quantities over the patient, scalds are frequently dangerous on account of their extent. It is well worthy of remark, that the danger of the effects of fire is more proportioned to the size, than the degree, of the injury. A burn, that is so violent, as to kill parts at once, may not be in the least dangerous, if not extensive; while, a scald, which perhaps only raises the cuticle, may prove fatal, if very large. The degreee of danger, however, is to be rated from a consideration both of the

size and violence of the injury. The worst burns, which occur in practice, arise from explosions of gun-powder, or inflammable gases, from ladies' dresses catching fire, and from the boiling over of hot fluids, in laboratories, manufactories, &c.

Burns, which only destroy the cuticle, and irritate the skin, are very similar to the effects, produced by cantharides and rubefacients. The irritation, which such injuries excite, increases the action of the arteries of the part affected, and they effuse a fluid under the cuticle, which become elevated, and detached. Hence, the skin becomes covered with vesicles, or bladders, which are more or less numerous, and large, according to the manner, in which the cause has operated. But, when the skin, or subjacent parts, are destroyed, no vesicles make their appearance. In this circumstance, a black eschar is seen; and when the dead parts are detached, there remains a sore, more, or less deep, according to the depth, to which the destructive effects of the fire have extended.

The parts may either be killed, at the moment of the injury, by the immediate effect of the fire, or they may first inflame, and then mortify.

In all cases of burns, the quantity of injury depends on the degree of heat in the burning substances; on the duration, and extent of their application; and on the sensibility of the burnt part.

When a large surface is burnt, mortification sometimes makes its appearance with great violence, and very quickly after the accident: but, in general, the symptom, the most to be dreaded, in such cases, is inflammation. The pain and irritation often run to such a pitch, that, notwithstanding every means, there is frequently immense trouble in keeping down the inflammation. When the burnt surface is very large, the effects of the inflammation are not confined to the part, which was first injured; but, even cause a great deal of fever; and, in certain cases, a comatose state, which may end in death.

It has been observed, that persons, who die of severe burns, seem to experience a remarkable difficulty of breathing, and oppression of the lungs. These organs, and the skin, are certainly both concerned in separating a large quantity of water from the circulation, and their participating in this function, may perhaps, afford a reason, for the lungs seeming to be affected, when a large surface of skin is injured in cases of burns. However, the kidneys perform the same office, and they are not particularly affected in burnt patients; so that the asthmatic symptoms, in these cases, are probably owing to a sympathy between the lungs and skin, or rather to causes not at present understood.

TREATMENT OF BURNS.

The former plan of treating burns was founded on principles, which seem applicable to cases of inflammation in general. The treatment was most commonly antiphlogistic, and even copious bleeding from the arm was not unfrequently practised.

We shall first offer a concise account of the old practice, as explained by Mr. B. Bell. When the skin is not destroyed, but seems to suffer merely from irritation, relief may be obtained by dipping the part affected in very cold water, and keeping it for some time immersed. This author states, that plunging the injured part suddenly into boiling water would also procure ease; an assertion, however, much to be doubted, and a practice not likely to be imitated. In some cases, emollients afford immediate relief; but, in general, astringent applications are best. Strong brandy, or alcohol, is particularly praised. At first, the pain is increased by this remedy; but, an agreeable soothing sensation soon follows. The parts should be immersed in the spirit, and, when this cannot be done, soft old linen, soaked in the application, should be kept constantly on the burn. Goulard's lotion, or a strong solution of the cerusa acetata, is recommended, and, said to prove useful, however, only by being astringent, as equal benefit may be derived from a strong solution of alum, &c. Such applications were frequently made with a view of preventing the formation of vesicles; but, Mr. B. Bell always remarked, there was less pain, when the blisters had already appeared, than when prevented from rising, by remedies applied immediately after the occurrence of the injury.

The applications should be continued, as long as the pain continues; and in extensive burns, creating great irri-

tation, opium should be prescribed. The stupor, with which patients, so situated, are often attacked, receives more relief from opium, than any thing else.

Some recommend opening the vesications immediately; others assert, that they should not be meddled with. Mr. B. Bell thinks, they should not be opened till the pain arising from the burn, is entirely gone. At this period, he says, they should always be punctured; for, when the serum is allowed to rest long upon the skin beneath, it has a bad effect, and even induces some degree of ulceration. Small punctures, not large incisions, should be made. All the fluid having been discharged, a liniment of wax and oil, with a small proportion of saccharum saturni, is to be applied.

When there is much irritation and fever, blood-letting, and such remedies, as the particular symptoms demand, must be advised. When the skin ulcerates, the treatment does not differ from what will be described, when we speak of *Ulcers*.

When the burnt part, is, from the first, more or less destroyed, cooling emollient applications were formerly thought most effectual, and a liniment, composed of equal proportions of lime-water and linseed oil, gained the greatest celebrity. Even, at this day, the application is very often employed. Mr. B. Bell advises it to be put on the parts, by means of a soft pencil, as the application and removal of the softest covering, are often productive of much pain.

In some cases, Mr. B. Bell says, Goulard's cerate, and a weak solution of the saccharum saturni, procure ease more quickly than the above liniment.

The sloughs having come away, the sores are to be dressed according to common principles. (See *Ulcers*.)

When burns are produced by gunpowder, some of the grains are apt to be forced into the skin. These should be picked out with the point of a needle, and an emollient poultice applied, which will dissolve and bring away any particles of gunpowder, which may yet remain.

Burnt parts, which are contiguous, are apt to grow together in the progress of the cure. The fingers, toes, sides of the nostrils, and the eye-lids, are very liable to this occurrence. It is to be prevented by keeping dressings always between the parts, likely to become adherent, until they are perfectly healed.

The sores, resulting from burns, are, perhaps, more disposed, than any other ulcers, to form large granulations, which rise considerably above the level of the surrounding skin. No poultices should now be used. The sores should be dressed with any moderately stimulating, astringent ointment: the basilicum with the pulv. hydrarg. nitrat. rub. is now generally preferred: and, if the part will allow of the application of a roller, the pressure of this will be of immense service in keeping down the granulations, and rendering them more healthy. When these methods fail, the sores should be gently rubbed with the argentum nitratum.

MR. CLEGHORN'S PLAN.

Mr. Cleghorn recommends the immediate application of vinegar, which is to be continued, for some hours, by any the most convenient means, until the pain abates. Should it return, the vinegar is to be repeated. If the pain is so severe as to have destroyed any part, when the pain has ceased, it is to be covered with a poultice, which must remain on six, or, at most, eight hours. When this is removed, the part is to be entirely covered with very finely powdered chalk, so as to make every appearance of moisture on the surface of the sore, no longer visible. This being done, the whole is to be covered with the poultice again. The same mode is then to be pursued every night and morning, until the cure is complete. If the use of poultices should seem to relax the ulcers too much, a plaster, or ointment, containing white lead, is to be applied; but, the chalk is still to be used next the sore.

In respect to general remedies, Mr. Cleghorn allowed his patients to eat boiled, or roasted fowl, or, in short, any plain dressed meat, they liked. He did not object to their taking moderate quantities of wine, spirits and water, ale, or porter. His applications he observed, allayed pain and inflammation, and either prevented, or removed fever, and, judging from their effects, he thought they had powerful antiseptic virtues. He never had occasion to order bark, or any internal medicines whatever, and he only once thought it necessary to let blood. When a pa-

tient was costive, Mr. Cleghorn used to order boiled pot-barley and prunes, or some other laxative nourishing food, and sometimes an injection, *but never any purgatives.* It is distressing to a patient with bad sores, to be often going to stool. Besides, Mr. Cleghorn remarked, that weakness and languor, (which never, in his opinion, hasten the cure of any sore) are always brought on, more or less, by purgatives. From the effects, too, which he felt them have upon himself, and observed them to have upon others, they did not seem to him to have so much tendency to remove heat and feverish symptoms as is generally supposed, and more frequently carry off *useful* humours, than *hurtful* ones.

Diluted sulphuric acid would not answer well, instead of vinegar. The latter produced most benefit, when it was fresh and lively to the taste.

In cold weather, in particular, Mr. Cleghorn used to warm the vinegar a little, place the patients near the fire, give them something warm internally, and, keep them, in every respect, in a comfortable situation. His object, in so doing, was to prevent the occurrence of tremblings, and chilness, which in two instances, alarmed him a good deal, after employing vinegar, which was too cold.

The account of Mr. Cleghorn's plan was published by Mr. Hunter, in the *Medical Facts and Observations, Vol.* 2.

SIR JAMES EARLE'S PLAN.

This gentleman exclusively advises the use of cold water, or rather ice; and he has brought forward several cases of extensive burns, in which this method was employed with the best effect. We have mentioned cold water, among the applications to burns, enumerated by Mr. B. Bell, and it was certainly not uncommonly used long before Sir James Earle published on the subject. This author, however, has made the plan more extensively known, and, as it is an eligible one, he has a certain claim to praise. The burnt parts may either be plunged in cold water, or they may be covered with linen dipped in the same, and renewed as often as it acquires warmth from the part. The application should be continued as long as the heat and pain remain, which they will often do, for a great many hours. (See *Essay on the Means of lessening the Effects of Fire on the Human Body.* 1799.)

MR. KENTISH'S PLAN.

From what has been stated, it appears, that cold and hot, irritating and soothing, astringent and emollient applications, have all been outwardly employed, in cases of burns, without much discrimination.

But, the internal treatment has always been of one kind, and both the ancients and moderns agree in advising blood-letting, cooling purges, and, in short, the whole of the antiphlogistic plan. Mr. Kentish is the only one, who has ventured to put in practice stimulating means, internally, as well as externally. It is to be remarked, at the same time, that Mr. Cleghorn's practice was somewhat analogous to that recommended by the latter gentleman. He condemned purges, and he allowed his patients to take stimulants internally.

The theories advanced by Mr. Kentish, which, however, are very objectionable, lead him to lay down two practical indications, in injuries caused by a pernicious quantity of heat, suddenly applied to a part of the body, and which injuries are attended with increased action. The two indications, for restoring the unity of action, are; first, gradually diminishing the excitement, or action, of the part; secondly, increasing the action of the system to meet the increased action of the part, holding this law as the system in view: *That any part of the system, having its action increased to a very high degree, must continue to be excited, though in a less degree, either by the stimulus, which caused the increased action, or some other having the nearest similarity to it, until by degrees the extraordinary action subsides into the healthy action of the part.*

With this view, holding the part to the fire seems the best mode of relief; but, as parts of the body are injured, to which this cannot be done, the most stimulant applications must be had recourse to; for, in this class, there is little fear of any of them being greater, than that which originally caused the accident. The strongest rectified spirits, made still stronger by essential oils, are proper, and may also be heated as much as the sound parts can bear. These, and many more applications of the same class, says Mr. Kentish, will

give the speediest and most effectual relief. These are only to be continued for a certain time, otherwise they may afterwards cause the very ill they were given to cure. They are then to be succeeded by less stimulant applications, until the parts act by common natural stimuli.

The internal mode of relief is to give those substances, which soonest excite the system to great action, such as æther, ardent spirits, opium, wines, &c. by which means the solution of continuity of action is allowed to continue the shortest time possible, and the unity of action restored, which constitutes the cure.

Suppose, for instance, as a local application, we at first apply the strongest alcohol, heated to the degree, which the sound part would bear without injury: it should afterwards be gradually diluted until it becomes a proof-spirit, and the heat should be diminished, although gradually, as cold is always pernicious, bringing on that tendency to shiver, which should ever be continually guarded against, as being a most hurtful symptom, and the forerunner of a violent sympathetic fever. To prevent this, the external heat should be kept at a high temperature, and the action of the whole system in as great a degree, as may be safe. By this means, you make the action of the whole meet the increased action of the part, by which the lessening of the increased action of the part to join the action of the whole, is rendered more easy. Thus, there is, says Mr. Kentish, a unity of intention by both the external and internal means, which leads to the restoration of the unity of action, and thus is the cure performed.

It may be said, these circumstances can only take place, when there is an increased action, and, that when the parts are destroyed, other means should be used, such as emollients, &c. In replying to this remark, Mr. Kentish distinguishes burns into two kinds; one, in which the action of the part is only increased; and, another, in which some parts have increased action, and other parts are destroyed. It is of little consequence, says Mr. Kentish, what is applied to the dead part, as the detachment of an eschar depends upon the action of parts, which remain alive, and not upon what is applied to those, which are dead. Mr. Kentish remarks, however, that he never saw an instance of a burn, in which, though some parts were totally destroyed, there were not always other parts, in which there was only increased action. Now as our duty is always to save living parts, our mode of cure, in the first instance, will always be the same, viz. to cure the parts, which have only an increased action, in the doing of which the dead parts will not be the worse, as their separation is a process of the system, which requires time, and, if the injury is to any extent, draws forth the joint efforts of the system, and even, says Mr. Kentish, calls up all the energy of its powers, to violent fever. This state should be supported by every artificial aid, in order to bring the parts to suppuration, otherwise the subject falls in the contest; for, if the living parts have not the power to throw off the dead, the dead will assimilate the living to themselves, and a mortification ensue.

When the living parts have been preserved, (continues Mr. Kentish,) which according to this treatment, will be in the course of two or three days, the dead parts will be more plainly observed, and the beginning of the process to throw them off will be commencing. This process must be assisted by keeping up the powers of the system against debility, by stimulant medicines and a generous diet. The separation of the eschars will be greatly promoted by the application of the stimulus of heat, by means of cataplasms frequently renewed. These may be made of milk and bread, and some camphorated spirit, or any essential oils, sprinkled upon the surface. Such means need only be continued, until the suppuration is established, as then a different mode must be pursued.

After Mr. Kentish had supported the system to a suppuration, he then found, that gradually desisting from his stimulant plan, diminished the secretion of pus, and wonderfully quickened the healing process.

Thus we see, observes Mr. Kentish, the whole of the former treatment inverted. The most gentle soothing means were used externally and internally; these were continued until suppuration took place; and then the system was excited, under an idea of supporting it, which not unfrequently so fatigued the constitution, as to induce a hectic fever. The present mode is the reverse of this. When a part of the frame has been much excited, this part

is not allowed to cease to act for want of stimulus, but, is kept in action by an adequate stimulus, which is to be gradually diminished, until the ordinary action returns. With the same view, the internal means are highly stimulant to the whole system, which must be supposed to be in a natural state at the time of the accident.

Thus increasing the action of the whole by strong stimuli, and decreasing the action of the part, by lessening the stimuli, the desired end will be more readily obtained; that is, equilibrium of the action will be restored.

When parts are destroyed, there must be other parts with increased action; and the foregoing mode will be the best for restoring the living parts, and promoting the separation of the dead ones. Suppuration having taken place, the exciting of the system by any thing stimulant, either by food, or medicine, should be cautiously avoided. Should the secretion of pus continue too great, gentle laxatives, and a spare diet, are indicated. If any part, as the eyes, for instance, remain weak, with a tendency to inflammation, topical bleedings, or small quantities of blood taken from the arm, are useful. To defend the new skin, camphorated oil, or camphorated oil and lime-water, in equal parts, are good applications. Wounds of this kind heal very fast, when the diminution of pus is prevented, by attention to diet: if necessary to keep up the patient's strength, small doses of bark, taken two or three times a day, in some milk, will answer that purpose, and will not excite a quickened circulation, as wine, ale, or spirits, are apt to do. By attention to these principles, (continues Mr. Kentish,) I can truly assert, that I have cured very many extensive and dangerous burns and scalds, in one, two, three, and four weeks, which in the former method would have taken as many months; and some, which I believe to have been incurable by the former method.

After explaining his principles, Mr. Kentish takes notice of the several substances, which have commonly been employed. Of these he would chiefly rely on alcohol, the fluid volatile alkali, æther (so applied as to avoid the cooling process of evaporation), and spirit of turpentine.

In applying these, we are directed to proceed, as follows: the injured parts are to be bathed, two, or three times over, with spirits of wine, spirits of wine with camphor, or spirit of turpentine, heated by standing in hot water. After this, a liniment, composed of the common yellow basilicon, softened with spirit of turpentine, is to be spread on soft cloth, and applied. This liniment is to be renewed only once in twenty-four-hours, and, at the second dressing, the parts are to be washed with proof spirit, or laudanum, made warm. When a secretion of pus takes place, milder applications must be made, till the cure is effected.

The yellow ointment stops the pores of the cloth, impedes evaporation, and thus confines the effect of the alcohol to the burnt surface. The first dressings are to remain on four and twenty hours. Mr. Kentish thinks it of importance, that the injured surface should be left uncovered, as little as possible. It is, therefore, recommended, to have plasters, ready spread, before removing the old ones, and then only to take off one piece at a time.

It will seldom be necessary to repeat the application of alcohol a second time, or that of oleum terebinthin. The inflammatory action will be found diminished, and, according to Mr. Kentish's principles, the exciting means should therefore be diminished. Warm proof-spirits, or laudanum, may be substituted for the alcohol, and the unguentum resinæ flavæ is to be mixed with oleum camph. instead of turpentine. If this should be found too irritating, Mr. Kentish recommends ung. saturn. or cer. lap. calaminaris. Powdered chalk is to be used to repress the growth of exuberant granulations, and to absorb the pus. In the cavities of separated eschars, and in the furrows, between sloughs, and the living parts, he introduces powdered chalk. Then a plaster is applied, and, in tedious cases, a poultice over the plaster.

With respect to the internal treatment, the author observes, that great derangement of the system arises in certain persons, from causes, which, in others, produce no effect; and that this depends on a difference in the degree of strength. Hence, he concludes, that as strength resists the sympathetic irritative actions of parts, and weakness induces them, we should, in all cases, make the system as strong as we can, immediately upon the receipt of the injury. In considerable burns,

he supposes a disproportion of action to take place, between the injured parts, and the system at large, or what, he styles, a solution of the continuity of action; and, that, by a law of the system, a considerable commotion arises, for the purpose of restoring the equilibrium, or enabling the constitution to take on the action of the part. Hence, Mr. Kentish is of opinion, that the indication is *to restore the unity of action of the whole system, as soon as possible*, by throwing it into such a state as to *absorb the diseased action*, and then gradually bring down the whole to the natural standard of action, by nicely diminishing the exciting powers. Æther and alcohol, or other stimulants, are to be immediately given, in proportion to the degree of injury, and repeated, once or twice, within the first twelve hours, and, afterwards, wine or ale is to be ordered, till suppuration takes place, when it will be no longer necessary to excite the system.

In a second essay, on the subject of burns, Mr. Kentish remarks, that, in the first species of burns, *in which the action of the part is only increased*, he has not found any thing better, for the first application, than the heated oleum terebinthinæ, and the digestive, thinned with the same. In superficial burns, when the pain has ceased, it will be adviseable to desist from this application in about four and twenty hours, as that time in many cases will be sufficient, and, at the second dressing, a digestive sufficiently thinned with common oil, will be adequate to the case, and, on the third day, we are to begin with the ceratum lap. calaminaris. Mr. K. has frequently seen secondary inflammation excited by the remedy. The most certain remedy, for this unpleasant symptom, is to apply a digestive thinned with oil, or a plaster of cerate, and over that a large warm poultice. The cerate will finish the cure. Should there be much uneasiness of the system, an anodyne, proportioned to the age of the patient, should be given.

The growth of fungus, and the profuse discharge of matter, are to be repressed, as already mentioned, by sprinkling powdered chalk on the surface, and the use of purgatives, in the latter stages. The chalk must be very finely levigated.

Mr. Kentish's theories are, certainly, visionary; they may amuse the fancy, but, can never improve the judgment. He is a man, however, who has had superior opportunities of observing this part of practice, and the great success of his plan of treatment has acquired very extensive approbation, although there are still many practitioners, who prefer the common methods, and the antiphlogistic principles.

BURSÆ MUCOSÆ. These are small membranous sacs, situated about the joints, particularly, the large ones of the upper and lower extremities. For the most part, they lie under tendons. The celebrated Dr. A. Monro, of Edinburgh, published a very full account of the bursæ mucosæ, and also of their diseases. These parts are naturally filled with an oily kind of fluid, upon which the tendons play, in their passage over joints. In the healthy state, this fluid is so small in quantity, that it cannot be seen without opening the membrane containing it; but, occasionally, such an accumulation takes place, that very considerable swellings are the consequence. Tumours of this sort are often produced by bruises and sprains, and, now and then, by rheumatic affections. These swellings are not often attended with much pain, though, in some cases, it is very acute, when pressure is made with the fingers. The tumours yield, in a certain degree, to pressure; but, they rise again, with an appearance of elasticity, not remarked in other sorts of swellings. At first, they appear to be circumscribed, and confined to a small extent of the joint; but, sometimes, the fluid, forming them, is so abundant, that they extend over a great part of the circumference of the limb. The skin, unless inflamed, retains its natural colour.

In this morbid state of the bursæ mucosæ, they contain different kinds of fluids, according to the cause of the disease. When the tumour depends on a rheumatic affection, the contents are ordinarily very fluid. They are thicker, when the cause is of a scrophulous nature. When the disease is the the consequence of a bruise, or sprain, the effused fluid often contains hard concretions, and, as it were, cartilaginous ones, which are sometimes quite loose, and, more or less, numerous. Such substances may frequently be felt, when the tumour is examined with the fingers.

In practice, such distinctions are not of much consequence. While the swellings are not very painful, an attempt

may be made to disperse them, by warm applications, friction (particularly, with camphorated mercurial ointment,) or blisters, kept open with the savin cerate. But, if these tumours should become very painful, and not yield to the above methods, Dr. Monro recommends opening them; a practice, however, which can seldom be really necessary, or proper. This author was continually alarmed at the idea of the bad effects of air, admitted into cavities of the body, and, hence, in the operation even of opening the bursæ mucosæ, he is very particular in directing the incision in the skin, not to be made immediately opposite that made in the sac. Care must also be taken to avoid cutting the tendons, near the swelling.

Dr. Monro has seen cases, in which amputation became indispensable, in consequence of the terrible symptoms following the opening of bursæ mucosæ.

On account of such evil consequences, which are imputed to the air, though they would as often arise, were the same practice pursued in a situation, in which no air could have access at all, it has been recommended to pass a seton through the swelling, and to remove the silk, after it has remained just long enough to excite inflammation of the cyst, when an attempt is to be made to unite the opposite sides of the cavity by pressure.

I have never seen any swelling of this kind, which could not be discussed, by the means usually employed for promoting the absorption of other tumours. Indeed, the treatment should be very like that of Hydrops articuli. (See *Articulation.*)

Consult *Monro's Works by his son;* and *Latta's System of Surgery.*

C

CÆSAREAN OPERATION. (Pliny, book 7. of his Natural History, gives us the etymology of this operation. *Auspicatiùs* (says he) *enectâ parente gignuntur, sicut Scipio Africanus prior natus, primusque Cæsarum à cæso matris utero dictus; quâ de causâ cæsones appellati. Simili modo natus est Manlius qui Carthaginem cum exercitu intravit.*) The bringing of the fœtus into the world from the uterus, through an incision, made in the parietes of the abdomen,

There are three cases in which this operation may be necessary. 1. When the fœtus is alive, and the mother dead, either in labour, or the last two months of pregnancy. 2. When the fœtus is dead, but cannot be delivered in the usual way, from the deformity of the mother, or the disproportionate size of the child. 3. When both the mother, and child are living, but delivery cannot take place from the same causes, as in the second instance.

Delivery cannot possibly happen in the ordinary way, when the fœtus is situated in the ovaries, or Fallopian tube, or in the cavity of the peritoneum. There are many instances recorded of ventral pregnancies, which the mothers have survived, the dead putrified fœtus being discharged, either out of an abscess, or through the rectum.

Both the mother and child, if accounts can be credited, have often lived after the Cæsarean operation, and the mother even borne children afterwards. Heister gives a relation of such success, in his Institutes of Surgery, cap. 113. See also *Mem. de l'Acad. de Chirurgie, tom.* 1. *p.* 623. *tom.* 2. *p.* 308. *Edinb. Med. Essays, vol. V. art.* 37, 38.

In England, the Cæsarean operation has almost always failed. Mr. James Barlow, of Chorley, Lancashire, succeeded, however, in taking a fœtus out of the uterus by this bold proceeding, and the mother was perfectly restored to health. (See *Haighton's Inquiry concerning the true and spurious Cæsarean operation, and Barlow's account in the Med. Reports and Researches,* 1798.)

Govei, p 401, relates a case of ventral conception, in which instance the Cæsarean operation was done, and the child preserved. A lady, aged 21, had a tumour in the groin, which, was at first supposed to be an epiplocele, but an arterial pulsation was perceptible in it. In about ten weeks, the swelling had become as large as a pound of bread. Govei, solicited by the lady, opened the tumour. He first discover-

ed a sort of membranous sac, whence issued a gallon of a limpid fluid. The sac was dilated, and a male fœtus found, about half a foot long, and large in proportion. It was perfectly alive, and was baptized. After tying the umbilical cord, the placenta was found to be attached to the parts just behind, and near, the abdominal ring; but it was easily separated. Govei does not mention whether the mother survived; but the thing would not be very astonishing, considering the situation of the fœtus. Bertrandi says, he was unacquainted with any other example of the Cæsarean operation being done, in cases of extra-uterine fœtuses, so as to save both the mother and infant. This eminent man condemned operating, in ventral cases, on the ground that the placenta could not be separated from the viscera, to which it might adhere, or, if left behind, it could not be detached, without such inflammation and suppuration, as would be mortal. But if, in addition to such objections, says Bertrandi, the operation has been proposed by many, and practised by none, we may conclude that this depends on the difficulty of judging of such pregnancies, and of the time when the operation should be attempted. He puts out of the question the dilatations, which have been indicated for extracting dead portions of the fœtus, and also Govei's case, who operated without expecting to meet with a fœtus at all. (*Bertrandi sur les Opérations de Chirurgie.*)

When the fœtus is contained in the womb, and cannot be expelled by reason of the invincible obstacles already mentioned, the Cæsarean operation should be practised, before the mother, and fœtus, both perish from the violence of the pains, hemorrhage, convulsions, &c.

For this purpose, an extensive incision must be made in the integuments of the abdomen, and in the uterus. Some have thought, that cutting the parietes of the belly was mortal, while others have believed a wound of the uterus to be so. Hence, such persons have condemned the operation on the principle, that religious reasons do not authorize taking one life to save another. All the opponents of the Cæsarean operation fear the hemorrhage, which, they say, must follow. Indeed, if the uterus were not to contract sufficiently, when the fœtus and after-birth have come away, the bleeding would really be perilous. But when, by means of the Cæsarean operation, the fœtus is extracted, together with the placenta and membranes, the uterus will then contract, just as it does after a natural labour. Besides, even when the mother is alive, the operation is not commonly done, till the uterus evinces a propensity to deliver itself, and begins to contract. The womb being delivered of its contents, the incision becomes closed, the vessels obliterated, and there is no fear of hemorrhage. The wound must also make so irritable an organ more disposed to contract; but, whatever arguments may be adduced, it is enough to say in this case: *Artem experientia fecit, exemplo monstrante viam.* Rousset, about the close of the 16th century, published a work, in French, intitled, *Hystérotomie, ou l'Accouchement Cesarien.* This book was translated into Latin, and enlarged with an appendix by the celebrated Bauhin. Even then, the practice of the Cæsarean operation on the living mother had its defenders. Bauhin relates that, in the year 1500, a sow-gelder, performed the Cæsarean operation on his wife, *tam feliciter, ut ea posteà gemellos et quatuor adhuc infantes enixa fuerit.* This is said to be the first instance, in which the operation was ever done on the living mother with success. Many other cases were afterwards collected, and published.

The possibility of operating successfully on the living mother has been demonstrated, with so much perspicuity and accuracy, by M. Simon. in *Tom.* 1. *de l'Acad. de Chirurgie*, that there cannot be a doubt of the thing having been frequently practised with success. Here we are presented with a collection of sixty-four Cæsarean operations, more than a half of which had been done on thirteen women. Some of these had undergone the operation once, or twice; others five or six times. There was one woman in particular, who had undergone it seven times, and always with success. This seems to prove, notwithstanding all assertions to the contrary, that the operation, for the most part, succeeds. But if the life of the mother should not invariably be preserved, the Cæsarean operation ought not to be rejected on this account; it ought always to be done, when relief cannot be obtained by other means; just as amputation and lithotomy are

practised, though they are not constantly followed by success. Would any thing be more cruel, than to abandon a mother and her child, and leave them to perish, while there is any hope of saving them both? It is true, that when a pregnant woman dies of any inward disorder, and not from the pains, and efforts of labour, the fœtus is commonly still alive in the uterus; but, after difficult labours, and the great efforts, made by the uterus to overcome the obstacles to parturition, the fœtus is almost always dead; and of what avail would the operation then be, which is usually done after the death of the mother? (See *Bertrandi Traité des Opérations de Chirurgie.*)

Notwithstanding all the descriptions of the Cæsarean operation, to be found in books, there can be no doubt, that, when the fœtus is not a ventral one, the proper place for making the incision, in order to get at the uterus, is in the linea alba. Here, no muscular fibres will be wounded. The operator should first divide the integuments perpendicularly, so as to expose the linea alba, making the wound about six inches long. An opening should then be carefully made through the aponeurosis, into the abdomen, either at the upper, or lower part, of the linea alba in view. A curved bistoury is then introduced into the opening, and the tendon and peritoneum cut from within outward, as far as the extent of the wound in the integuments. The latter cut should be cautiously made, with the crooked bistoury, guided by the forefinger of the left hand, lest any of the intestines should be accidentally injured. The uterus must next be carefully opened, making an incision in it, of the same length, as the preceding ones. The fœtus is to be taken out through the wound, and then the placenta and membranes. In this way, M. Artiste operated, so as to save both mother and child. (See *Edinburgh Surgical Journal, No.* 14.)

Mr. Wood, of Manchester, performed the Cæsarean operation, in a case, in which parturition was prevented by deformity of the pelvis. The incision was made nearly in a transverse direction, on the left side of the abdomen, about five inches in length, beginning at the umbilicus. This part was fixed upon, because the nates of the child could be felt there, and it was evident, that no intestine was interposed betwixt the abdominal parietes and the uterus. There was scarcely any effusion of blood, either from the external wound, or from that of the uterus, though the latter was made directly upon the placenta. Instead of dividing the placenta, Mr. Wood introduced his hand betwixt it and the uterus, and laying hold of one of the child's knees, extracted the fœtus with ease. His hand passed with ease, betwixt the placenta and uterus; this produced a hemorrhage, but, not in any considerable degree; for, the whole quantity of blood lost did not exceed seven, or eight ounces. After the uterus was emptied, the intestines and omentum protruded at the wound. These having been reduced, the integuments were brought into contact by sutures and adhesive plaster. This operation, however, did not save the woman's life; she died on the fourth day from the time of its being done. (See *Medical and Physical Journal, Vol.* 6.)

This subject is ably treated of by Denman, in his *Introduction to Midwifery;* and by Hull, in his *Defence of the Cæsarean Operation,* 8*vo.* 1798.

CALCULUS, (from *calx*, a limestone, The *gravel* and *stone.* The Greeks call this disorder *lithiasis* and *adamitum;* the Latins name it *calculus.* In English, we understand, by *gravel*, small stones, which pass from the kidneys, through the ureters in a few days; and by the *stone*, a calculous concretion in the kidneys, or bladder, of too large a size to pass, or at least, without great difficulty.

With gravelly complaints the surgeon has nothing to do, and we shall therefore limit our remarks to the stone in the bladder. When once a stone, in this situation, has acquired a moderate size, it usually occasions the following symptoms: frequent inclination to make water, excessive pain in voiding it drop by drop, and, sometimes, a sudden stoppage of it if discharged in a stream; after making water, great torture in the glans penis, which lasts one, two, or three minutes; and, in most constitutions, the violent straining makes the rectum contract, and expel its excrements; or, if it be empty, occasions a tenesmus, which is sometimes accompanied with a prolapsus ani. The urine is often tinctured with blood, from a rupture of the vessels, and sometimes pure blood itself is discharged. Sometimes, the urine is

very clear, but, frequently, there are great quantities of slimy sediment deposited at the bottom of it, which is only a preternatural separation of the mucilage of the bladder, but, has often been mistaken for pus. For the symptoms more particularly, see *Lithotomy. Sharp on Operations.*

Late experiments have shewn, that only a very small portion, not exceeding one two-hundredth part of a urinary calculus, is earthy, and that it consists, in a great measure, of matters, which are volatile in a moderate heat. (*Austin.*)

Calculi are occasionally found in the lachrymal sac, the ducts of the sublingual glands, the gall-bladder, the kidneys, ureters, urinary bladder, and urethra. Concretions of various kinds are formed in many other parts. Stony incrustations have been found under the prepuces of infants, and in the joints of gouty people, matter, resembling chalk, is often abundant. The pineal gland naturally contains a sabulous matter.

When stones are formed in parts without motion, they sometimes cause no pain, nor inconvenience. In the ducts of the sublingual glands, there have been instances of their increase to a large size, without producing sufficient sensation to be noticed, till they have burst their way through the integuments, and they are sometimes met with in tumours and abscesses, when there is no suspicion of them. In the hernia of the bladder, mentioned by Pott, which included a stone, as the part, in which the body lodged was motionless, there was no pain, and the patient felt no symptom of the stone, and was only conscious of a lump in the groin. Stones, however, often give great pain by the distention of the sensible parts which contain them. (*Earle.*)

As the bladder is the largest receptacle for fluid, and contains it a long while, it is more liable to calculi than any other cavity. Indeed, the urine, in this situation, seems so much concerned in the formation of these concretes, that any foreign body, of whatever kind, which accidently may be deposited in it, will there infallibly attract and collect solid particles, even in persons who are not constitutionally subject to the stone, nor have ever been affected with any disease of the bladder. When stones are formed in the cavity of this organ, the motions and contractions, to which it is subject, cause them to produce the most exquisitely painful sensations. (*Earle.*)

The stone is a disease, to which both sexes and all ages are liable, and calculi have even been found in the bladders of very young children, nay, of infants only six months old. When, from whatever cause, a nucleus is once formed, the solid matter, which is attracted, round it, collects and is deposited in laminæ of different thicknesses. Some stones are of a reddish brown colour, others white, and some of a dark colour resembling iron ore: these last are very uncommon. Some stones are close, compact, and hard; others of a texture as soft as chalk. Sometimes, the different laminæ in the same stone, differ from each other in texture, colour, and consistence. Soft stones grow faster, than hard ones, and are often angular; hard ones, with a smooth surface, sometimes do not excite great pain; when angular, or rough, the contractions of the bladder on them, cause exquisite pain and irritation, particularly, on the expulsion of the last drops of urine. Small stone of this description, falling into, and lodging in the neck of the bladder, are more painful, than when they are grown so large, as to continue in the cavity of the bladder, where the pressure on them is not so violent. (*Earle.*)

Women seem less subject to this complaint than men, either owing to constitutional causes, or to the capaciousness, shortness, and straightness of their urethræ, allowing the calculi to be discharged, while small, together with the urine. (*Earle.*)

In children, the stone seems generally to be formed in the bladder, as they seldom complain of pain in the kidneys; but, in adults, it frequently originates in the kidneys, and thence is washed by the urine into the bladder. This can scarcely be effected, without the person feeling pain, and a consciousness of having passed a stone; in which case, he should drink plenteously of diluting liquors, and retain his urine till the bladder is so distended, as to create a great desire to make an evacuation. He should then place himself on his knees, bend his body forward, and make water in that situation. The little stone by its weight will fall into the neck of the bladder, and, very probably, be carried away with the urine,

which is rushing out. Sir James Earle is persuaded, that, if persons subject to calculous concretions were attentive to such directions, we should see fewer cases of stone in the bladder. (*Earle on the Stone, Edit.* 2. 1796.)

Internal medicines have been given, with a view of dissolving the stone in the bladder, and doing away all occasion for lithotomy, which is undeniably a very painful, and frequently fatal operation. The remedies, possessing, or said to possess such power, are termed *lithontriptics*, and, though we have no decisive evidence of their being able to dissolve the stone in the bladder of a living subject, they undoubtedly mitigate the pain, and render the fits milder, and less frequent.

From the experiments of Fourcroy, it appears, that almost every ingredient in calculi is dissolved by the caustic alkali; and various experiments have shewn, that the whole calculus yields to its powers. Lime water has also been found a solvent of urinary calculi out of the body. It is obvious, however, that what is taken by the mouth is subject to many changes in the alimentary canal, and also the lymphatic, and vascular systems, and that, in this way, it must be exceedingly difficult to get such substances, (even were they not liable to alterations) in sufficient quantity into the bladder. Indeed, there are very few well authenticated facts of the urine being so changed, as to become a menstruum for the stone. Excepting the case of Dr. Newcombe, recorded by Dr. Whytt, the instance of Mr. Home is almost the only one. Though lithontriptic remedies, however, may not in general actually dissolve the stone in the living bladder, yet it is an incontrovertible fact, that they frequently mitigate the paroxysms of pain; and, to lessen such torture, as that of the stone in the bladder, is surely an object of no little importance.

Lime was long ago known as a solvent of urinary calculi, and different methods were employed to administer it with safety. One of these plans fell into the hands of a Mrs. Steevens, and her success caused great anxiety for the discovery of the secret. At last, Parliament bought the mystery for 5000l. In many instances, stones which had been unquestionably felt, were no longer to be discovered; and, as the same persons were examined by surgeons of the greatest skill and eminence, both before, and after, the exhibition of the medicines, it is no wonder, that the conclusion was drawn, that the stones had been really dissolved. From the cessation of such success, and from its now being known, that the stones are occasionally protruded, between the fasciculi of the muscular fibres of the bladder, so as to become lodged in a kind of cyst, on the outside of the muscular coat, and cause no longer any grievances, surgeons of the present day, however, are inclined to suspect, that this must have happened in Mrs. Steevens's cases. This was certainly what happened to one of the persons, on whom the above medicine was tried, as Dr. W. Hunter informs us. It is evident, that a stone, so situated, would not only produce no particular irritation, but would also be quite indiscoverable by the sound; for, in fact, it is no longer in the cavity of the bladder.

Mrs. Steevens first gave calcined eggshells alone; but, finding costiveness produced, she added soap. In time, she rendered her process more complicated, adding snails burnt to blackness, a decoction of camomile flowers, parsley, sweet fennel, and the greater burdock.

As soap was with reason supposed to increase the virtues of the lime, it led to the use of the caustic alkali, taken in a mucilage of veal broth. Take of kali prepared, ℥viij; of quick-lime ℥iv; of distilled water lbij. Mix them well together in a large bottle, and let them stand for 24 hours. Then pour off the lye, filter it through paper, and keep it in well stopped phials for use. Of this the dose is from 30 drops to ʒij, which is to be repeated, two, or three times a day. Mix the quantity to be used in the day, with three pints of plain broth, made of the lean part of veal, all the fat, or oily parts being separated from the liquor, by skimming them off when cold. Let the patient drink, within an hour, a pint of this broth three times a day; early in the morning, at noon, and in the evening. Continue this plan, for three or four months, living, during this course, on such things as least counteract the effect of the medicine. The common fixed alkali, or carbonated-alkali, and the acidulous soda water, have of late been used as lithontriptics. Honey has also been given,

and Mr. Home, surgeon at the Savoy, has recorded its utility in his own, and his father's cases. Bitters have likewise been tried.

Dismissing all theories, limewater, soap, acidulous soda water, caustic alkali, and bitters, are useful in cases of stone. Of soap, as much may be taken as the stomach will bear, or as much as will prove gently laxative; but, of the limewater few can take more, than a pint daily.

The acidulous soda water may be taken in larger quantities, as it is more agreeable. The acidulous salt is now prepared, so as to produce this water extemporaneously. It must be swallowed, however, while the salt is dissolving, as the carbonic acid gas escapes very rapidly.

For curing stone-patients, little reliance can be placed in any lithontriptics hitherto discovered, though they may rationally be given, with a confident hope of procuring a palliation of the fits of pain, attending the presence of a stone in the bladder. The only certain method of getting rid of the calculus, is making an opening in this viscus, large enough to allow the stone to be taken out with a pair of forceps. (See *Lithotomy.*) Consult *Austin's Treatise on the Stone*, 1791. *Earle on the Stone*, 1796. *London Medical Dictionary, article Calculus.*

Calculus in the interior of the Eye. Scarpa has dissected an eye, which was almost entirely transformed into a stony substance. It was taken from the body of an old woman, and was not above half as large as the other sound one. The cornea appeared dusky, and, behind it, the iris, of a very singular shape, was distinguishable, being concave, and without any pupil in its centre. The rest of the eyeball, from the limits of the cornea backward, was unusually hard to the touch.

On making an incision, Scarpa found the sclerotica and choroides, almost in their natural state, and a small quantity of a limpid fluid issued from the anterior chamber of the aqueous humour. Beneath the choroides, two hard calculous concave plates presented themselves, united together by means of a complete membranous substance. One was situated forward; the other backward; the latter occupied the bottom of the eye; the former the situation of the corpus ciliare and crystalline lens.

Scarpa made an incision, through the compact membrane, which joined together the margins of the two calculous bodies. He found in the cavity, instead of the vitreous humour, some drops of a glutinous bloody fluid, and, in the longitudinal direction of this cavity, a little soft cylinder, which, extending forward from the bottom of the eye, along the great axis of this organ, was inserted into a cartilaginous, elastic substance, situated in the centre of the front calculous body, precisely where, in the natural state, it is customary to find the lens, and its capsule, which were entirely wanting.

The posteriour surface of the iris had formed a firm adhesion to the middle of the cartilaginous substance, situated in the centre of the front calculus. Hence, the iris, when beheld on the side next the cornea and anteriour chamber appeared, as it actually was, concave in the middle.

The optic nerve, which had degenerated into a mere thread, entered the sclerotica and choroides, as well as the centre, or bottom, of the posteriour calculous body, and lost itself in the little soft cylinder, which, as was explained, proceeded to be inserted into the cartilaginous substance, situated in the middle of the anteriour calculus, or the place naturally occupied by the lens, and its capsule. The greater part of this little cylinder, was, according to appearance, nothing else, than the membrane of the vitreous humour, destitute of fluid, shrivelled, and changed into a compact substance.

Haller met with a case similar to the foregoing one: 'In furis cadavere, 'quod anno 1752 dissecuimus, diritas 'quidem non tanta, raritas autem major 'fuit. Cum enim in eo homine nervos 'oculi sollicitè pararemus, cœcum fu- 'isse eo latere, atque cicatricem in 'corneâ esse, et duritatem in oculo ipso 'apdaruit. Cum dissectione defuncti 'essemus, adparuit mira mali causa. 'Choroïdeæ membranæ suberat, retinæ 'loco, lamina ossea, aut lapidea, (nam 'fibras osseas nullas vidimus) cui ipsa 'choroïdea adhærebat, ut alias retinæ 'solet concentrica, hemispherio cavo 'similis, nisi quod duplici lamina fieret, 'et in altero latere duobus quasi localis 'excavaretur. Is quasi scyphus accu- 'ratè rotundo foramine perforabatur, 'quà nervus opticus subit, ut eo magis 'induratam retinam adpareret.

'Intra hanc osseam caveam nullum 'vitreum legitimum corpus, sed ner-

'vum, quasi albam, nempe cylindrum 'reperimus, quæ per foramen ossei 'cyathi transmissa metiens ejus diame-'trum, denique adhærebat osseo con-'fuso corpori, quod potuisses pro cor-'ruptâ lente crystallinâ habere. Ei 'corpori undique et iris, et processus 'ciliorum cognomines, connasebantur, 'et cornea denique ad quam iris pari-'ter conferbuerat. Nunc sive retinam, 'ut ego persuadeor, sive quidquam 'aliud fuisse velis, quod in os cavum 'et hemisphæricum mutatum sit, in 'oculo tamen tenerrimâ parte corporis 'indurationem perfectam natam esse 'adparet; nihil ergo in corpore nostro 'dari, quod indurari nequeat. Lapillos 'aliquos in lente crystallinâ repertos 'fuisse legi. Ejusmodi autem morbus, 'nescio an visus sit, qualem hæc oppor-'tunitas nobis obtulit.' (Obs. Pathol. Oper. Min. Obs. 15.)

Fabricius Hildanus, Lancisi, as quoted by Heister, Morgagni, Morand, Zinn, and Pellier, make distinct mention of calculi in the interiour of the eye.

(*Scarpa sulle Malattie degli Occhi. Venezia*, 1802.)

CALLOSITY, (from *callus*, q. v.) *Callositas*. Preternatural hardness.

CALLUS, (from *calx*, the heel, or *calco*, to tread.) This term used to be applied to the thick skin, at the bottom of the heel, hardened by pressure. In surgery, the meaning of the word *callus* is *new bone*, or the solid substance, which serves to join together the ends of a fractured bone.

The old surgeons believed callus to be a mere inorganic concrete, a fluid poured out from the extremities of the ruptured vessels, which was soon hardened into bone. They always described it, as an "exudation of the bony juice," and imagined that it oozed from the ends of broken bones, as gum from trees, sometimes too profusely, sometimes too sparingly. The reunion of broken bones, and the hardening of callus, they compared with the glueing together of two pieces of wood, or the soldering of a broken pot. (*A. Paré.*) The old surgeons also conceived, that callus sometimes flowed into the joints, so as to form a clumsy, prominent protuberance. They imagined, that callus was a juice, which congealed at a particular period of time, and they therefore had fixed days for undoing the bandages of each particular fracture. They supposed, that its exuberance might be suppressed by a firm and well rolled bandage, and its knobby deformities corrected by pillows and compresses; that it might be softened by frictions and oils, so as to allow the bone to be set anew. All their notions were mechanical; and their absurd doctrines have been the apology for all the contrivers of machines, from Hildanus down to Dr. Aitken and Mr. Gooch. (*John Bell's Principles of Surgery, Vol.* 1).

A bone is a well organized part of the living body; that matter, which keeps its earthy parts together, is of a gelatinous nature. The earthy matter, to which a bone owes its firmness, is deposited in the interstices of the gluten, undergoing a continual change and renovation. It is incessantly taken up by the absorbents, and secreted again by the arteries. It is this continual absorption and deposition of earthy matter, which forms the bone at first, and enables it to grow with the growth of the body. It is this unceasing activity of the vessels of a bone, which enables it to renew itself, when it is broken or diseased. In short, it is by various forms of one secreting process, that bone is formed at first, is supported during health, and is renewed on all necessary occasions. Bone is a secretion, originally deposited by the arteries of the bone, which arteries are continually employed in renewing it. Callus is not a concrete juice, deposited merely for filling up the interstices betwixt fractured bones, but it is a regeneration of new and perfect bone, furnished with arteries, veins, and absorbents, by which its earthy matter is continually changed, like that of the contiguous bone. Indeed, there could be no connexion, between the original bone and callus, were the latter only the inorganic concrete, which it was formerly supposed to be.

Notwithstanding the more accurate opinions now entertained, concerning callus, the supposition is still very common, that the slightest motion will destroy a callus, which is about to form. But, continues Mr. John Bell, it is an ignorant fear, proceeding merely from not having observed the state of the parts; for, when callus forms, the perfect constitution of the bone is restored; the arteries pour out from each end of a broken bone a gelatinous matter; the vessels, by which that gluten is secreted, expand and multiply in it, till they form, betwixt the

broken ends, a well organized, and animated mass, ready to begin anew the secretion of bone. Thus, the ends of the bone, when the bony secretion commences, are nearly in the same condition, as soft parts which have recently adhered; and it is only when there is a want of continuity in the vessels, or when a want of energetic action incapacitates them from renewing their secretion, that callus is imperfectly formed. This is the reason, why in scorbutic constitutions, in patients infected with syphilis, in pregnancy, in fever, or in any great disorder of the system, or while the wound of a compound fracture is open, no callus is generated. (*John Bell's Principles of Surgery, Vol.* 1. 600, 501.

For some time the secretion of earthy matter is imperfect; the young bone is soft, flexible, and of an organization suited for all the purposes of bone; but, as yet, delicate and unconfirmed; not a mere concrete, like a crystallization of a salt, which, if interrupted in the moment of forming, will never form; not liable to be discomposed by a slight accident, nor to be entirely destroyed by being even roughly moved, or shaken. Incipient callus is soft, fleshy, and yielding; it is ligamentous in its consistence, so that it is not very easily injured; and, in its organization, it is so perfect, that when it is hurt, or the bony secretion interrupted, the breach soon heals, just as soft parts adhere, and thus the callus becomes again entire, and the process is immediately renewed.

In consequence of the above circumstances, when a limb is broken a second time, when the first fracture is nearly cured, the bone unites more easily, than after the first accident; and when broken a third, and fourth time, the union is still quicker. In these cases, the limb yields, it bends under the weight of the body, which it cannot support; but, without any snapping or splintering of the bone, and, generally, without any overshooting of the ends of the bone, and without any crepitation.

Callus is found to be more vascular, than the old bone. Mr. John Bell mentions an instance of a bone, which had been broken twelve years, before he injected it, yet the callus was rendered very singularly red. When a recently formed callus is broken, many of its vessels are ruptured, but some are only elongated, and it rarely happens, that its whole substance is torn. It is easy to conceive, how readily the continuity of the vessels will be renewed in a broken callus, when we reflect on its great vascularity; and the vigorous circulation, excited by the accident, in vessels already accustomed to the secretion of bone. These reasons shew, why a broken, or bent callus, is more speedily united, than a fractured bone. (Observations, connected with the subject of *Callus*, will be found in the article *Fracture*.)

CALOMEL. Its extensive utility, in numerous surgical diseases, will be conspicuous in an immense proportion of the articles in this work.

CALX CUM KALI PURO. This is the common strong kind of caustic, employed in surgery. It is chiefly used for making the eschars, when issues are to be formed. This is often necessary in cases of diseased vertebræ, white swellings, morbid hip-joints, &c. (See *Vertebræ*.) This caustic is also sometimes used, though not so often as it was formerly, for opening buboès and other abscesses. Some are in the habit of making it into a paste with soft soap; they cover the part affected with adhesive plaster, in which there is a hole of the size of the eschar intended to be made; and into this aperture they press the paste till it touches the skin. A bandage is then applied to secure the caustic substance in its situation, till the intended effect is produced.

The action of the calx cum kali puro, in this way, however, is more inert and tedious, and, perhaps, on this account, more painful upon the whole. Hence, many of the best modern surgeons never adopt this method; but, after covering the surrounding parts with sticking plaster, rub the caustic on the situation, where it is desirable to produce an eschar, till the skin turns brown. The end of the caustic must be first a little moistened.

The calx cum kali puro is commonly employed also for destroying large funguses.

Before the port-wine injection was found to be the best radical cure for the hydrocele, this caustic was mostly used in this instance. (See *Hydrocele*.) Mr. Else, in the case alluded to, used to mix the caustic with powdered opium, by which, it is said, though not with much appearance of truth, that

the sloughs were made with little or no pain to the patient.

Some assert that the kali purum alone, acts more quickly, than when mixed with quicklime. I have not found this to be the fact, and, after trying both, give the preference to the calx cum kali puro.

CAMOMILE. *Chamæmelum.* The flowers are bitter and aromatic, and are employed in surgery in fomentations.

CAMPHOR, is used externally, chiefly as a means of exciting the action of the absorbents, and thus dispersing many kinds of swellings, extravasations, indurations, &c. Hence, it is a very common ingredient in liniments. It has also the property of rousing the action of the nerves, and quickening the circulation in parts, on which it is rubbed. For this reason, in paralytic affections, it is sometimes employed.

Perhaps, there is no composition, that has greater power in exciting the absorption of any tumour, or hardness, than camphorated mercurial ointment.

Camphor is often given internally, in delirium, depending on the irritation of local surgical diseases, as we shall have occasion to explain in several parts of this work. It is also a remedy frequently administered in cases of mortification. Some have recommended it, as singularly useful for the relief of stranguries, even those depending on the operation of cantharides. But, although it may occasionally have succeeded, when given with this view, it not only does not always do so, but, it has been known to cause an opposite effect, sometimes producing great scalding in voiding the urine, and sometimes pains like those of labour. (*Medical Transactions, Vol.* 1. *p.* 470.)

CANCER, (derived from the Latin *cancer, a crab,* to which fish a part affected with cancer, and surrounded with varicose veins, was thought to have some resemblance.)

Practitioners distinguish cancer into two kinds, viz. *occult* and *ulcerated.* No definition can be offered, which is applicable to both, though each of these terms implies the same disease, only in a different stage.

By *occult cancer* is meant a hard, scirrhous tumour, accompanied with pains, which are lancinating, excessively acute, and recur more or less frequently. At length, the tumour breaking, is converted into cancer, strictly so called, or the disease in a state of ulceration.

The occult cancer is also sometimes termed *scirrhus,* on account of its peculiar hardness.

OF SCIRRHUS, OR CANCER, NOT IN THE ULCERATED STATE.

Mr. Abernethy has given a matchless history of this affection, as it appears in the female breast, where it most frequently occurs, and can be best investigated. It sometimes, says this valuable writer, condenses the surrounding substance so as to acquire a capsule; and then it appears, like many sarcomatous tumours, to be a part of new formation. In other cases, the mammary gland seems to be the nidus for the diseased action. The boundaries of the disease cannot be accurately ascertained in the latter case, as the carcinomatous structure, having no distinguishable investment, is confined with the rest of the gland. In either instance, carcinoma begins at a small spot, and extends from thence in all directions, like rays from a centre. This is one feature distinguishing this disease from many others, which at their first attack, involve a considerable portion, if not the whole, of the part, in which they occur. The progress of carcinoma is more or less quick in different instances. When slow, it is in general unremitting. Mr. Abernethy thinks, that though the disease may be checked, it cannot be made to recede by the treatment, which lessens other swellings. He is not, however, positive on this point; for, surgeons have informed him, that diseases which eventually proved to be carcinomatous, have been considerably diminished by local treatment. With great deference to Mr. Abernethy, we may be allowed to remark in this place, that every tumour, which ends in cancer, is not from the first of this nature, though it has in the end become so; consequently, it may at first yield to local applications, but will not do so, after the cancerous action has commenced. Hence, Mr. Abernethy's opinion, that a true carcinomatous tumour cannot be partially dispersed, at least, remains unweakened by the fact, that some tumours have at first been lessened by remedies, though they have at last ended in cancer. Mr. Home's observations fully prove, what indeed every

surgeon has long known, that any sort of tumour may ultimately become cancerous.

Without risk of inaccuracy, we may set down the backwardness of a scirrhous swelling to be dispersed, or diminished, as one of its most confirmed features. This obdurate and destructive disease excites the contiguous parts, whatever their nature may be, to enter into the same diseased action. The skin, the cellular substance, the muscles, and the periosteum, all become affected, if they are in the vicinity of the cancer. This very striking circumstance distinguishes carcinoma, says Mr. Abernethy, from several other diseases. In what this author calls *medullary sarcoma*, the disease is propagated along the absorbing system; but the parts immediately in contact with the enlarged glands do not assume the same diseased actions. Neither in the *tuberculated* species does the ulceration spread along the skin, but destroys that part only covering the diseased glands. Mr. Abernethy acquaints us, that Mr. Hunter took notice, that a disposition to cancer exists in the surrounding parts, before the actual occurrence of the diseased action. Hence arose the following rule in practice: *That a surgeon ought not to be contented with removing merely the indurated, or actually diseased part, but that he should also take away some portion of the surrounding substance, in which a diseased disposition may probably have been excited.* In consequence of this communication of disease to the contiguous parts, the skin becomes indurated, and attached to a carcinomatous tumour, which, in like manner, is fixed to the muscles, or other part over which it was formed.

As a carcinomatous tumour increases, it generally, though not constantly, becomes unequal upon its surface, so that this inequality has been considered as characteristic of the disease. A lancinating pain is common; but it is not experienced in every case, without exception. It is also a symptom, attending other tumours, which are unlike carcinoma in structure, and it cannot, therefore, be deemed an infallible criterion of the nature of the disease. (*Abernethy.*)

A hard and painful glandular swelling, having a disposition to become cancer, says Richter, is the common, but, inadequate and erroneous definition of scirrhus. The disease is not regularly attended with swelling; sometimes scirrhous parts diminish in size, and shrink. Hardness is not a characteristic property; for, many tumours, which are not scirrhous, are exceedingly indurated. The disease is not always situated in a gland: it oftentimes attacks structures, which cannot be called glandular; and hard glandular swellings are often seen, which do not partake of scirrhus. The disposition to cancer cannot be enumerated among the marks of scirrhus, since it is not discoverable, till carcinoma has actually commenced. Its termination in open cancer, is not an invariable occurrence; and other tumours become cancerous, to which no one would apply the term scirrhus. (*Anfangsgr. der Wundarzn. Band* 1.)

Scientific surgeons ought undoubtedly to have a definite meaning, when they employ the word scirrhus; superficial practitioners do unquestionably use the word most vaguely; and, perhaps, influenced by its etymology, they call an immense number of various morbid indurations scirrhous.

I have always considered scirrhus, as a diseased hardness, in which there is a propensity to cancerous ulceration, and a greater backwardness to recede, than exists in any other kind of diseased hardness, although the skin may occasionally not break during life, and a few scirrhous indurations may have been lessened.

Though Richter states, that this disposition cannot be discovered, till carcinoma has actually taken place; though Messrs. Burns and Home confirm, that other indurations and tumours may terminate in cancer; though Mr. Abernethy shews, that sarcomatous, and encysted tumours may end in most malignant diseases, and such as merit the name of cancer; yet, it is now well ascertained, that in all these instances, the changes, which precede cancerous ulceration, bear no similitude to the genuine scirrhus.

The puckering of the skin, the dull leaden colour of the integuments, the knotted and uneven feel of the disease, the occasional darting pains in the part, its fixed attachment to the skin above, and muscles beneath, form so striking an assemblage of symptoms, that, when they are all present, there cannot be the smallest doubt, that the tumour is a scirrhus, and that the disease is about

to acquire, if it have not already acquired, the power of contaminating the surrounding parts, and the lymphatic glands, to which the absorbents of the diseased part tend. (*First Lines of the Practice of Surgery, p.* 143.)

The truly scirrhous tumour, which is known to be capable of forming the cancerous poison, when allowed to increase in size is known to be hard, heavy, connected with the gland of the breast; and, when moved, the whole gland moves along with. The structure of a scirrhous tumour in the breast, is different in the various stages of the disease; and a description of the appearances, exhibited in the three principal ones, may give a tolerable idea of what the changes are, which it goes through, previous to its breaking, or becoming, what is termed, an open cancer.

When a section is made of such a tumour, in an early stage, provided the structure can be seen to advantage, it puts on the following appearance: the centre is more compact, harder to the feel, and has a more uniform texture, than the rest of the tumour; and is nearly of the consistence of cartilage. This middle part does not exceed the size of a silver penny; and, from this, in every direction, like rays, are seen ligamentous bands, of a white colour, and very narrow; looking, in the section, like so many extremely irregular lines, passing to the circumference of the tumour, which is blended with the substance of the surrounding gland. In the interstices, between these bands, the substance is different, and becomes less compact towards the outer edge. On a more minute examination, transverse ligamentous bands, of a fainter appearance, form a kind of net-work, in the mashes of which the new-formed substance is inclosed. This structure accords with what Dr. Baillie describes to be the case, in cancerous diseases of the stomach and uterus. (*Home.*)

In a further advanced stage of the tumour, the whole of the diseased part has a more uniform structure; no central point can be distinguished; the external edge is more defined, and distinct from the surrounding gland; and the ligamentous bands, in different directions, are very apparent, but do not follow any course, that can be traced. (*Home.*)

When the tumour has advanced to what may be called cancerous suppuration, which, however, does not always happen in the centre, before it has approached the skin, and formed an external sore; it then exhibits an appearance totally different from what has been described. In the centre is a small irregular cavity, filled with a bloody fluid, the edges of which are ulcerated, jagged, and spongy. Beyond these, there is a radiated appearance of ligamentous bands, diverging towards the circumference; but, the tumour, near the circumference, is more compact, and is made up of distinct portions, each of which has a centre, surrounded by ligamentous bands, in concentric circles.

In some instances, the scirrhus has no appearance of suppuration, or ulceration, in the centre, but consists of a cyst, filled with a transparent fluid, and a fungous excrescence, projecting into this cavity, the lining of which is smooth and polished. When a large hydatid of this kind occurs, a number of very small ones have been found, in different parts of the same tumour; and, in other cases, there are many very small ones, of the size of pins' heads, without a large one. These hydatids are certainly, by no means, sufficiently frequent in their occurrence to admit of their forming any part of the character of a cancerous tumour. (*Home's Observations on Cancer.*)

In the fourth chapter of this work, the author relates two cases of hydatids found in the breast. In the first, the contents of the cyst were bloody serum; in the second, a clear fluid. These two cases of simple hydatids in the breast, unconnected with any other diseased alteration of structure, led Mr. Home to consider the hydatids sometimes found in cancerous breasts; and, he believes, that such hydatids are no part of the poisonous disease, but accidental complaints superadded to it; and, since such hydatids do occur in the natural state of the glands, they are much more likely to do so in disease. (*Home.*)

Mr. Home endeavours to define his conception of a cancer, as follows: as cancer is a term, too indiscriminately applied to many local diseases for which we have no remedy, though they differ very much among themselves, it becomes necessary to state what the complaints are, which I include under this denomination. The present observations, respecting cancer, apply only

to those diseased appearances, which are capable of contaminating other parts, either by direct communication, or through the medium of the absorbents; and when they approach the skin, produce in it small tumours of their own nature, by a mode of contamination, with which we are at present unacquainted.

There is a disease, by which parts of a glandular structure are very frequently attacked, particularly the os tincæ, the alæ of the nose, the lips, and the glans penis. This has been called cancer, but differs from the species, of which we are now treating, in not contaminating the neighbouring parts, with which it is in contact; and neither affecting the absorbent glands, nor the skin at a distance from it. It is, properly speaking, an eating sore, which is uniformly progressive; whereas, in cancer, after the sore has made some progress, a ridge is formed upon the margin, and the ulceration no longer takes that direction. It also differs from a cancer, in admitting of a cure, in many instances, and under different modes of treatment.

From the facts that have been stated, (in Mr. Home's case) it appears, that cancer is a disease, which is local in its origin. In this respect, the cases (alluded to) only confirm an opinion very generally received.

Mr. Home endeavours to establish a second point, that cancer is not a disease, which immediately takes place in a healthy part of the body; but one, for the production of which it is necessary, that the part should have undergone some previous change, connected with the disease. In proof of this, Mr. Home adduces the two first cases in his work, and the innumerable instances, in which a pimple, small tumour, or wart upon the nose, cheek, or prepuce, after remaining for ten, fifteen, or thirty years, without producing the smallest inconvenience; but, at the age of sixty or seventy, upon being cut in shaving, bruised by any accidental violence, or otherwise injured, assumes a cancerous disposition.

All the cases of induration of the gland of the breast, or of indolent tumours in it, which have continued for years, without producing any symptom, and, after being irritated by accidental violence, have assumed a new disposition, and become cancerous, admit of the same explanation; and may be considered as so many proofs of the truth of this latter position. (*Home.*)

DISTINGUISHING CHARACTERS OF SCIRRHUS.

A scirrhous induration seldom acquires the magnitude, to which almost all other tumours are liable to grow, when no steps are taken to retard their growth. Many scirrhi are certainly attended even with a diminution, or shrunk state, of the part affected.

Scirrhi are generally more fixed, and less moveable, than other sorts of tumours; especially, when the latter have never been in a state of inflammation.

With the exception of the fungus hæmatoides, other diseases do not involve in their ravages indiscriminately every kind of structure, skin, muscle, cellular substance, &c. and the integuments seldom become affected, before the distention, produced by the size of such swellings, becomes very considerable. In scirrhous cases, the skin soon becomes contaminated, discoloured, and puckered.

Some few tumours may be harder, and heavier, than a few scirrhous ones; but, the reverse, is commonly the case.

As other indurations, and tumours, may assume the cancerous action, and even end in cancerous ulcerations; and, as some true scirrhi, when not irritated by improper treatment, may continue stationary for years; the occurrence of actual carcinoma cannot prove, that the preceding state was that of scirrhus. The only criterion of the latter disease is deduced from the assemblage of characters already specified; for, except the peculiar puckering, and speedy leaden discolouration of the skin, no other appearances, considered separately, form any line of discrimination.

The white ligamentous bands, around a scirrhus, is a very characteristic symptom; but, these cannot be detected, till the disease has been removed. Hence, how manifestly prudent it must be to take away a considerable portion of the substance surrounding a scirrhous tumour! Were any of these white bands left, the disease would inevitably recur.

OF CANCER IN THE STATE OF ULCERATION.

The diseased skin, covering a carcinomatous tumour, generally ulcerates,

before the tumour has attained any great magnitude; a large chasm is then produced in its substance, partly by a sloughing, and partly by an ulcerating process. Sometimes, when cells, contained in the tumour, are by this means laid open, their contents, which are a pulpy matter of different degrees of consistence, and various colours, fall out, and an excoriating ichor distils from their sides. This discharge takes place with a celerity, which would almost induce belief, that it can hardly result from the process of secretion. When the diseased actions have, as it were, exhausted themselves, an attempt at reparation appears to take place, similar to that which occurs in healthy parts. New flesh is formed, constituting a fungus of peculiar hardness, as it partakes of the diseased actions, by which it was produced. This diseased fungus occasionally even cicatrizes. But, though the actions of the disease are thus mitigated; though they may be for some time indolent and stationary; they never cease, nor does the part even become healthy.

In the mean while, the disease extends through the mediun of the absorbing vessels. Their glands become affected, at a considerable distance from the original tumour. The progress of carcinoma, in an absorbent gland, is the same as that, which has been already described. The disease is communicated from one gland to another, so that after all the axillary glands are affected, those, which lie under the collar-bone, at the lower part of the neck, and upper part of the chest, become disordered. Occasionally, a gland, or two, become diseased higher up in the neck, and apparently out of the course which the absorbed fluids would take. As the disease continues, the absorbent glands, in the course of the internal mammary vessels, become affected. In the advanced stage of carcinoma, a number of small tumours, of similar structure to the original disease, form at some distance, so as to make a kind of irregular circle round it.

The strongest constitutions now sink under the pain and irritation, which the disease creates, aggravated by the obstruction, which it occasions to the functions of absorption, in those parts, to which the vessels leading to the diseased glands belong. Towards the conclusion of the disease, the patient is generally affected with difficulty of breathing, and a cough. (*Abernethy.*)

The edges of a cancerous ulcer are hard, ragged, and unequal, very painful, and reversed in different ways, being sometimes turned upwards and backwards, and, on other occasions, inwards. The whole surface of the sore is commonly unequal: in some parts, there are considerable risings, whilst, in others, there are deep excavations. The discharge, for the most part, is a thin, dark coloured, fetid ichor; and is often possessed of such a degree of acrimony, as to excoriate, and even destroy, the neighbouring parts. In the more advanced stages of the disease, a good deal of blood is often lost from the ulcerated vessels. A burning heat is universally felt over the ulcerated surface; and, this is the most tormenting symptom, that attends the disorder. Those shooting, lancinating pains, which are generally very distressing in the occult state of the complaint, become now a great deal more so. Notwithstanding that cancerous diseases are not always situated in glandular parts, yet the situation of such sores affords some assistance in the diagnosis; for, six times as many cancerous affections occur in the lips, and breasts of women, as in all the rest of the body together. (*B. Bell.*)

Concerning the peculiar state of the parts in cancer, or the proximate cause, many opinions have prevailed. Until lately, the melancholic humour was supposed to be the fluid, which was obstructed, and accumulated, in consequence of which it fermented, and produced a burning ulcer; and whatever promoted the generation of this humour, was currently admitted, as a remote cause of cancer. "Women," says Paré, "are more subject to scirrhus, than men: because their liver is warmer, and their spleen, being weaker, is less able to purge the blood of choler." Grief and chagrin, by promoting the formation of this fiery fluid, were accordingly considered by Heister as very apt to induce the "cancerous diathesis;" and he adds, by way of corollary, "old maids, and women, who do not breed, are very subject to cancer in the breast." Some thought that the obstructed humour became charged with an acid, (*Dionis*) and that this produced an ulceration. Others conjectured, that by an adustion, or

over-concoction, it grew sharp and burning. Wiseman thought it more probable, that it might become arsenical. These changes were almost universally believed to depend upon the previous stagnation, in consequence of obstruction; and this leading point has uniformly been insisted upon by every preceding author, whatever may be his particular notion, with regard to the nature of the obstructed fluid, whether bile, blood, or lymph. Even Mr. B. Bell insists fully on the cause of cancer being a mechanical obstruction. Some have asserted, that they have detected little worms in the parts, which, eating them up, produced all the mischief attendant on cancer; and that to their introduction the disease was owing. Others have ridiculously assigned a little wolf in the part, as the cause of the disease! Strange as this doctrine, of living creatures producing cancer, may appear, it is nevertheless adopted by Dr. Adams. (*Observations on Morbid Poisons.*) When hydatids find their way into a solid substance, the consequence, in his opinion, will be cancer; and the success of an operation will, he conjectures, depend, in a great measure, upon these animals being confined in a common cyst, for then they may be all removed; whereas, if they be unconnected, some of the smaller ones may be allowed to remain, From the surface of the cyst, which contains the animal, a fungus shoots out, and thus acts, as a barrier, between it and the skin; or, if the animal have been in the stomach, it separates it from the coats of that viscus, "preventing suppuration in the one instance, and absorption in the other." This suppuration, and "disposition to fungate, before the skin is broken," is, (continues Mr. Burns) if I understand him, produced by the death of the animal; for, says Dr. Adams, "if hydatids possess the principle of vitality, during their transparent state, and their opacity is the effect of the loss of that principle, would they not, in the latter stage, stimulate the part, in which they are situated, to suppuration, as we find the case with the guinea-worm, when dead?"

Concerning the manner, in which these animals produce the symptoms of cancer, we are told, that "this enlargement of a foreign body in a solid substance, and so extremely sensible, as the breast, cannot but be attended with intense pain, and frequent inflammation." A doctrine not far removed, says Mr. Burns, from that taught in the humoral schools, which maintained, that the coagulation, and inspissation of the fluids, distended the follicles of the glands, producing many cavities, and much pain. (See *Burns on Inflammation, Vol. II.*)

We have already stated, that, though hydatids are occasionally found in cancerous tumours, they are not found often enough to make any part of the character of the disease; and they are met with, in cases, in which there is not the least vestige of such disorder.

After cancer had continued some time, it was believed, that the matter was absorbed into the blood, and that all the humours were speedily assimilated. Hence, was explained the fatal and rapid progress of relapses, after an apparent cure, The only effect of absorption, however, is on the lymphatic glands, which intervene betwixt the sore and the heart; for, beyond these, the absorbed matter is changed in its nature and properties. (*Burns.*)

In many instances, cancer is evidently produced by the same causes, which are capable of producing simple inflammation. It is, however, a general opinion, that cancer arises frequently from some unknown and mysterious cause, which we cannot detect, and which, therefore, has been resolved into some constitutional taint, or cancerous ferment. But, so far as we know, the constitution is perfectly healthy in the commencement of this disease; nor is there the smallest proof, that it resembles scrophula, in depending on any peculiarity of constitution, before the causes operate. Blows, bruises, &c. may give rise to cancer; but in many instances, there is no evident local cause acting directly on the part. In the breast, cancer frequently commences, without the interference of any topical agent. There is always, however, in these cases, an irregularity, or disappearance of the menses; and the affection of the mamma seems to depend on sympathy between it and the uterus. Certain it is, that cancer is very frequent about the time of life, when the menstrual discharge ceases.

Cancerous diseases are undoubtedly most common in elderly persons; but, no age is exempted from this disease. Mr. Burns mentions his having seen it distinctly marked, and attended with a fatal event, in children of five years

old: he mentions two instances of the eye being affected in such subjects.

TREATMENT OF CANCER.

Some have supposed cancers to be a general disorder of the system; while others have regarded them merely as a local affection. This is a point of much importance in practice; for, if cancers are originally only local affections, no objection can be made to extirpating them. They who think, that cancer is a constitutional disease, regard the operation as useless, perhaps hurtful, inasmuch as it may convert a scirrhus into an open cancer, or make the affection occur in some other part.

The best practitioners of the present day, however, have rejected the doctrine of cancer depending on constitutional causes; and we have stated Mr. Home's sentiments, in opposition to the opinion. When cancer breaks out again, in the same part, after the performance of an operation, it is often owing to some part of the disease having been blameably left behind, or to the operation having been put off too long. How likely it is, that some of the cancerous mischief may be left unremoved by the operator, is obvious, on considering the manner, in which the white bands, resembling ligament, shoot into the surrounding fat; and that, even the fibres of the muscles, beneath a cancerous disease, are frequently affected. At the same time, it must be allowed, that the disease is sometimes, to all appearances, so freely and completely removed, that its recurrence must perhaps be imputed to the continued operation of the same unknown cause, which originally produced the first cancerous mischief.

Until very lately, the accounts given of the results of operations for cancers, were so unpromising, that they must have deterred many patients from undergoing a timely operation; which, for cancerous complaints, is the only remedy to be depended on, with which we are as yet acquainted. As Mr. B. Bell remarks, the great authority of Dr. Alexander Monro must have had no inconsiderable influence even with practitioners, in making them much more backward in undertaking the extirpation of cancers, than they otherwise, would probably have been. "Of near sixty cancers," says he, "which I have been present at the extirpation of, only four patients remained free of the disease, at the end of two years: three of these lucky people had occult cancers in the breast, and the fourth had an ulcerated cancer on the lip." (*Edinb. Med. Essays, Vol. V.*) Dr. Monro also observes, that, in those, in whom he saw the disease relapse, it was always more violent, and made a quicker progress, than it commonly did in others, on whom no operation had been performed. Hence, he questions, "whether ought cancerous tumours to be extirpated, or ought the palliative method only to be followed?" and, upon the whole, he concludes against their extirpation, except in such as are of the occult kind, in young healthy people, and that have been occasioned by bruises, or some other external causes.

More modern experience has, however, afforded a very different result, and given ample encouragement to the early performance of an operation, and even to making an attempt to cut away the disease, in every instance, both of the occult, and ulcerated kind, when such a measure can be so executed, as not to leave a particle of the cancerous mischief behind.

Mr. Hill, in 1772, published some valuable remarks on the present subject. At this period, he had extirpated from different parts of the body eighty-eight genuine cancers, which were all ulcerated, except four; and all the patients, except two, recovered of the operation. Of the first forty-five cases, only one proved unsuccessful; in three more, the cancer broke out again in different parts; and, in a fifth, there were threatenings of some tumours, at a distance from the original disease. These tumours, however, did not appear, till three years after the operation; and the woman was carried off by a fever, before they had made any progress. All the rest of the forty-five continued well, as long as they lived; or are so, says Mr. Hill, at this day. One of them survived the operation above thirty years; and, fifteen were then alive, although the last of them was cured in March 1762.

Of the next thirty-three, one lived only four months; and, in five more, the cancer broke out afresh, after having been once healed. The reason, why, out of forty-five cases, only four or five proved unsuccessful, and six, out of thirty-three, was as follows,

"The extraordinary success, met with, (says Mr. Hill,) made cancerous patients resort to me from all corners of the country, several of whom, after delaying till there was little probability of a cure by extirpation, or other means, forced me to perform the operation, contrary both to my judgment and inclination."

Upon a survey in April 1764, made with a view to publication, the numbers stood thus: Total cured, of different ages, from eighty downwards, sixty-three; of whom there were then living thirty-nine. In twenty-eight of that number, the operation had been performed more than two years before; and, in eleven, it had been done in the course of the last two years. So that, upon the whole, after thirty years' practice, thirty-nine, of sixty-three patients, were alive and sound; which gives Mr. Hill occasion to observe, that the different patients lived as long after the extirpation of the cancers, as, according to the bills of mortality, they would have done, had they never had any cancers, or undergone any operation.

The remaining twenty-five, which complete the eighty-eight, were cured since the year 1764. Twenty-two of these had been cured, at least, two years; and some of them, it may be remarked, were seventy, and one ninety years old.

In the year 1770, the sum of the whole stood thus: Of eighty-eight cancers, extirpated at least two years before; not cured, two; broke out afresh, nine; threatened with a relapse, one; in all, twelve, which is less than a seventh part of the whole number. At that time, there were about forty patients alive and sound, whose cancers had been extirpated above two years before.

M. B. Bell who was present at many of these cases, bears witness to Mr. Hill's accuracy; and, the former very judiciously states, that, "from these and many other authenticated facts, which, if necessary, might be adduced, of the success, attending the extirpation of cancers, there is, it is presumed, very great reason, for considering the disease, in general, as a local complaint, not originally connected with any disorder of the system; and that a general cancerous taint seldom, or perhaps never, occurs, but, in consequence of the cancerous virus being absorbed into the constitution from some local affection. This, in every case of real cancer, or rather in such scirrhosities, as, from their nature, are known generally to terminate in cancer, should certainly determine us to have recourse to extirpation as early as possible; and, if this were done soon after the appearance of such affections, or before the formation of matter takes place, their return would probably be a very rare occurrence." (*System of Surgery, Vol. VII.*)

MEDICINES AND PLANS, WHICH HAVE BEEN TRIED, FOR THE CURE OF SCIRRHUS AND CANCER.

Of the general remedies, narcotics, such as cicuta, opium, nightshade, &c. have been employed with most confidence.

Cicuta owed its reputation to the experimenting talent of Storck, who has written several libelli on this plant. According to him, cicuta possesses very evident powers over cancer, and has cured a great many cases; but, in less prejudiced hands, it has been found much less successful; and even in many of the instances, adduced by Baron Storck, of its utility, it is by no means proved, that the disease was really cancer. The public have now with great reason, very little reliance in this medicine. In cancerous ulceration, Mr. Burns declares, that he never knew cicuta, even produce the temporary melioration, which many talk of.

The common way of exhibiting the hemlock is to begin with small doses, and increase them gradually, until they produce vertigo. We may begin with two grains of the extract, or four of the powder, recently prepared, twice, or thrice a day, and the quantity is to be gradually increased. In this way, some patients have at last been able to take an ounce of the extract daily; but, says Mr. Burns, if a much less quantity, than this, produce no good effect, we may consider it as useless to continue a remedy, which, in this dose, must injure the constitution every day that it is continued. On the continent, hemlock has been used in the form of a bath; but, it is so disagreeable, that few will submit to this method.

The belladonna has been much recommended by Lambergen. During its use, he kept the bowels open with

clysters, administered every second day. The dose should be, at first, a grain of the dried leaves, made into a pill. This, in the beginning, is to be given in the morning and evening, and afterwards more frequently. The reputation of belladonna has not been supported by much success.

The hyocyamus has often been tried in cancerous cases, and was held in great estimation by the ancients. Mr. Burns says, he has employed it occasionally, but, with little effect. The dose, with which you may begin, is two grains of the extract.

The aconitum has also been given; and, as it is a very powerful and dangerous narcotic, a quarter of a grain of the extract is generally the dose, at first. The solanum dulcamara, Paris quadrifolia, phytolacco, &c. have been recommended; but, they are now hardly ever employed; which is a sufficient proof of their inefficacy. Mr. Burns mentions his having tried the hepatized ammonia, without any benefit. Richter has given the laurus cerasus, but with little success. The dose of the distilled water being uncertain, four, or five grains of the fresh leaves may be infused in a little water, as a dose.

The digitalis diminishes vascular action, and may act on scirrhi, like abstinence, bleeding, &c. It has, however, no specific virtue in curing cancerous diseases.

Opium is seldom employed, with an intention of curing cancer, although it probably has just as much power of this kind, as other narcotics, which have been more frequently used. For the purpose of lessening the pain of cancerous diseases, however, opium is very freely employed.

Tonics may sometimes improve the general health; but, as they never produce any effect on the local disease, they are now seldom exhibited.

Mr. Justamond thought arsenic a specific for cancers. Future experience has not, however, confirmed the truth of this opinion.

Mercury, in conjunction with decoctions of guaiacum, sarsaparilla, &c. has been recommended; but, as Mr. Burns very justly remarks, no fact is more certainly ascertained, than that mercury always exasperates the disease, especially, when in the ulcerated state.

The cuprum vitriolatum has been tried; but, it has at this day no fame whatever. The same may be said of muriated barytes.

The carbonate (rust) of iron has been extolled, by Mr. Carmichael, for its efficacy in curing cancer. This gentleman used to begin with twelve grains of the preparation every six hours; while he also used, as a lotion, a saturated solution of the acetite of the same metal, or, else the powdered rust was sprinkled on the sore. Many remedies have acquired celebrity in cases of cancer, because very bad and malignant diseases, only supposed to be cancers, have got well, under their use. Such is probably the case with the carbonate of iron.

In some instances, Mr. Justamond used to join the corrosive sublimate with arsenic. Opium, added to both applications, mitigates the pain, without injuring the efficacy of the remedy.

The only mode of treatment, which Mr. Pearson has ever seen do any particular benefit to cancer, is that of keeping the patient on diet, barely sufficient for the support of life, such as barley water, alone, tea, &c. Patients, with cancers, receive considerable benefit from being kept strictly on a milk diet.

The old surgeons commonly dressed cancerous sores, with narcotic applications. Vesalius used cloths, dipped in the juice of the solanum; whilst others employed it mixed with the oil of roses, and preparations of lead and antimony. Others had recourse to the hyocyamus; but, of late, the cicuta poultices seem to have superseded most other narcotic applications. These have undoubtedly, in many cases, as Mr. Burns observes, abated the pain, and diminished the fetor; but, this is all which can reasonably be expected; and even this expectation will not always be realized.

Carrot poultices are better, than those of hemlock, as they produce as much ease, and diminish the fetor more powerfully.

The fetor of cancers having been thought to resemble that of the kali sulphuratum (liver of sulphur) and the oxygenated muriatic acid being the best agent for decomposing, and destroying such smell, it has been recommended, as an application to cancerous sores. It may correct the fetor; but, it will never accomplish a cure.

Carbonic acid has been said not only to correct the fetor, but in some instances, completely to cure the disease. It was long ago proposed, says Mr. Burns, by M. Peyrilhe, and, of late, it has again been brought forward by Dr. Ewart. Experience has, however, not shewn, that the efficacy of carbonic acid, in cases of cancer, is very great. Fourcroy remarks: "After the first applications, the cancerous sore appears to assume a more favourable aspect; the sanies, which flowed from it, becomes whiter, thicker, and purer, and the flesh has a redder and fresher colour; but, these flattering appearances are deceitful, nor do they continue long, for the sore speedily returns to its former state, and its progress goes on, as before the application." The best method of applying carbonic acid is, by means of a bladder, the mouth of which is fastened round the sore, with adhesive plaster. The air is introduced by a pipe, inserted at the other end.

Sometimes, the fermenting poultice is employed.

Digitalis, as a local application, is entitled to about as much confidence as cicuta.

Tar ointment, gastric juice, absorbent powders, &c. have been tried; but, without any evident good. (See *Burns on Inflammation, Vol. II.*)

Mr. Fearon rejects, probably with much reason, all internal remedies, as inefficient in the treatment of cancer; and, he recommends, in the early stages of the complaint, a method of practice founded on his idea of the inflammatory nature of the disease. "In the beginning of scirrhous affections of the breast and testis, the mode I have adopted of taking away blood, is by leeches repeatedly applied to the parts. In this course, however, I have often been interrupted by the topical inflammation, produced by these animals, around the parts where they fastened. In delicate female habits, I have often lost a week, before I could proceed to the reapplication of them. When the symptoms lead me to suspect the stomach, uterus, or any of the viscera, to be so affected, that the complaint either is, or, most probably, soon will become cancerous, I then have recourse to general bleedings. But, whether topical, or general perseverance for a sufficient length of time, is necessary. Though the pulse never indicated such practice, yet the patients have not suffered by repeated bleedings; on the contrary, when they passed a certain time without losing blood, they felt a return of their symptoms, and, of their own accord, desired to be bled again. To this plan of repeated bleedings, I joined a milk and vegetable diet, avoiding wine, spirits, and fermented liquors." Mr. Fearon used also to keep the belly open, and employ saturnine applications.

From the preceding accounts, we may infer, that scarcely any reliance is to be placed in any known remedy, or plan, in cases of real scirrhi, and ulcerated cancers. The operation is the only rational means of getting rid of the disease; and, to waste time, so as to allow the disorder to increase in a serious degree, merely for the sake of trying a train of unpromising medicines, is a conduct, which is unworthy of a wise surgeon's imitation.

Perhaps, in early cases, Mr. Fearon's method is warrantable, together with diet merely enough to support life; but, the punishment, attending a resignation to this regimen, would be greater, than that of having the disease cut away, while the chance of efficacy would be much less. Upon the whole, therefore, the operation is what we should generally resort to, as the surest, and the safest means of getting rid of cancerous diseases. As I have before remarked, the operation is always admissible, when every particle of the disease can be removed by it. Even large open cancers, if they can be entirely cut away, are often capable of being effectually cured.

The removal of cancerous disorders, even in the slightest and most trivial cases, should be always effected with the scalpel, in preference to caustic; the use of which, though formerly recommended by some authors, and still adhered to by some (*Young*) ought, for very obvious reasons, to be entirely laid aside. The irritation generally occasioned by every application of the caustic kind, together with the pain and inflammation, which commonly ensue, are strong objections in cancerous cases. Plunket's remedy, which is chiefly arsenic, is equally objectionable. Nor can you, at once, so certainly extirpate every atom of cancerous mischief with any caustic, as you can with the knife; for, with this, you immediately gain an ocular inspection of the surface sur-

rounding the disease, so as to see and feel whether the disordered parts are completely removed, or whether any portion of the disorder requires a further employment of the instrument. With respect to the pain, that of caustics is infinitely greater, more intolerable, and more tedious, than that occasioned by the knife. When caustic also fails in destroying every particle of the disease at once, it almost always tends to enlarge in a very rapid way, the original boundaries of the mischief. For an account of the method of removing scirrhi and ulcerated cancers, see *Mamma, Removal of.*

For information on cancer, the reader is particularly referred to *B. Bell's Surgery, Vol.* 2. *Justamond on Cancers. Hill's Cases in Surgery. Pearson on Cancerous Complaints. Abernethy's Surgical Observations,* 1804. *Pearon on Cancers. B. Bell on Ulcers. Home on Cancer. Adams on Cancerous Breasts, and on Morbid Poisons. Medical Museum, Vol.* 1. *London Medical Transactions, Vol.* 1. *Gooch's Med. Observations, Vol.* 3. *And article Cancer, in London Medical Dictionary and Rees's Cyclopædia.*

CANCER SCROTI. CHIMNEY-SWEEPER'S CANCER. (See *Scrotum.*)

CAPELINA, (from *capeline*, a woman's hat, or bandage, French.) *A reflex bandage.* It is a double-headed roller, about twenty-four feet long, and four inches broad; sometimes narrower. The middle is applied to the occiput, and, after two or three circular rounds, the rollers intersect each other upon the forehead and occiput; then one roller being reflected over the vertex to the forehead, the other is continued in a circular track. They next cross each other upon the forehead, after which the first head is carried back obliquely toward the occiput, and reflected by the side of the other. The last is continued in a circular direction, but the first is brought again over the sagittal suture, backward and forward, and so continued, till the whole head is covered.

This bandage used to be applied in cases of hydrocephalus; it has no advantage, however, and is now hardly ever used.

CAPISTRUM, (καπιστρον, from *caput*, the head; as being made to guide and govern the head.) A surgical bandage, somewhat resembling a bridle or headstall. (See *Bandage.*)

CARBUNCLE, (from *carbo*, a burning coal.) *Anthrax*, This is a very common symptom in the plague; but comes on also sometimes as a primary disease. The first symptoms are great heat and violent pain in some part of the body, on which arises a kind of pimple, attended with great itching; below which a circumscribed, but very deep-seated, and extremely hard tumour soon assumes a dark red, or purple colour about the edges A little blister frequently appears on the apex, which, as it occasions an intolerable itching, is often scratched by the patient.

The blister being thus broken, a brown sanies is discharged, and an eschar makes it appearance. Many such pimples are sometimes produced upon one tumour, in consequence of the patient's scratching the part.

The carbuncle sometimes appears in persons affected with putrid fevers, in which case it is attended with great weight and stiffness of the adjacent parts: the patient is restless and pale, the tongue white, or of a deep red, and moist; the pulse low, urine sometimes pale, sometimes very turbid, with all the other symptoms, in an exaggerated degree, which attend typhoid fevers. Sometimes a little slough, of a black colour, appears in the middle of the tumour. This was supposed by the ancients to be a part of the body burnt to a cinder, or hard crust, by the violence of the disease. The carbuncle is considered a sort of gangrenous affection of the cellular substance. *(Latta.)* The progress of carbuncles to the gangrenous state is generally quick. Their size is very various; they have been known to be as large as a plate. Considerable local pain and induration always attend the disease. The skin, indeed, has a peculiar feel, like that of brawn. As the complaint advances, several apertures generally form in the tumour. Through these openings, there is discharged a greenish, bloody, fetid, irritating matter. The internal sloughing is often very extensive, even when no sign of mortification can be outwardly discovered.

The constitution is often so low and exhausted, that death follows. The carbuncle, indeed, is most frequent in old persons, whose constitutions have been injured by voluptuous living, and, hence, we cannot be surprised, that the local disease, influenced by the ge-

neral disorder of the system, should assume a dangerous aspect.

The duty of the surgeon, in cases of anthrax, may be described in a very few words. With regard to the local treatment of a carbuncle, the grand thing is to make an early and free incision into the tumour, so as to allow the sloughs and matter to escape readily. As much of the contents as possible is to be at once pressed out, and then the part is to be covered with an emollient poultice. With respect to the constitutional treatment, we should remember, that the disease is only met with in bad constitutions, and in persons who are weak and irritable. Hence, it is only when there is a full strong pulse, and the complaint is just beginning, that bleeding is allowable. Bark and camphor are the internal medicines most commonly needed. The vitriolic acid is also very proper, as well as wine and aromatics. As the pain is very severe, opium is, for the most part, productive of infinite relief. (See *Bromfield's Chirurgical Cases and Observations. L'Encyclopédie Méthodique, art. Anthrax. Pearson's Principles. Richhter's Anfangsgr. der Wundarzn, Band* 1.

CARCINOMA, (from καρκινος, a crab.) See *Cancer.*

CARIES, (from κειρω, to abrade.) The clearest way, in which we can convey an idea of caries, is by comparing it with ulceration of the soft parts, in which we know a breach is produced by the action of the absorbents. All the bones are liable to caries; but the spongy ones are more frequently attacked, than such as are compact. Hence, the vertebræ, astragalus, and other bones of the tarsus, those of the carpus, the sternum, and the extremities of long bones, are the most common situation of this affection. The bones of young persons are said to be more frequently carious, than those of old subjects.

Many authors have confounded caries with necrosis, which they have called dry caries. Others have considered it to be the same as exostosis. The carious part of a bone becomes so soft, that the end of a blunt probe may be easily forced into its substance. The openings, with which the bone is perforated, are filled with fungous flesh, which bleeds from the slightest cause. A dark-coloured serum is discharged, which always has a disagreeable smell, but becomes particularly fetid, when exposed to the air.

In necrosis, the bone is entirely deprived of the vital principle; in caries, this principle exists, and there is a morbid action going on, which destroys the texture of the bone.

Some of the causes of caries are internal, others external. The former are the most frequent; a contusion, or external violence, being more apt to produce necrosis than caries.

Abscesses are said to produce, occasionally, a caries of the bones, over which they take place. For this reason, it has been laid down, as a rule, to open such abscesses at an early period, in order to prevent the disorder of the bone. If some abscesses, however, as for instance, those which form over the anterior surface of the tibia, and mastoid process of the temporal bone, be frequently attended with caries, the latter is the cause and not the consequence of the suppuration. Pus, which is a bland, unctuous, inodorous fluid, never attacks the soft parts, with which it is in contact, until its qualities are changed by exposure to the air. When an abscess forms in the anterior part of the parietes of the abdomen, the peritoneum of that part, naturally a thin membrane, instead of being corroded, becomes thick, and strong enough to resist the effusion of pus into the cavity of the abdomen. The periosteum becomes thickened in similar circumstances, when the abscess is a consequence of an external injury.

Scrophula invades the spongy structure of the bones and the lymphatic system. A caries from this cause is very common in the tarsus, carpus, elbow, and knee; but it is always preceded by a white-swelling.

The venereal disease is sometimes a cause of caries, though its action on the bones generally occasions necrosis, or exostosis. However, when it attacks the bones of the nose, it renders them carious, by which they are consumed, and the face sadly disfigured. The bones of the palate are sometimes destroyed in the same manner, and by the same cause.

In cancers of the mammæ, the sides of the sternum are sometimes found carious.

A superficial caries is easily detected. When the affected bone is deeply situated, the disease may be ascertained by introducing a probe, which will readily pass into the substance of the bone. But, bones not easy of access, may become carious, in which cases,

the diagnosis is not so obvious. However, if a fistula, from which a fetid blackish matter flows, run forwards to a bone, and the adjacent soft parts be swollen and indurated, there is reason to suspect the existence of caries.

Caries, occasioned by syphilis, affects most commonly the tibia, os frontis, ossa nasi, ossa palati, and sternum.

A caries of the vertebræ is known by peculiar symptoms, among which a paralysis of the inferior extremities, and lumbar abscesses, are the most remarkable.

A caries of the spongy parts of bones is much more difficult to cure, than a similar affection of their compact parts. Caries of the carpal and tarsal bones is particularly obstinate. These bones being in close contact, the affection cannot easily be prevented from spreading from one to the other. Amputation is often the only means of cure. The same is frequently the case, when the spongy heads of the long bones become carious. Even this mode of relief is not practicable when the head of the bone lies very deeply, like that of the os femoris.

Caries, resulting from scrophulous, or cancerous mischief, is more difficult of cure, than when it arises from venereal or scorbutic causes; for, some efficacious remedies against the latter are known; but cancer and scrophula resist all the remedies hitherto discovered. The prognosis is less favourable in old, than young subjects, and much depends on the extent of the disease, the patient's strength, and the state of the soft parts.

To form a just idea of the treatment of caries, we should consider, that a bone, thus affected, is a prey to a morbid action of its own parts, and that this action creeps from one part to another, and pervades the whole with greater or less rapidity, if art should not interfere, and assist nature in arresting its progress.

When the caries arises from constitutional disease, this should be resisted with suitable remedies.

Thus mercurial and sudorific medicines put a stop to caries arising from the venereal disease. Spirituous drinks, vegetable diet, and acids, cure both the scurvy, and the caries dependent on it.

But, when caries is altogether a local affection, the separation of the diseased parts may be promoted by absorbent powders, and stimulant applications. Lint, dipped in the tincture of aloes or myrrh, has often been put on such diseased bones. If these remedies be found ineffectual, a pledget of lint, dipped in a solution of the argentum nitratum, may be employed.

On the Continent, and particularly in France, they still adhere to the plan of touching carious parts of bones with the actual cautery, after bringing them fairly into view by a previous use of the knife. It is thought, that the burning iron acts by changing the caries into a necrosis, irritating the subjacent sound parts, and exciting that action of the vessels, by which the dead or diseased part of the bones must be thrown off. (See *Boyer on Diseases of the Bones, Vol.* 1.)

Issues seem to be most effectual in checking the caries attendant on white-swellings and diseased vertebræ. (See *Articulation and Vertebræ.*)

Mr. Hey has succeeded in cutting away a carious part of the tibia. He began the operation by dissecting off the granulations of flesh, which had arisen from the bone, and then sawed out, by means of a circular-headed saw, a wedge of the tibia, two inches in length. The removal of this portion brought into view a caries of the cancelli, almost as extensive as the piece already removed. With different trephines, suited to the breadth of the caries, Mr. Hey removed the diseased cancelli of the bone, quite through to the opposite lamella. As the caries extended in various directions, it was not possible to remove the whole of it with a trephine, without removing also a large portion of the sound part of the bone, which Mr Hey wished to avoid. By the assistance, therefore, of a strong sharp-pointed knife, he pursued the caries in every direction, until every part was taken away, which had an unsound appearance. The wound was simply dressed with dry lint; the whole surface was speedily covered with good granulations, and a complete cure was obtained, without any exfoliation.

Mr. Hey concludes this subject, as follows: "I have treated some other cases of caries of the tibia in the same manner, and with equal success. Where the extent of the caries is not so great as to prevent a complete removal of the morbid part, this method is extremely useful, and far superior to the use of the potential or actual cautery.

"The trephine is not wanted, where the cancelli of the bone are not affected with the caries. The diseased parts of the lamella may be removed with gouges or small chissels. Granulations of flesh will then arise from the sound parts of the bone, and become united with the integuments, which ought to be preserved as far as is possible."

The two cases, which Mr. Hey has related, are exactly of that kind, to which several writers apply the term *spina ventosa*. (See *Practical Observations in Surgery*.)

CARTILAGES IN JOINTS. (See *Articulation*.

CARUNCLE, (dim. of *caro*, flesh.) *Caruncula*. A small excrescence, which has the appearance of flesh.

CASTRATION. *Castratio*. (from *castro*, to castrate.) The operation of removing a testicle. For an account of the cases rendering this necessary, see *Testicle, Diseases of*. The manner of operating is as follows: The patient being laid on a table of convenient height, the integuments covering the spermatic vessels in the groin, are to be divided. This incision should begin as nearly as can be, opposite to the opening in the abdominal muscle, and should be continued a good way down the scrotum.

The manner of beginning this incision is differently described by writers; some of them advising that the skin be held up by an assistant; others that the knife be used perpendicularly in this as in other parts. The latter mode is preferred by English surgeons in general. The length of the division is a more important consideration. A small wound will indeed serve to lay bare the spermatic chord; but it will not permit the operator to do what is necessary afterwards with dexterity, or facility; and as the scrotum must, first or last, be divided nearly to the bottom, it had better be done at first. The spermatic chord, thus laid bare, is to be freed from its surrounding membranous connexions; and then the operator, with his finger and thumb, separating the blood vessels from the vas deferens, must pass a ligature between them, and having tied the former only, must cut through the whole chord, at a quarter or half an inch distance from the said ligature, according as the state of the process and testicle will admit. This done; he is then, with the same knife, with which he has performed the former part of the operation, to dissect the testicle out from its connexion with the scrotum: the loose texture of the connecting cellular substance, the previous separation of the testicle from the spermatic chord, and the help of an assistant to hold up the lips of the wound, will enable him to do this with very little pain to the patient, and great facility to himself. If any considerable artery bleeds in the scrotum, it is to be tied. (*Pott.*)

Mr. S. Sharp once castrated a man, whose testicle weighed above three pounds, and some of the vessels were so exceedingly varicous and dilated, as nearly to equal the size of the humeral artery. (*Operations of Surgery, chap.* 10.)

Desault first divides the chord, and, holding its upper end between the index finger and thumb of his left hand, he then takes up the arteries with a pair of forceps, which are immediately tied by an assistant. (*Desault par Bichat, tom.* 2.)

Pott used to fill the cavity of the wound with lint; but Desault, and all the modern surgeons of this country, bring the edges of the wound together, and endeavour to heal as much of it as possible by the first intention. Some, with this view, use sutures and sticking-plaster; others, only the latter, aided with compresses and a T bandage; which means, in my humble opinion, are quite enough.

Sometimes, one or more vessels begin to bleed soon after the patient is in bed, although they effused no blood just after the removal of the testicle. Keeping the dressings and scrotum continually wet with the cold saturnine lotion very often, suffices for the suppression of such hemorrhage: if not, the wound must be opened again, and the vessels tied.

In every operation, in which a considerable portion of skin is to be divided, and particularly in this, and in the amputation of women's breasts, it should always be remembered, that, as the division of the skin (the general organ of sensation) is the most acute and painful part of what is done by the knife, it cannot be done too quickly, and should always be done at once: the scrotum should always be divided to the bottom, and the circular incision in the skin of a breast always made quite round, before any thing else be thought of. If this be not executed properly,

and perfectly, the operation will be attended with a great deal of pain which might be avoided, and the operator will be justly blameable. (*Pott.*)

If the tumour be of a pyriform figure, perfectly smooth, and equal in its surface, and free from pain, notwithstanding the degree of hardness may be great, and the surgeon may, in his own opinion, be clear that the tumour is not produced by water, but is a true scirrhus, let him immediately previous to the operation, pierce the anterior part with a trochar, in order to be certain. "My reason for giving this advice is, that I was once so deceived by every apparent circumstance of a true, equal, indolent scirrhus, that I removed a testicle, which proved upon examination to be so little diseased, that, had I pierced it with a trochar previous to the operation, I could and certainly should have preserved it." (*Pott.*)

It is well known, that the agony of tying the chord is immensely increased by including the vas deferens, and, as no good results from so doing, the practice deserves the severest reprobation, notwithstanding the opposite opinion of Pearson, and the writer of the article *Castration* in Rees's Cyclopædia.

Consult *Le Dran. Sharp on the Operations of Surgery. Pott on the Hydrocele, &c. Sabatier, de la Médicine Opératoire, Tom.* 1. *Bertrandi sur les Opérations de Chirurgie. Œuvres Chirurgicales de Desault par Bichat, tom.* 2. *p.* 409. A long account of the particular sentiments of several eminent surgeons is to be found in Rees's Cyclopædia. art. *Castration.*

CATAPLASM, (from καταπλασσω, to spread.) *Cataplasma.* A poultice.

The following ones are eminently useful.

CATAPLASMA ACETOSÆ. *Sorrel Poultice.* ℞ *Acetosæ* ℔j. To be beaten in a mortar into a pulp.

CATAPLASMA ÆRATUM. *Fermenting Poultice.* ℞ *Farinæ Tritici. Cerevisiæ Spumacæ, Yest dictæ ; Singulorum,* ℔ss. These are to be mixed together and exposed to a moderate heat, till the effervescence begins. This is a celebrated application in cases of sloughing and mortification.

CATAPLASMA CICUTÆ. *Hemlock Poultice.* ℞ *Herbæ cicutæ exfoliatæ* ℥ij. *Aquæ fontanæ* ℔ij. To be boiled, till only a pint remains, when as much linseed meal as necessary is to be added.

This is an excellent application to many cancerous and scrophulous ulcers, and other malignant ones; frequently producing a great diminution of the pain of such diseases, and improving their appearance. Justamond preferred the fresh herb, bruised.

CATAPLASMA DAUCI. *Carrot Poultices.* ℞ *Radicis Dauci recentis,* ℔j. Bruise it in a mortar into a pulp. Some, perhaps, with reason recommend the carrots to be first boiled. The carrot poultice is employed, as an application to ulcerated cancers, scrophulous sores of an irritable kind, and various inveterate malignant ulcers.

CATAPLASMA LINI. *Linseed Poultice.* ℞ *Farinæ Lini* ℔ss. *Aq. ferventis* ℔iss. The powder is to be gradually sprinkled into the hot water, while they are quickly blended together with a spoon.

This is the best, and the most convenient of all the emollient poultices for common cases, and has, in a great measure, superseded the bread and milk one, so much in use formerly.

Mr. Hunter speaks, in the following terms, of the linseed poultice, and its uses:

"Poultices are commonly made *too thin:* by which means, the least pressure, or their own gravity, removes them from the part: they should be thick enough to support a certain form when applied.

"They are generally made of *stale* bread, and milk. This composition, in general, makes too *brittle* an application; it breaks easily into different portions, from the least motion, and often leaves some part of the wound uncovered, which is frustrating the first intention.

"The poultice which makes the best application, and continues most nearly the same between each dressing, is that formed of the meal of linseed: it is made at once, and when applied, it keeps always in one mass."

"The kind of wound, to which the above application is best adapted, is a wound made in a sound part, which we intend shall heal by granulation. The same application is equally proper when parts are deprived of life, and consequently will slough. It is therefore the very best dressing for a *gunshot* wound, and probably for most *lacerated wounds:* for *lint,* applied to a part that is to throw off a *slough,* will

often be retained till that slough is separated, which will be for eight, ten, or more days."

CATAPLASMA LYTHARGYRI ACETATI.

℞ Aquæ lythargyri acetati drach. j
Aquæ distillatæ lib. j
Micæ panis q. s.—Misce.

Practitioners, who place much confidence in the virtues of lead, externally applied, often use this poultice in case of inflammation.

CATAPLASMA QUERCUS MARINI.

This is prepared by bruising a quantity of the marine plant commonly called *sea tang*, which is afterwards to be applied by way of a poultice.

Its chief use is in cases of scrophula; white swellings and glandular tumours more especially.

When this vegetable cannot be obtained in its recent state, a common poultice of sea-water and oatmeal has been substituted by the late Mr Hunter and other surgeons of eminence.

CATARACT, (from καταρασσω, to confound, or disturb; because the disease confounds, or destroys vision.) This is a species of blindness, arising almost always from an opacity of the crystalline lens, or its capsule; the cataract depending on an opaque state of the liquor of Morgagni being very rare.

Hippocrates called it, γλαυχωμα. Galen ὑποχυμα. The Arabians, *gutta opaca*. Celsus, *suffusio*.

Hippocrates and the ancient Greeks described the cataract, as a disease of the crystalline lens under the name above mentioned; but, no sooner had Galen promulgated the doctrine of the lens being the immediate organ of sight, than the correct opinion of the ancient founder of medicine began to decline, and, for many ages afterwards, had no influence in practice. In fact, the seat of the cataract seems to have been entirely forgotten, till about 1656. when first Lasnier, and afterwards, Borel, Bonnetus, Blegny, Geoffroi, &c. revived the truth, which appears to have been so long extinct, and they, and a few others, believed that the disease was situated in the crystalline lens. The bulk of practitioners, however, remained ignorant of this fact even as late as 1713, or, in other words, until the several publications of Mery, Maître-Jan, Brisseau, and Heister, combined to render the truth universally known. (*Critical Reflections on the Cataract.*)

SYMPTOMS OF A CATARACT.

The cataract shews itself, as a speck, or spot in the pupil of the eye, occupying sometimes the whole, and sometimes only a part of this aperture. It is most commonly of a grey, or whitish colour; but, sometimes, of a deep white, and, it may in all cases, be easily distinguished from the naturally dark appearance of the pupil. In the commencement of the disorder, it occasions a weakness, or imperfection of the sight; and it terminates, sooner, or later, in the almost total extinction of this sense, During its progress, the persons, who are affected by it, perceive objects more distinctly in a moderate, than a strong light; the reason of which is, that the pupil being more dilated in a weak light still admits some rays, through the yet transparent circumference of the crystalline. (*Wenzel on the Cataract.*)

A settled mist seems to cover objects and confuse those, which are minute. In this disorder, especially, when it arises without any assignable external cause, this mist is almost always perceptible by the patient, before any opacity has become visible in the pupil. (*Ware.*)

DIFFERENT KINDS OF CATARACT, AND PARTICULAR SYMPTOMS OF EACH.

When the opaque lens is either more indurated, than in the natural state, or retains a tolerable degree of firmness, the case is termed, a *firm*, or *hard cataract*. When the substance of the lens seems to be converted into a whitish, or other kind of, fluid, lodged in the capsule, the case is denominated a *milky*, or *fluid cataract*. When the opaque lens is of a middling consistence, neither hard, nor fluid, but, about as consistent, as a thick jelly, or curds, the case is named a *soft*, or *caseous cataract*. When the anterior, or posterior, layer of the crystalline capsule becomes opaque, after the lens itself has been removed from this little membranous sac, by a previous operation, the affection is named a *secondary membranous cataract*.

There are no certain criteria, by which it can be ascertained previously to an operation, whether a cataract is soft or hard; of a caseous or fluid con-

sistence; or whether, together with an opacity of the crystalline lens, the membranous capsule, in which it is contained, may not have lost its natural transparency: those formerly mentioned by Richter, and other similar ones proposed for consideration by Mr. Pott, cannot be sufficiently confided in to form a guide in practice.

I think it right, however, to state, in as concise a manner as possible, the symptoms and appearances, which Richter has more recently explained, and, for a long series of years, found generally to portend the truth; and I shall confine myself to the hard, the fluid, and the caseous or soft cataracts.

The harder the cataract is, the thinner and smaller it becomes. In this case, the disease presents either an ash-coloured, a yellow, or a brownish appearance. The interspace, betwixt the cataract and pupil, is very considerable. The patient very distinctly discerns light from darkness, and can even plainly perceive large bright objects. In the dilated state of the pupil, a black circle surrounding the lens is very perceptible. The motions of the pupil are free and prompt. The anterior surface of the cataract appears flat without any degree of convexity. (*Richter's Anfangsgründe der Wundarzneykunst, p.* 177. 3 *Band.*)

The fluid, or milky cataract, has usually a white appearance; and irregular spots and streaks, different in colour from the rest of the cataract, are often observable on it. These are apt to change their figure and situation, when frequent and sudden motions of the eyes occur, or when the eyes are rubbed and pressed; sometimes, also, these spots and streaks vanish, and then reappear. The lower portion of the pupil seems more opaque than the upper, probably, because the untransparent and heavy parts of the milky fluid, sink downward to the bottom of the capsule. The crystalline lens, as it loses its firmness, commonly acquires an augmented size. Hence, the fluid cataract is thick, and the opacity close behind the pupil. Sometimes one can perceive no space between the cataract and margin of the pupil. In advanced cases, this aperture is usually very much dilated, and the iris moves very slowly and inertly. This happens because the cataract touches the iris, and impedes its action. The fluid cataract is sometimes of such a thickness, that it protrudes into the pupil, and presses the iris so much forward, as to make it assume a convex appearance. Patients, who have milky cataracts, generally distinguish light from darkness very indistinctly, and sometimes not at all; partly, because the cataract, when it is thick, lies so close to the iris, that few or no rays of light can enter between them into the eye; partly, because the fluid cataract always assumes, more or less, a globular form, and therefore has no thin edge, through which the rays of light can penetrate. (*Richter's Anfangsgründe der Wundarzneykunst.* 3 *Band.* 174, 276.)

Sometimes the opaque lens is of a middling consistence, neither hard, nor fluid, but about as consistent as thick jelly, curds, or new cheese. Cases of this description are termed soft or caseous cataracts. As the lens softens in this manner, it commonly grows thicker and larger, even acquiring a much greater size than the fluid. It is not unfrequent to meet with caseous cataracts of twice the ordinary size of a healthy crystalline lens. It impedes the motion of the pupil more considerably than the fluid cataract, because it lies closer to the iris. It is accompanied by all the symptoms of fluid cataracts, except that the spots and streaks, sometimes also observable on this kind of cataract, do not vary their situation and figure. (*Richter's Anfangsgründe der Wundarzneykunst. p.* 178. 3 *Band.*)

CAUSES OF THE CATARACT.

Persons, who are much exposed to strong fires, as blacksmiths, locksmiths, glassmen, and those, who are engaged in similar employments, seem to be more subject to the cataract, than others. Persons, above the age of forty, are reckoned more liable to cataracts, than younger ones. (*Wenzel.*) The disease, however, is, by no means, unfrequent in the latter; even children are often seen affected with this kind of blindness, and some are born with it. In the majority of instances, a cataract seems to arise spontaneously, without any assignable cause. Sometimes the opacity of the lens is the consequence of external violence: a case, which, more frequently, than any other, gets well without an operation.

PROGNOSIS, AND MODE OF JUDGING OF CASES FIT FOR AN OPERATION.

Some little attention is necessary to distinguish those cases of cataract, which afford a reasonable prospect of benefit from an operation, and to discriminate them from others, either less promising, or absolutely prohibitory of relief.

When, in the incipient state of the disease, the patient discerned objects, as it were, through a mist, which increasing in density, at length became a complete impediment to vision; when the opacity of the crystalline lens has supervened gradually, and has not been preceded, and is not accompanied by a chronic ophthalmy peculiarly affecting the interior of the eye; when no particular head-ach, nor pains in the eye and eye-brow have been experienced; when the pupil, notwithstanding the cataract, preserves its circular figure, and the faculty of varying its dimensions in the different degrees of light; when the patient can distinguish a brilliant light from total darkness; and, especially, if in a moderate light, where, usually, the pupil is not too much contracted, he should be able to distinguish bright colours, and the shadows of objects before him: there is every reason for performing, and expecting success from, an operation. (*Scarpa sulle Malattie degli Occhi.*)

The power of distinguishing light from darkness, is much more satisfactory, than motion of the iris. I have seen in St. Bartholomew's Hospital, and in the York Hospital under Mr. Albert, several cases of complete gutta serena in both eyes, in which there was the freest contraction and dilatation of the pupils. It is obvious, that, had such patients been, at the same time, afflicted with cataract (a complication by no means unfrequent,) and a surgeon, induced by the moveable state of the iris, had undertaken an operation, how unavailing it must have proved, since the rays of light could only have been transmitted to an insensible retina. Richter, and Wenzel, make mention of these peculiarities, and the latter refers the phenomenon to the iris deriving its nerves wholly from the lenticular ganglion, while the immediate organ of sight, is constituted entirely by another distinct nerve. Hence we can no longer consider motion of the iris as an infallible criterion, according to several authors, (*Wathen*) that the retina is endued with sensibility. Relating to this subject, is a curious remark by Mr. Lucas in the Medical Observations and Inquiries: he attended, in conjunction with Messrs. Hey and Jones, his colleagues of the Leeds' Infirmary, five children of a clergyman at Leaven, near Beverly, who were all born blind. He writes, "None of them can distinguish light from darkness, and, although the pupil is, in common, neither too much dilated nor contracted, and has motions, yet these do not seem to depend upon the usual causes, but are irregular." (*Vol.* 6.)

The reciprocal sympathy between the two organs of sight, is so active, that no one, solicitous to acquire either physiological, or pathological knowledge respecting them, ought, for a moment to forget it. Hence, in the examination of cataracts, it is of the highest importance to keep one eye entirely secluded from the light, while the surgeon is investigating the state of the iris in the other; for, the very impression of the rays of light upon one eye, sensible to this stimulus, is known to be often sufficient to produce corresponding motions of the iris in the opposite one, although in the state of perfect amaurosis. In other examples of cataract, the pupil may be quite motionless, and yet sight shall be restored after the performance of an operation. (*Wenzel.*) There are, however, two circumstances, which may prevent us from ascertaining, whether the retina is sensible to light or not: the first is, a circular adhesion of the crystalline capsule to the iris. It must be a difficult thing to discriminate the nature of this case, by merely observing, as Richter directs, the distance between the cataract and pupil; inferring, that when the space, between the pupil and opaque lens, is inconsiderable, such an adhesion has happened; and, that when the cataract does not seem particularly close to the pupil, and yet the patient cannot discern light from darkness, it is complicated with amaurosis. The second circumstance, sometimes utterly preventing the ingress of any light to the healthy retina, is the round bulky form of the cataract.

But although I have remarked, that the power of distinguishing light from darkness is more satisfactory, than motion of the iris; it is not an unequivo-

cal test of the retina being perfectly free from disease. While the gutta serena is incomplete, the patient can yet distinguish light, and the shadows of objects. Dilatation of the pupil is, also, a deceitful criterion to ascertain the complication of gutta serena with the cataract. When the cataract is large, or adherent to the iris, the pupil is frequently much dilated, however natural and sound the state of the optic nerve may be: the pupil often continues quite undilated in the most perfect gutta serena. (*Richter.*)

From all this it must be manifest, 1st, that the irregularity, and inconstancy of the symptoms of gutta serena, together with the possibility of particular states of the cataract rendering the patient utterly unconscious of the stimulus of light, make it necessary for the surgeon to be particularly attentive to the appearance, and to the history of the origin and progress of the disease, in order to understand the real condition of certain cases. 2d, That, when the patient can distinguish light from darkness, though the iris may be motionless, there is good ground for trying an operation. Possibly, in this circumstance, an incipient *amaurosis* may exist, but, the *chance* of the defect of the iris arising from other causes; the *certainty*, that the opaque body *must* be removed from the axis of sight, (even were the disease of the retina cured,) ere sight could be restored; and the *improbability*, that an operation to cure the cataract, would render the other complaint at all less remediable; fully justify the attempt. 3dly, That, should the patient have been free from particular pain in the head and eye; should he, in a previous stage of the cataract, have been able to distinguish light from darkness, and then suddenly have lost that power, in consequence of inflammation affecting the eye, and depriving the iris of motion; in which case there is ample reason to conclude, that adhesions between the iris and cataract have taken place; and should there be ground to suspect, from the appearances which I have already noticed, that the cararact is of exceedingly large dimensions; notwithstanding the incapacity to feel the stimulus of light, there is yet sufficient foundation to entertain a little hope, and to vindicate the practice of the only effort that can be availing, and, excepting a trivial and a temporary pain, one that cannot be materially injurious to the patient. The concurrent testimony of almost all writers upon the subject confirms, that the restoration of sight has sometimes been effected in the most hopeless cases, and I am, therefore, of opinion with Mr. Lucas, that it is proper, in all doubtful cases, to try couching, as a remedy by no means violent, or hazardous. (*Med. Observations and Inquiries, Vol.* 6 *p.* 257.)

As it not unfrequently happens, that cataracts, produced by external violence, spontaneously disappear, (*Pott, Hey, &c.*) the operation should never be too hastily recommended for such instances. One reason, assigned for not operating, when only one eye is affected, viz. that one eye is sufficient for the necessities of life, is but of a frivolous description; and, another, that the patient would never be able to see distinctly after the operation, by reason of the difference of the focus in the eyes, is (I have grounds for believing) only a gratuitous supposition, blindly transmitted from one writer to another. For the reasons of what I have here advanced, and for the proofs, that success does sometimes, probably in general (if no other causes of failure exist,) attend the practice of couching and extraction, when only one eye is affected with a cataract, I must refer to my *Critical Reflections on the Cataract*, and to a paper in the *Med. and Physical Journal* for May, 1808.

TREATMENT OF THE CATARACT.

The principal external remedies, that have been employed in the cure of the cataract, are, bleeding, cupping, scarifying, setons, issues, blisters, and fumigations; and the principal internal remedies are, aperients, incisives, emetics, cathartics, sudorifics, cephalics, and sternutatories. Preparations of eyebright, millepedes, wild poppy, henbane, and hemlock, have also been much commended, as specifics for the disorder.

Scultetus asserts, that he checked the progress of a cataract, by applying to the eye the gall of a pike, mixed with sugar; and Spigelius, as we are informed by the same author, boasted of having successfully used, for this purpose, the oil of the eel-pout (*mustela fluviatalis.*)

Cataracts are said to have been cured in venereal patients, while under a course of mercury. It is probable, however, that many such cases have been mere opacities of the cornea, which have been mistaken for cataracts. Baron Wenzel placed no reliance whatever in the power of any remedies to dissipate a cataract, and, as he had remarked their inefficacy in numerous instances, he felt authorized in declaring, that internal remedies, either of the mercurial, or any other kind, are inadequate to the cure of this disorder; and equally so, whether the opacity be in the crystalline, or in the capsule, whether incipient, or advanced.

Although Mr. Ware coincides with Wenzel, in regard to the uncertainty of all known medicines to dissipate an opacity, either in the crystalline, or its capsule, or even to prevent the progress of such opacity, when once begun, yet many cases have proved, that the powers of nature are often sufficient to accomplish these purposes. The opacities, in particular, which are produced by external violence, Mr. Ware has repeatedly seen dissipated in a short space of time, when no other parts of the eye have been hurt. In such cases, the crystalline lens has generally been absorbed, as is proved by the benefit, which has afterwards been derived from deeply convex glasses. In some of these cases, though the crystalline has been dissolved, the greater part of the capsule has remained opaque, and the light has been transmitted to the retina only through a small aperture, which has become transparent in its centre. Instances are also not wanting, in which cataracts, formed without any violence, have been suddenly dissipated in consequence of an accidental blow on the eye. The remedies, which Mr. Ware has found more effectual, than others, have been the application to the eye itself of one, or two drops of æther, once, or twice, in the course of the day, and the occasional rubbing of the eye, over the lid, with the point of the finger, first moistened with a weak volatile, or mercurial liniment.

Cataracts are usually cured, either by removing the opaque lens, from the axis of vision by means of a needle; or by extracting the lens from the eye, through a semi-circular incision, made at the lower part of the cornea. The first operation is termed *couching*, or *depression of the cataract*; the second is named *extraction*.

EXTRACTION OF THE CATARACT.

As soon as it was fully proved, that the true cataract was an opacity, of the crystalline humour, that the loss of sight would not be occasioned by the removal of this humour, that the cornea may be divided without danger, and that, if the aqueous humour be discharged, it will be quickly regenerated, the mode of cure, by extracting the cataract out of the eye, must naturally present itself to the mind. (*Wenzel.*)

Freytag was the first operator, who made an attempt to extract the cataract, about the close of the 17th century. After him Lotterius of Turin, performed this operation. David first communicated this method to the public. And the ingenuity and industry of Wenzel brought this mode of operating to a state of perfection never before attained. (*Brambilla Instrumentarium Chirurgicum Austriacum*, 1782. *p.* 71.)

Wenzel's knife resembles the common lancet employed in bleeding, excepting that its blade is a little longer, and not quite so broad. Its edges are straight, and the blade is an inch and a half (eighteen lines) long, and a quarter of an inch (three lines) broad, in the widest part of it, which is at the base. From hence it gradually becomes narrower towards the point; so that this breadth of a quarter of an inch extends only to the space of about one third of an inch from the base; and, for the space of half an inch from the point, it is no more than one eighth of an inch broad.

The lower edge of the knife, by which is meant, that which is lowest during the operation, is sharp through the whole length of the blade. At the distance of a quarter of an inch from the base, this lower edge has a slight projection, which is of use in making the section through the cornea. The upper edge Wenzel divides into three portions. For the space of five sixths of an inch from the basis, the edge is blunt, and very slightly flattened. For the space of half an inch, or rather six lines and a half, further towards the point, it is blunt and rounded; although to the naked eye this part appears sharp, on account of its being very thin.

And the extremity of this edge, to the extent of one eighth of an inch from the point, is keen, like the lower edge, in order to facilitate the conveyance of the instrument through the cornea.

The swelling in the middle of the blade is merely intended to prevent the instrument from breaking. The handle, in which the blade is fixed, has eight sides, which are alternately large and small. This form enables the operator to hold the instrument more firmly, which is not so apt to turn round in the hand. It is generally three inches and two thirds in length, and, from two lines, to two and a half, in thickness. The blade is so fixed in the handle, that the two sides of the former lie parallel with the broadest side of the latter. On the upper side of the handle, which answers to the upper, or blunt edge, of the knife, a small mark is placed, which directs the proper manner, in which the instrument should be held in performing the operation.

The shape of this knife is well calculated to effect the division of the cornea, with the utmost ease and safety, as it cuts this membrane, in proportion as it enters the eye. (*Wenzel.*)

The knife, employed by Mr. Ware, is, in regard to its dimensions, not unlike the instrument employed by the Baron. The principal difference between them is, that Mr. Ware's knife is less spear-pointed; in consequence of which, when this latter instrument has pierced through the cornea, its lower, or cutting edge will sooner pass below the inferior margin of the pupil, than the knife used by Wenzel. On this account, Mr. Ware is of opinion, that the iris will be less likely to be entangled under the knife, which he recommends, than under Wenzel's, when the instrument begins to cut its way downwards, and the aqueous humour is discharged. Mr. Ware particularly advises great care to be taken to have the knife increase gradually in thickness from the point to the handle; by which means, if it be conducted steadily through the cornea, it will be next to an impossibility, that any part of the aqueous humour should escape, before the section is begun downwards; and, consequently, during this time, the cornea will preserve its due convexity. But, if the blade should not increase in thickness from the point; or if it be incurvated much in its back, or edge, the aqueous humour will unavoidably escape, before the puncture is completed; and the iris, being brought under the edge of the knife, will be in great danger of being wounded by it. (*Ware*)

Baron Wenzel considers all instruments, invented for fixing the eye, quite unnecessary: they render the operation more complicated, more dreadful to the patient, more embarrassing to the operator, and they are very liable to irritate and wound the eye. If the above oculist could approve of any kind of speculum, he should give the preference to Rumpelt's instrument, which is nothing more than a thimble, at the end of which is a sharp pointed instrument, like the pique of Pamard. The thimble is to be placed on the middle finger of the operator, and it has the advantage of not obstructing the use of the forefinger, but leaves it at liberty to keep down the lower eyelid.

The pressure, occasioned by all contrivances for fixing the eye, is a serious objection to their employment, as such pressure is apt to cause a sudden protrusion and loss of great part of the vitreous humour. (*Wenzel.*)

Mr. Ware coincides very much with Wenzel on the subject of specula. At the same time, he remarks, that, in some instances of children born with cataracts, he has been obliged to fix the eye with a speculum; without the aid of which, he has found it totally impracticable to make the incision through the cornea, with any degree of precision, or safety. His speculum is a noval ring, the longest diameter of which is about twice as long as the diameter of the cornea, and the shortest about half as long again as this tunic. Annexed to the upper rim of the speculum is a rest, or shoulder, to support the upper eyelid; and, by its lower rim, it is fixed to a handle of such a length, and bent in such a way, as may render it convenient to be held. (*Ware.*)

When the patient is to undergo the operation, he should be seated in a low chair, before a light, which is not too bright, and, which, consequently, does not occasion too great a contraction of the pupil. The sound eye being covered with a compress, an assistant, placed behind, must hold the patient's head, and support it on his breast. With the forefinger of the hand that is at liberty, he is then to raise the upper lid of the eye to be operated upon, and gently press the tarsus, with the extremity of the finger, against the upper

edge of the orbit, avoiding all undue pressure on the eye.

The operator is to be seated in a chair, a little higher, than that of the patient. The eyes naturally turning towards the light, he is to place the patient's head obliquely at a window, so that the eye to be operated upon may be inclined towards the outer angle of the orbit. This position will enable the operator to bring out the knife, on the inner side of the cornea, opposite to the part, where it pierces this tunic, more exactly, than he would otherwise be able to do. The operator is to rest his right foot on a stool, placed near the patient, that his knee may be raised high enough to support the right elbow, and to bring the hand, with which he holds the knife to a level with the eye, on which he is to operate. He is then to take the cornea knife in his right hand, if it be the left eye, on which he is to operate, and, *vice versa*, in the left hand, if it be the right eye. The knife is to be held like a pen in writing, and the hand is to rest steadily on the outer side of the eye, with the little finger, separated a little from the rest, on the edge of the orbit. In this position, the operator should deliberately wait, till the eye becomes quite still. (*Wenzel.*)

When the eye is perfectly quiet, and so turned towards the outer angle, that the inner and inferior part of the cornea can be distinctly seen, through which Wenzel recommends the point of the knife to be conveyed, the operator is to plunge the knife into the upper and outer part of this tunic, a quarter of a line distant from the sclerotica, in such a direction, that it may pass obliquely from above, downwards, parallel to the plane of the iris. At the same time, the operator must depress the lower lid with his fore and middle fingers, taking care to avoid all pressure on the eyeball. (*Wenzel.*)

Mr. Ware does not approve of this plan of leaving the eye unfixed, while the incision is made through the cornea. The danger likely to arise from undue pressure, can only take place, after the instrument has made an opening into the eye: but, the pressure which Mr. Ware advises, in order to fix the eye, is to be removed the instant the knife is carried through the cornea, and before any attempt is made to divide this tunic downwards. To understand this subject better, however, the reader should know, that Mr. Ware divides the incision of the cornea into two distinct processes; the first of which may be called *punctuation*, and the second *section*. So long, says Mr. Ware, as the knife fills up the aperture, in which it is inserted, that is, until it has passed through both sides of the cornea, and its extremity has advanced some way beyond this tunic, the aqueous humour cannot be discharged, and pressure may be continued with safety. The punctuation of the cornea being completed, the purpose of pressure is fully answered; and, if such pressure be continued, when the section of the cornea begins, instead of being useful, it will be hurtful. To avoid all bad effects, Mr. Ware recommends the cornea to be cut in the following way.

The operator is to place the fore and middle finger of the left hand, upon the tunica conjunctiva, just below, and a little on the inside of the cornea. At the same time, the assistant, who supports the head, is to apply one, or, if the eye projects sufficiently, two of his fingers, upon the conjunctiva, a little on the inside and above the cornea. The fingers of the operator and assistant, thus opposed to each other, will fix the eye, and prevent the lids from closing. The point of the knife is to enter the outside of the cornea, a little above its transverse diameter, and just before its connexion with the sclerotica. Thus introduced, it is to be pushed on slowly, but steadily, without the least intermission, and in a straight direction, with its blade parallel to the iris, so as to pierce the cornea towards the inner angle of the eye, on the side, opposite to that, which it first entered, and till about one third part of it is seen to emerge beyond the inner margin of the cornea. When the knife has reached so far, continues Mr. Ware, the punctuation is completed. The broad part of the blade is now between the cornea and the iris, and its cutting edge below the pupil, which of course is out of all danger of being wounded. As every degree of pressure must now be taken off the eyeball, the fingers, both of the operator and his assistant, are instantly to be removed from this part, and shifted to the eyelids. These are to be kept asunder by gently pressing them against the edges of the orbit; and the eye is to be left entirely to the guidance of the knife, by which, says Mr. Ware, it may be raised, depress-

ed, or drawn to either side, as may be found necessary. The aqueous humour being now partly, if not entirely evacuated, and the cornea of course rendered flaccid, the edge of the blade is to be pressed slowly downward, till it has cut its way out, and separated a little more, than half the cornea from the sclerotica, following the semicircular direction, marked out by the attachment of the one to the other. *(Ware.)*

As soon as the point of the knife had arrived opposite the pupil, Wenzel used to incline it gently backward, and thus puncture the capsule of the crystalline. But, Mr. Ware very properly objects to this method of opening the capsule with the instrument used for cutting the cornea, and at the same time. The plan may exhibit dexterity; but, is of no use, and is often attended with considerable danger of wounding the iris.

In the eyes of some persons, the iris is convex, and it is almost impossible to complete the section of the cornea, without entangling the iris under the edge of the knife, unless a particular artifice be adopted. Wenzel, in this circumstance, recommends gently rubbing the cornea downward with the finger; one of the most important directions, according to Mr. Ware, in the Baron's whole book.

Wenzel imputed several advantages to the oblique manner, in which he used to divide the cornea. The best modern oculists, however, do not attribute any superior uses to this method, and consequently do not imitate it.

If the edge of the knife should incline too much forward, and its direction be not altered, the incision in the cornea will be too small, and terminate almost opposite the pupil. In this case, there will be great difficulty in extracting the cataract, and the cicatrix afterwards will often obstruct sight. If, on the contrary, the edge of the instrument be inclined too much backward, and its direction be not changed, the incision will approach too near the part, where the iris and sclerotica unite, and there will be great danger of wounding one, or the other of these coats of the eye. Both these accidents may be prevented by gently rolling the instrument between the fingers, until the blade takes the proper direction. *(Wenzel.)*

Mr. Ware has seen operators, through a fear of wounding the iris, introduce and bring out the instrument at a considerable distance before the union of the cornea and sclerotica; in consequence of which, the incision from one side of the cornea to the other has been made too small to allow the easy extraction of the cataract, although from above downward, it was fully large enough for this purpose. Mr. Ware has also sometimes observed, that though the punctuation of the cornea, from side to side, has been properly conducted, and its section, afterwards, to all appearance, effectually completed, yet, on account of the frictions, employed to disengage the iris from the edge of the instrument, the knife, in cutting downward, has been carried between the layers of the cornea, and, consequently, though the incision has appeared externally, to be of its proper size; internally, it has been much too small for allowing the cataract to be easily extracted. In this case, the incision must be enlarged, by means of a pair of curved blunt-pointed scissars, which should be introduced to the part, where the knife first entered the cornea. *(Ware.)*

After the knife has pierced through the cornea, and while it is cutting its way downward, the assistant, to whose care the upper eyelid is entrusted, is gradually to let it drop, in order to prevent the cataract from escaping too hastily. Then the whole charge of the eye devolves solely on the operator, who is to solicit the extraction of the cataract by gentle pressure on the upper part of the globe, the capsule of the crystalline having been previously opened.

Wenzel himself does not recommend opening the capsule of the crystalline, in every instance, at the same time, that the cornea is cut. In cases, where the pupil is much contracted, as well as in those, where the muscles of the eye and eyelids are easily thrown into convulsions, it is improper, says he, to puncture the capsule when the section is made through the cornea. This is also improper when the space, between the crystalline, and the iris, termed the posterior chamber, is large. In all such cases, Wenzel acknowledges, that it is better simply to divide the cornea in the first instance, and then to puncture the capsule with a different instrument.

Wenzel and his father used to employ, for this purpose, a flat needle, one line, that is, one twelfth part of an inch, in diameter, having its cutting extremity a little incurvated. This needle, which should be made of nealed gold, that its pliability may allow the operator to bend it in different directions, as occasion requires, is fixed in a handle, two inches and a half in length, and similar to that of the cornea knife. At the other extremity of the same handle a small curette, or scoop, is fixed, made also of nealed gold, which is of use to extract the cataract.

When the crystalline, dislodged from its capsule, protrudes through the wound in the cornea, its removal from the eye may sometimes be assisted by the use of the above needle; and afterwards the opaque and glutinous matter, remaining, must be removed by means of the curette.

It is always advisable, after the operation, gently to rub the anterior part of the cornea over the lids, either with the thumb or the curette. This process usually collects in the centre of the pupil some small fragments of opaque matter, which the crystalline leaves behind it, and which, if not taken away with the curette, might give rise to a particular kind of secondary cataract. The curette is also of use for replacing the iris, a portion of which membrane occasionally comes through the incision in the cornea. *(Wenzel.)*

Sometimes the cataract is hindered from coming out, on gentle pressure being made, in consequence of adhesions. Wenzel recommends these to be broken by means of the golden needle, introduced under the cornea, and applied in different directions, according as the case requires, and more especially round the circumference of the crystalline.

Sometimes, when the capsule of the crystalline is destroyed, and the crystalline itself is perfectly free, this humour plunges to the inferior part of the vitreous humour, leaving only its upper edge visible through the pupil. The hyaloid membrane is also most commonly destroyed, and the vitreous humour in a state of fluidity. All pressure, therefore, on the eyeball, must be avoided, since this would produce a large evacuation of the vitreous humour. The only method is to introduce through the pupil, a small steel hook to take hold of the crystalline, which, in this case, is often very small, and with this instrument to extract it from the eye. *(Wenzel.)*

When the capsule used to become opaque after the operation, so as to form, what is termed, the secondary membranous cataract, Wenzel, after dividing the cornea, used to remove the opaque substance, by means of a small pair of forceps.

After the operation, no fluid application, according to Wenzel, should be made to the eye. It should be simply covered with a dossil of lint; over which a dry compress should be applied. The dressings should in general be removed every day.

Mr. Ware, however, approves of fluid applications. He has found, that a dossil of lint, steeped in plain water, or brandy and water, and covered with the spermaceti, or saturnine cerate, and removed once every day, is the most easy and convenient dressing, that can be applied after the operation. The cerate over the lint prevents the latter, when impregnated with the discharge, from becoming stiff, and irritating the lids, Mr. Ware thinks the mode of applying the compress and bandage over the eye, a circumstance of no small importance, because, if too loose, the dressings are very apt to slip off, and, consequently, to press unequally and injuriously on the eye; and, if too tight, the undue pressure will excite pain and inflammation, and even force out some of the vitreous humour. Mr. Ware's compress is made of soft linen, folded, two or three times, wide enough to cover both eyes, and sufficiently long to extend from the upper part of the forehead to the lower part of the nose. This he pins at the top of the patient's nightcap; and its lower part, which is divided in the middle, to allow the nose to come through it, he lays loosely over the eyes. The bandage, also made of old linen, and as broad as six fingers, he carries round the head over the compress, and pins to the side of the nightcap moderately tight, A slip of linen is afterwards carried under the chin, and pinned, at each end to the side of the bandage, to prevent it from slipping upwards. *(Ware.)*

The patient should lie continually on his back, after the operation, as this posture has a tendency to prevent the escape of the humours.

Mr. Ware has published a very able inquiry into the causes preventing the success of extraction of the cataract.

The first, which he considers, is making the incision through the cornea too small. In this circumstance, a degree of violence will be required to bring the cataract through the wound; and, if the cataract be not altered in its figure, the wound will be forcibly dilated, and the edge of the iris compressed between the cornea and the cataract. In this way, either some of its fibres may be ruptured, or it may be otherwise so much injured, as to excite a considerable degree of inflammation, and even induce, in the end, a closure of the pupil.

This accident may arise from the operator's cutting the cornea, without being able to see exactly the position of this membrane, in consequence of the eye having turned inward, owing to its not being properly fixed. The fault may also proceed from the incision having been begun below the transverse diameter of the cornea. In this manner, nine sixteenths, or rather more than half of the circumference of this membrane, will not be divided; which extent the incision ought always to occupy, in order to allow the cataract to be extracted with facility.

When the cornea is remarkably flat, and the iris projects unusually forward in the anterior chamber, however, Mr. Ware recommends including only one-third of the cornea in the first incision, and afterwards enlarging the aperture, on the outer side, by means of curved scissars.

Whenever the wound in the cornea is made too small, it should always be enlarged before proceeding further in the operation; and this can be best accomplished with a pair of curved blunt-pointed scissars, on the outer side of the cornea, where the knife first made its entrance.

Taking care to fix the eye in Mr. Ware's way, is certainly of great consequence in hindering the wound in the cornea from being made too small.

Wounding the iris with the cornea-knife, is the second accident, which Mr. Ware considers. The principal cause seems to him to be a discharge of the aqueous humour, before the knife has passed through the cornea low enough to hinder the lower part of the iris, which forms the inferior rim of the pupil, from getting beneath the edge of the instrument. The escape of the aqueous humour may be owing to some inaccuracy in the shape of the knife, or unsteadiness in introducing it. The falling of the lower part of the iris under the edge of the knife, Mr. Ware believes, cannot always be prevented by the utmost skill, or precaution of the operator. Happily, however, says he, we have been taught, that the iris may be reinstated, after it has been thus displaced, and without suffering any injury, by applying gentle frictions on the cornea, over the entangled part, with the point of the finger.

By unsteadiness in passing the knife, Mr. Ware means, that the knife may not only be suffered to make a punctuation through this tunic, but, that its edge may, at the same time, be unintentionally pressed downward, so as to make an incision likewise; in consequence of which downward motion of the knife, an aperture must unavoidably be left in the cornea, through which the aqueous humour will escape. If the cornea-knife increase through its whole length, both in width and thickness, and if it be merely pushed through the cornea, no space will be left, through which any fluid can escape.

The third accident, noticed by Mr. Ware, is the escape of the vitreous humour. The common occasion of this occurrence is the undue application of pressure. It may take place, either when the incision is made through the cornea, or at the time of extracting the cataract out of the eye. Some eyes are subject to spasm; which renders them much more liable to this accident. To prevent it, Mr. Ware recommends every kind and degree of pressure to be taken from the eye, before the knife has completely cut its way through the cornea. And, as soon as the knife has proceeded sufficiently low to secure the iris from being wounded, the operator should not only take heed, that his own fingers do not touch the eye, but should also direct the assistant, who supports the upper lid, to remove his fingers entirely from this part. The assistant seldom need make any pressure on the globe of the eye: however, when there is room for one of his fingers to be placed on the inner and upper part of the globe, without interfering with those of the operator, the method may be followed, in order to make the eye still more fixed. But immediately the punctuation of the cor-

nea is completed, the assistant's finger should always be entirely removed, both from the eyelids and eye itself.

Notwithstanding the upper lid is left thus free, there will be sufficient space between it and the lower lid, to allow the progress of the knife to be seen; and, in finishing the wound, the operator should depress the lower lid with great gentleness.

The vitreous humour may also be lost, in consequence of opening the capsule of the lens nearer the circumference, than the centre of the pupil. As the crystalline is both thinner and softer at that part, the instrument will be liable to pass through both sides of the capsule, and enter the vitreous humour. This humour having no longer any barrier to its escape, is liable to be forced out by the action of the eyelids alone; and, when pressure is afterwards made, to bring the cataract through, a much greater quantity will be lost, and the cataract, instead of coming forward, will recede from the pupil. The only way to extract it now, is, by having the upper lid gently raised by an assistant, (a rare instance, in in which this is necessary after cutting the cornea) while the operator, either with the fore-finger of the left hand, or with the blunt end of the curette, applied beneath the incision of the cornea, prevents the cataract from sinking further. Then, with the right hand, let him introduce a hook under the flap of the cornea; and with its point carefully entangle the cataract, and bring it away.

To prevent, however, such difficulties, Mr. Ware very judiciously advises never attempting to puncture the capsule, until the whole pupil is in view. This gentleman is in the habit of opening the capsule with a gold-pointed needle, arched towards its extremity. Wenzel's needle, for this purpose, is flat at its extremity: Mr. Ware's is pointed: and this is their only difference. The latter introduces his instrument under the flap of the cornea, with its arched part uppermost, until its point is on a level with the centre of the pupil. The end of the instrument should then be turned inward, and gently rubbed on the capsule of the crystalline, until it pierces it. In a few instances, Mr. Ware has found the capsule so tough, that the point of the gold needle would not enter it, and he has been obliged to use a sharp steel instrument, of the same shape as the gold-pointed one.

The vitreous humour may also be lost, at the time of extracting the cataract, and the usual cause is an undue application of pressure. All violent pressure is quite unnecessary for forcing out the cataract, when the wound in the cornea is sufficiently large. When the wound is too small, it should be enlarged, as above directed. If pressure be continued at all after the cataract is extracted, the capsule of the vitreous humour will certainly be ruptured, and some of this part of the eye protruded. Pressure may even rupture the capsule of the vitreous humour, before the cataract is brought through the incision in the cornea; and the same consequences will ensue, and the same practice be necessary, as in the case, in which the operator has unskilfully opened the capsule of the vitreous humour with the needle, in attempting to open that of the lens.

In taking away fragments of opaque matter, remaining behind, by means of the curette, great care is requisite to avoid wounding the posterior part of the capsule of the crystalline with the end of the instrument, so as to open a way for the escape of the vitreous humour.

The vitreous humour may, indeed, be forced out, after the extraction of the cataract, merely by a spasmodic action of the eyelids. On this subject, Mr. Ware, after hinting his suspicion, that, in a case of this kind, which he saw, the assistant's keeping up the lid contributed to this event, repeats his advice, "that the upper eyelid should be raised solely by the fingers of the left hand of the operator," after cutting the cornea.

Mr. Ware seems to think, that more evil has resulted from the operator's being deterred, by the readiness, with which the vitreous humour continues to start out, from ascertaining, that all the fragments of the cataract are removed, and that the whole of the iris has resumed its position, than from the mere loss of the vitreous humour, which is quickly regenerated.

Mr. Ware afterwards takes notice of the accident of extracting only a part of the cataract, and leaving the remainder behind. He is an advocate for removing all opaque substances from the pupil, except an extreme degree of irritability, to which some eyes are sub-

ject, should render the introduction of every sort of instrument, after the cataract is extracted, difficult and dangerous. Mr. Ware usually removes opaque portions of the cataract by means of a curette; and, occasionally, when the opaque substance has been large, and has adhered to the capsule, he has been obliged to extract it with small forceps. Before finishing the operation, Mr. Ware approves of always rubbing the end of the finger gently on the fore part of the eye, over the eyelids; which proceeding tends to bring in view any opaque matter, which may previously lie behind the iris. Mr. Ware relates a case, proving, that such opacities as cannot be removed in the operation, are capable of being absorbed.

This gentleman says, that an opacity of the capsule can be the only reason for removing it. The anterior part, also, can alone become the object of the operator's attention; its posterior part is necessarily hidden, while the cataract remains in the eye, and afterwards, if discovered to be opaque, it is so closely connected with the capsule of the vitreous humour, that Mr. Ware believes it cannot be removed by any instrument, without hazarding a destructive effusion of this humour.

When, however, the opaque lens, is accompanied with an opacity in the front part of the capsule. Mr. Ware recommends the following plan. After cutting the cornea, as usual, a fine-pointed instrument, somewhat smaller in size than a round couching needle, and a little bent towards the point, should be introduced under the flap of the cornea, with its bent part upward, until its point is parallel with the aperture of the pupil. The point should then be turned toward the opaque capsule, which is to be punctured by it, in a circular direction, as near to the rim of the pupil as the instrument can be applied, without hurting the iris. Sometimes, the part included within the punctures, may be extracted on the point of the instrument; and, if this cannot be done, it should be removed with a small pair of forceps. The lens, whether opaque, or transparent, should next be extracted, by making a slight pressure with the curette, either above, or below, the circumference of the cornea.

Mr. Ware afterwards considers the bad consequences of allowing foreign bodies of any kind, after the operation, to press unequally on the globe of the eye; comprehending, under this head, the intervention of the edge of the lower eyelid between the sides of the divided cornea; the inversion of the edge of the lower eyelid; and the lodgment of one, or more, loose eyelashes on the globe of the eye.

To prevent the first accident, every operator, before applying the dressings, should carefully depress the lower eyelid; and, before he suffers the lid to rise, should take care, that the flap of the cornea be accurately adjusted in its proper position; and, that the upper lid be dropped, so as completely to cover it. After this, the eyelids should not be opened again, for three, or four days, that is, until there is good reason to suppose the wound in the cornea closed. (*Ware.*)

The inversion of the lower eyelid is hurtful, in consequence of its making the eyelashes rub against the eye. These should be extracted the day before the operation. For the mode of effecting a permanent cure, see *Trichiasis.*

Besides the danger, to which the eye is exposed, from the inversion of the edge of the lid, the eye may receive injury from the improper position of the eye lashes alone; one, or more of which, during the operation, may happen to bend inwards; or, becoming loose, may afterwards insinuate themselves between the inside of the lid and the eye. An eyelash, bent inward, should be rectified; if broken off and loose, it should be removed, before dressing the part.

Mr. Ware lastly considers prematurely exposing the eye to a strong light. He censures the plan of opening the eyelids, within the first two or three days after the operation, because the stimulus of the light increases the ophthalmy, and the method is apt to disturb the wound in the cornea, before it is closed. Mr. Ware, however, wishes it not to be inferred, that he is an advocate for long confinement after the operation. His mode is to keep the patient wholly in bed, and to direct him to move his head, as little as possible, for the first three days after the operation. During this time, a dossil of wet lint is kept on his eyes, covered with a saturnine plaster, compress, and bandage, as already described. The dressing is renewed once every day, and the outside of the eyelids washed with

warm water in winter, and cold in summer. At each time of dressing, the skin of the lower lid is drawn gently down to prevent any tendency to an inversion. Animal food is prohibited, and the patient enjoined not to talk much. On the fourth day, he is permitted to sit up, for two, or three hours, and, if he has had no stool since the operation, a mild opening medicine is now administered. On the fifth, the time of his sitting up is lengthened, and, presuming that the wound in the cornea is now closed, Mr. Ware usually examines the state of the eye. After this, no dressings need be applied in the day-time, care being taken to defend it from a strong light, by a pasteboard hood, or shade, and by darkening the room, so that no inconvenience is felt. The patient may now also look, for a short time, at large objects. The following part of the treatment need interfere very little with the wishes of the patient, unless unexpected accidents should occur. *(Ware.)*

OF COUCHING, OR DEPRESSION OF THE CATARACT.

This operation consists in removing the opaque lens out of the axis of vision, by means of a needle, constructed for the purpose.

There are two couching needles, which now seem to be preferred to all others: and these are the only ones requiring a description here. I allude to the one used by Mr. Hey; and to that employed by Professor Scarpa.

The length of Mr. Hey's needle is somewhat less than an inch. It would be sufficiently long, if it did not exceed seven-eighths of an inch. It is round, except near the point, where it is made flat by grinding two opposite sides. The flat part is ground gradually thinner to the extremity of the needle, which is semicircular, and ought to be made as sharp as a lancet. The flat part extends in length, about an eighth of an inch, and its sides are parallel. From the part where the needle ceases to be flat, its diameter gradually increases towards the handle. The flat part is one fortieth of an inch. The handle, which is three inches and a half in length, is made of light wood, stained black. It is octagonal, and has a little ivory inlaid in the two sides, which correspond with the edge of the needle.

Mr. Hey describes the recommendations of this instrument in the following terms.

1. "It is only half the length of the common needle; and this gives the operator a greater command over the motions of its point, in removing the crystalline from its bed, and tearing its capsule. It is also of some consequence, that the operator should know how far the point of his needle has penetrated the globe of the eye, before he has an opportunity of seeing it through the pupil; as it ought to be brought forwards when it has reached the axis of the pupil. Now he may undoubtedly form a better judgment respecting this circumstance, when the length of his needle does not much exceed the diameter of the eye, than when the capsule is so opake that the point cannot be seen through the pupil.

2. "As this needle becomes gradually thicker towards the handle, it will remain fixed in that part of the sclerotis, to which the operator has pushed it, while he employs its point in depressing and removing the cataract. But the spear-shaped needle, by making a wound larger in diameter, than that part of the instrument, which remains in the sclerotis, becomes unsteady, and is with difficulty prevented from sliding forwards against the ciliary processes, while the operator is giving it those motions which are necessary for depressing the cataract.

"On the same account the common spear-shaped needle may suffer some of the vitreous humour to escape during the operation, whereby the iris and ciliary processes would be somewhat displaced, and rendered flaccid; whereas the needle which I use, making but a small aperture in the sclerotis, and filling up that aperture completely during the operation, no portion of the vitreous humour can flow out so as to render the iris and ciliary processes flaccid.

3. "This needle has no projecting edges: but the spear-shaped needle, having two sharp edges, which grow gradually broader to a certain distance from its point, will be liable to wound the iris, if it be introduced too near the ciliary ligament, with its edges in a horizontal position. I have been informed, that, in an operation performed by one of the most eminent surgeons in the metropolis, now deceased, the iris was divided as far as the pupil. If the operator, in order to avoid this danger, introduces his needle with its edges in a vertical position, he will di-

vide the fibres of the sclerotis transversely, and, by thus enlarging the wound, will increase the unsteadiness of the instrument. Besides, however the needle be introduced, one of its sharp edges, must be turned toward the iris in the act of depressing the cataract; and, in the various motions which are often necessary in this operation, the ciliary processes are certainly exposed to more danger, than when a needle is used which has no projecting edge.

4. "It has no projecting point. In the use of the spear-shaped needle, the operator's intention is to bring its broadest part over the centre of the crystalline. In attempting to do this, there is great danger of carrying the point beyond the circumference of the crystalline, and catching hold of the ciliary processes, or their investing membrane, the *membrana nigra*. This accident is more probable, as the point of the needle must unavoidably be directed obliquely forwards, and this motion, if carried too far, brings the point into contact with the ciliary processes, as they surround the capsule of the crystalline.

"A needle, made according to the figure given in the annexed plate, will pass through the sclerotis with ease. It will depress a firm cataract readily, and break down the texture of one that is soft. If the operator finds it of use to bring the point of the needle into the anterior chamber of the eye (which is often the case), he may do this with the greatest safety, for the edges of the needle will not wound the iris. In short, if the operator, in the use of this needle, does but attend properly to the motions of its point, he will do no unavoidable injury to the eye; and this caution becomes the less embarrassing, as the point does not project beyond that part of the needle by which the depression is made, the extreme part of the needle being used for this purpose. (*Hey.*)

Scarpa employs a very slender needle, possessing sufficient firmness to enter the eye without hazard of breaking, and having a point, which is slightly curved. The curved extremity of the needle is flat upon its dorsum, or convexity, sharp at its edges, and has a concavity, constructed with two oblique surfaces, forming in the middle a gentle eminence, that is continued along to the very point of the instrument: there is a mark on the side of the handle, which corresponds to the convexity of the point. The surgeons of the Leeds Infirmary have had one advantage in the needle, which they have used in imitation of Baron Hilmer; I mean, having it made of no greater length than the purposes of the operation demand. A couching needle is sufficiently long when it does not exceed, at most, an inch in length: this affords the operator a greater command over the motions of the point, and enables him to judge more accurately, how far it has penetrated the globe of the eye, before he has an opportunity of seeing it through the pupil. To the needle, therefore, so much recommended by Scarpa, and so successfully used by him, and Doctor Morigi, principal surgeon of the hospital at Piacenza, and one of the most expert operators of the present day in Italy, it seems proper to unite the improvement of having it made no longer than is necessary. The needle here described, will penetrate the sclerotic coat as readily as any straight one, of the same diameter, and, by reason of its slenderness, will impair the internal structure of the eye less in its movements than common couching needles. When cautiously pushed in a transverse direction, till its point has reached the upper part of the opaque lens, it becomes situated with its convexity tnwards the iris, and its point in an opposite direction; and, upon the least pressure being made by its convex surface, it removes the cataract a little downward, by which a space is afforded at the upper part of the pupil, between the cataract and ciliary processes, through which the instrument may be safely conveyed in front of the opaque body and its capsule, which it is prudent to lacerate in the operation. In cases of caseous, milky, and membranous cataracts, the soft pulp of the crystalline may be most readily divided, and broken piecemeal by the edges of its curved extremity; and the front layer of the capsule lacerated into numerous membranous flakes, which, by turning the point of the instrument towards the pupil, may be as easily pushed through this aperture into the anterior chamber, where Scarpa finds absorption takes place more quickly, than behind the pupil.

In ordinary cases, there is not the least occasion for any preparatory treatment previous to the operation; all that prudence requires is, that the patient

should abstain from animal food, and fermented liquors, for a few days before submitting to it, and should take one dose of a gentle purgative. But this, like every other general observation, is liable to particular exceptions. Hypochondriacal men, hysterical women, and patients subject to affections of the stomach and nervous system, should take, for two or three weeks before the operation, tonic bitter medicines, particularly the infusion of quassia, either with, or without a few drops of æther vitriolicum to each dose; or, in other cases, ʒj of Peruvian bark, with ℈j of valerian, may be administered two or three times a day with particular benefit. It is observed by the most accurate writers upon this subject, that in such persons the symptoms consequent to operations upon the eyes, are often much more violent than in common cases; and it therefore seems proper to endeavour, previously, to meliorate their constitutions. When the patient is timid, it is very advisable to give him, half an hour before the time of operating, about fifteen drops of the *tinctura opii*, with a little wine.

Some patients, besides being afflicted with cataract, have the edges of the eyelids swollen and gummy, with relaxation, and chronic redness of the conjunctiva. Before undertaking to couch, it is, in this case, advisable to apply a blister to the nape of the neck, and to keep it open for two or three weeks, by means of the Savin cerate, and to insinuate every morning and evening, between the palpebræ and globe of the eye, a small quantity of the unguentum hydrarg. nitrat. mitius, prepared according to the pharmacopoeia of St. Bartholomew's Hospital,* increasing its strength gradually. In obstinate cases, when this ointment does not produce the desired effect, an ointment recommended by Janin, † should be substituted: it consists of ℥ss of hog's lard, ʒij of prepared tutty, ʒij of armenian bole, and ℥j of the white calx of quicksilver. At first, care should be taken to use it lowered, with twice or thrice its quantity of lard. In the day time, a collyrium, composed of ℥iv of rose water, ℥ss of the mucilage of quince seeds, and gr. v. of the sulphate of zinc, may also be frequently used with considerable advantage. By such means the morbid secretion from the Meibomian glands, and membranous lining of the eyelids, will be checked, and the due action of the vessels, and natural flexibility of the eyelids, will be restored. (*Saggio di Osservazioni, &c. sulle principali malattie degli occhi. Venez.* 1802.)

FIRM CATARACT.

In the operation, the patient should be seated rather low, opposite a window, where the light is not too vivid, and in such a manner that the rays may fall laterally upon the eye about to be couched. The other eye, whether in a healthy or diseased state, ought always to be closed, and covered with a handkerchief, or any thing convenient for the purpose; for, so strong is the sympathy between the two organs, that the motions of the one constantly produce a disturbance of the other. The surgeon should sit upon a seat rather higher than that upon which the patient is placed; and, to give his hand a greater degree of steadiness in the various manœuvres of couching, he will find it useful to place his elbow upon his knee, which must be sufficiently raised for this purpose, by a stool placed under the foot. The chair, on which the patient sits, ought to have a high back, against which his head may be so firmly supported, that he cannot draw it backward during the operation. The back of the chair must not slope backward, as that of a common one, but be quite perpendicular, in order that the patient's head may not be too distant from the surgeon's breast. (*Richter's Anfangsgründe der Wundarzneykunst. P.* 207. 3. *Band.*)

The propriety of supporting the patient's head rather upon the back of the chair, on which he sits, than upon an assistant's breast, must immediately strike every impartial mind; for, as Bischoff has observed, the least motion of the assistant, even that necessarily occasioned by respiration, causes, also, a synchronous motion of the part, sup-

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* ℞. Unguenti hydrargyri nitrati, ℥iv.
Adipis Suillæ, ℥viij.
Olei Olivæ, ℥ij.

† Memoires sur l'Oeil.

ported on his breast, which cannot fail to be disadvantageous, both in the operation of extraction, and of couching. Hence Callisen and Richter have recommended the same method of supporting the patient's head, as I have here submitted to public consideration.

In certain cases, where the muscles of the eye, and eyelids, are incessantly affected with spasm; or, where the eye is peculiarly diminutive, and sunk, as it were, in the orbit, the elevator for the upper eyelid, invented by Pellier, and approved by Scarpa, may possibly prove serviceable: in operating upon young subjects, I think it might contribute much to facilitate the operation.

The couching needle (if the curved one) is to be held with the convexity of its curvature forward; its point backward; and its handle parallel to the patient's temple. The surgeon, having directed the patient to turn the eye towards the nose, is to introduce the instrument boldly through the sclerotic coat, at the distance of not less than two lines from the margin of the cornea, for fear of injuring the ciliary processes. Most authors advise the puncture to be made at about one line, and some even at the minute distance of 1-16th of an inch (*Hey*) from the union of the cornea with the sclerotica; but, as the ciliary processes ought invariably to be avoided, and there is no real cause to dread wounding the aponeurosis of the abductor muscle, as some have conceived, the propriety of puncturing the globe of the eye, at the distance of two lines, or two and a half, from the margin of the cornea, as advised by Petit, Platner, Bertrandi, &c. must, in all cases, be sufficiently manifest.

Nor is it a matter of indifference, at what height the needle is introduced, if it be desirable to avoid, as much as possible, effusion of blood in the operation. Anatomy reveals to us, that the long ciliary artery pursues its course to the iris, along the middle of the external convexity of the eyeball, between the sclerotic and choroid coats; and hence, in order to avoid this vessel, it is prudent to introduce the instrument about one line below the transverse diameter of the pupil, as Duddell, Guntz, Bertrandi, Scarpa, &c. have directed. If the couching needle were introduced higher than the track of the long ciliary artery, it would be inconvenient for the depression of the cataract.

The exact place, where the point of the needle should next be guided, is, no doubt, between the cataract and ciliary processes, in front of the opaque lens, and its capsule: but, as I conceive, the attempt to hit this delicate invisible mark, borders upon impossibility, and, with a straight pointed needle, might even endanger the iris, I cannot refrain from expressing my dissent to the common method of passing a couching needle at once in front of the cataract. On the contrary, it seems safer to direct the extremity of the instrument immediately over the opaque lens, and, in the first instance, to depress it a little downward, by means of the convex flat surface of the end of the needle, in order to make room for the safe conveyance of the instrument, between the cataract and corpus ciliare, in front of the diseased crystalline and its capsule; taking care, in this latter step of the operation, to keep the marked side of the handle forward, by which the point of the needle will be in an opposite direction to the iris, and will come into contact with the diseased body, and the membrane binding it down in the fossula of the vitreous humour. Having done this (supposing it to be a firm cataract), the instrument will be visible through the pupil; and now we are to push its point transversely, as near as possible the margin of the lens, on the side next the internal angle of the eye, taking strict care to keep it continually turned backward. The operator is then to incline the handle of the instrument towards himself, by which its point will be directed through the capsule, into the substance of the opaque lens; and, on making a movement of the needle, describing the segment of a circle, at the same instant inclining it downward and backward, he will lacerate the former, and convey it, in the generality of cases, with the latter, deeply into the vitreous humour.

It happened, unfortunately for the credit of the operation of depression, that M. Petit admonished surgeons to beware of wounding the anterior layer of the crystalline capsule: he had an idea, that, in observing this caution, the vitreous humour would afterwards fill up the space, previously occupied by the lens, and that thus the refracting powers of the eye might become as strong as in the natural state, and the necessity for using spectacles might

thereby be considerably obviated. But, we are now apprized, that leaving this very membrane, from which M. Petit anticipated such great utility, even were it practicable to leave it constantly uninjured in its natural situation, would be one of the worst inculcations that could possibly be promulgated; for, in many cases, where Extraction proves fruitless, in some, where Depression fails, the want of success is owing to a subsequent opacity of the crystalline capsule; in short, blindness is reproduced by the secondary membranous cataract. It seems more than probable, that, in some of the instances, where the opaque lens has been said to have risen again, nothing more had happened, than the disease in question. Therefore, notwithstanding the whole capsule may be, in the majority of cases, depressed with the lens out of the axis of vision, as it is not a constant occurrence, I cannot too strongly enforce the propriety of extirpating, as it were, every source and seat of the cataract in the same operation, and in imitation of the celebrated Scarpa, the only one who, as far as my information reaches, has put sufficient stress upon this practice, I shall presume to recommend, as a general rule in couching, always to lacerate the front layer of the capsule, whether in an opaque or transparent state.

The capsule of the crystalline lens may retain its usual transparency, while the lens itself is in an opaque state. In this case, an inexperienced operator might, from the blackness of the pupil, suppose, not only that he had removed the lens, but also the capsule from the axis of sight; and, having depressed the cataract, he might unintentionally leave this membrane entire in its natural situation. Therefore, if there should be any reason for suspecting, that the anterior layer of the capsule has escaped laceration; if, in other words, the resistance made to moving the convexity of the instrument forward, towards the pupil, should give rise to such a suspicion; for the sake of removing all doubt, it is proper to communicate to the needle a gentle rotatory motion, by which its point will be turned forward, and disengaged, through the transparent capsule, opposite the pupil: then, by repeating a few movements downward and backward, it will be so freely rent with the needle, as to occasion no future trouble.

FLUID, OR MILKY CATARACT.

When the case is of this description, the operator frequently finds, that, on passing the point of the couching needle through the anterior layer of the capsule, its white milky contents instantly flow out, and spreading like a cloud over the two chambers of the aqueous humour, completely conceal the pupil, the iris, and the instrument, from his view; who, however, ought never to be discouraged at this event. In my *Critical Reflections on the Cataract*, I have dissented from continuing the operation, when, in its commencement, blood is effused into the aqueous humour; I have there adverted to the effusion of the milky matter of cataracts, into the same situation; and, I have said, that the two cases are not to be considered in a different light; but, I only alluded to the consequences of these occurrences. I shall now take the opportunity to observe, that, although it seems to me most prudent, to postpone the completion of the operation, in the example of blood concealing the pupil, in the first step of couching, and not to renew it, before the aqueous humour has recovered its transparency; yet, I am inclined to adopt this sentiment, chiefly because the species of cataract is, in this circumstance, quite unknown to the operator, consequently, he must be absolutely incapable of employing that method of couching, which the peculiarities of the case may demand. It is very different when a milky fluid blends itself with the aqueous humour, and prevents the surgeon from seeing the iris and pupil: this event is itself a source of information to him, inasmuch as it gives him a perfect insight into the nature of the cataract, which he is treating; and instructs him what method of operating it is his duty to adopt. The surgeon, guided by his anatomical knowledge of the eye, should make the curved point of the needle describe the segment of a circle, from the inner, toward the outer canthus, and in a direction backward, as if he had to depress a firm cataract. *(Scarpa.)* Thus he will succeed in lacerating, as much as is necessary, the anterior layer of the capsule, upon which, in a great measure, the perfect success of the operation depends; and, not only in the milky, but almost every other species of cataract.

In regard to the extravasation of the milky fluid, into the two chambers of the aqueous humour, numerous observations, from the most creditable authorities, prove, that it spontaneously disappears, very soon after the operation, and leaves the pupil of its accustomed transparency. "In twelve cases of a dissolved lens, on which I have operated," says Latta, "the dissolution was so complete, that, on entering the needle into the capsule of the lens, the whole was mixed with the aqueous humour, and all that could be done, was to destroy the capsule as completely as possible, that all the milky matter might be evacuated. In ten of these cases, vision was almost completely restored in four weeks from the operation." Mr. Pott, in treating of this circumstance, viz. the effusion of the fluid contents of the capsule into the aqueous humour, observes, that so far from being an unlucky one, and preventive of success, it proves, on the contrary, productive of all the benefit which can be derived from the most successful depression or extraction, as he has often and often seen. But as this point is, I believe, no longer made an objection to couching, it would be superfluous to enlarge, in confirmation of what has been stated concerning it.

SOFT, OR CASEOUS CATARACT

When the cataract is of a soft, or caseous description, the particles of which it is composed, will frequently elude all efforts made with the needle to depress them, and will continue behind the pupil in the axis of vision. This has been adduced as one instance that baffles the efficacy of couching, and may really seem, to the inexperienced, an unfortunate circumstance. It often happens that, in the operation of extraction, fragments of an opaque matter are unavoidably overlooked and left behind; yet Richter, who once so strenuously signalized himself in favour of the new operation, confesses, that such matter is removed by the absorbents. Supposing a caseous cataract should not have been sufficiently broken, and disturbed in the first operation, and that, consequently, the absorbents do not completely remove it, such a state may possibly require a reapplication of the instrument; but this does not generally occur, and is the worst that can happen. It is quite impossible to determine *a priori*, what effect will result from the most trivial disturbance of a cataract; its entire absorption may, in some instances, follow, while in others, a repetition of an operation becomes necessary for the restoration of sight. Even where the whole firm lens has reascended behind the pupil, as Latta and Hey confirm, the absorbents have superseded the necessity for couching again. The disappearance of the opaque particles of cataracts was, in all times, and in all ages, a fact of such conspicuity, that, as appears from the authorities already quoted, it was recorded, even previous to the discovery of the system of lymphatic vessels in the body. Indeed, the modern observations of Scarpa, and others, so strongly corroborate the account which I have given, of the vigorous action of the absorbents, in the two chambers of the aqueous humour; and, particularly, in the anterior one, that, from the moment the case is discovered to be a soft, or caseous cataract, it seems quite unnecessary to make any further attempt to depress it into the vitreous humour. Mr. Pott sometimes, in this circumstance, made no attempt of this kind, but contented himself with a free laceration of the capsule, and, after turning the needle round and round, between his finger and thumb, within the body of the crystalline, left all the parts in their natural situation, where he hardly ever knew them fail of dissolving so entirely, as not to leave the the smallest vestige of a cataract. This eminent surgeon even practised occasionally what Scarpa so strongly inculcates at this day; he even pushed the firm part of such cataracts through the pupil into the anterior chamber, where it always disappeared, without producing the least inconvenience: we must, at the same time add, that he thought this method wrong, not on account of its inefficacy, but in apprehension that it would be apt to produce an irregularity of the pupil, one of the worst inconveniences attending the operation of extraction. But the deformity of the pupil, after extraction, seems to proceed either from an actual laceration of the iris, or a forcible distention of the pupil, by the passage of large cataracts through it, a kind of cause that would not be present in pushing the broken portions of a caseous lens into the anterior chamber; therefore, it does not seem warrantable to reject this ve-

ry efficacious plan of treatment. for which the curved pointed needle is, undoubtedly, the best calculated. It is very deserving of notice, that Mr. Hey, who has several times seen the whole opaque nucleus, and very frequently small opaque portions fall into the anterior chamber, makes this remark: "Indeed, if the cataract could, in all cases, be brought into the anterior chamber of the eye, without injury to the iris, *it would be the best method of performing the operation.*" What the same author also observes in the subsequent part of this work, is strikingly corroborative of the efficacy of Scarpa's practice. The practice of the Italian professor consists in lacerating the anterior portion of the crystalline capsule, to the extent of the diameter of the pupil, in a moderately dilated state; in breaking the pappy substance of the diseased lens piecemeal; and in pushing the fragments through the pupil, into the anterior chamber, where they are gradually absorbed.

MEMBRANOUS CATARACT.

One great advantage in favour of couching, depends upon its generally removing the capsule, at the same time with the lens, from the passage of the rays of light to the retina. Sometimes, however, this desirable event, by which the patient is extricated from the danger of a secondary membranous cataract, does not take place even in the operation of depression; and, when the lens included in its capsule is extracted from the eye, by the other method, it may always be considered as rather an uncommon circumstance. What most frequently constitutes the secondary membranous cataract, is the anterior half of the capsule, which not having been removed, or sufficiently broken, in a previous operation, continues more or less entire in its natural situation, afterwards becomes opaque, and thus impedes the free transmission of the rays of light to the seat of vision. Sometimes the secondary membranous cataract presents itself beyond the pupil, in the form of membranous flakes, apparently floating in the aqueous humour, and shutting up the pupil: at other times it appears in the form of triangular membranes, with their bases affixed to the *Membrana Hyaloidea*, and their points directed towards the centre of the pupil. When there is only a minute membranous flake suspended in the posterior chamber, it is on no account necessary for the patient to submit to another operation; vision is tolerably perfect, and the small particle of opaque matter will, in time, spontaneously disappear. But when the secondary membranous cataract consists of a collection of opaque fragments of the capsule, accumulated so as either in a great degree or entirely to close the pupil; or when the disease consists of the whole anterior half of the opaque capsule, neglected in a prior operation, and continuing adherent in its natural situation, it is indispensable to repeat an operation; for, although in the first case, there may be good reason to hope that the collection of membranous fragments might, in time, disappear, yet it would be unjustifiable to detain the patient for weeks and months in a state of anxiety and blindness, when a safe and simple operation would restore him, in a very short space of time, to the enjoyment of this most useful of the senses. In the second case, it is absolutely indispensable; for while the capsule remains adherent to its natural connections, the opacity seldom disappears, and may even expand itself over a larger portion of the pupil. The operation should be performed as follows: when the aperture in the iris is obstructed by a collection of membranous flakes, detached from the membrana hyaloidea, the curved needle should be introduced, with the usual precaution of keeping its convexity forward, its point backward, until arrived behind the mass of opaque matter; the surgeon is then to turn the point of the needle towards the pupil, and is to push through this opening, regularly one after another, all the opaque particles into the anterior chamber, where, as we have before noticed, absorption seems to be carried on more vigorously than behind the pupil. All endeavours to depress them into the vitreous humour, Scarpa has found to be vain; for scarcely is the couching needle withdrawn when they all reappear at the pupil, as if (to use his own phrase) carried thither by a current: but when forced into the anterior chamber, besides being incapable of blocking up the pupil, they lie, without inconvenience, at the bottom of that cavity, and in a few weeks are entirely absorbed.

When the secondary membranous cataract consists of the whole anterior layer of the crystalline capsule, or of several portions of it connected with the membrana hyaloidea, the surgeon, after cautiously turning the point of the needle towards the pupil, is to pierce the opaque capsule; or, should there be any interspace, he is to pass the point of the instrument through it; then, having turned it again backward, he is to convey it, as near as possible, to the attachment of the membranous cataract, and after piercing the capsule, or each portion of it successively, and sometimes carefully rolling the handle of the instrument between his finger and thumb, so as to twist the capsule round its extremity, he will thus break the cataract, as far as is practicable, at every point of its circumference. The portions of membrane, by this means separated from their adhesions, are next to be cautiously pushed, with the point of the couching needle turned forward, through the pupil, into the anterior chamber. In these manœuvres the operator must use the utmost caution not to injure the iris, and ciliary processes, for, upon this circumstance depends having no bad symptoms after the operation, notwithstanding its duration may have been long, and the necessary movements of the needle numerously reiterated. If a part of the membranous cataract should be found adherent to the iris, (a complication, that will be indicated when, upon moving it backward or downward, with the needle, the pupil alters its shape, and, from being circular becomes of an oval, or irregular figure,) even more caution is required than in the foregoing case, so as to make repeated, but delicate movements of the needle, to separate the membranous opacity, without injuring the iris.

Nor will it be necessary to vary the plan of operating already explained, if occasionally the cataract should be formed of the posterior layer of the capsule.

The same plan also succeeds in those rare instances where the substance itself of the crystalline wastes, and is almost completely absorbed, leaving the capsule opaque, and including, at most, only a small nucleus, not larger than a pin's head. Scarpa terms it the *Primary Membranous Cataract;* he describes it as being met with in children, or young people under the age of twenty; as being characterized by a certain transparency, and similitude to a cobweb: by a whitish opaque point, either at its centre or circumference; and, by a streaked and reticulated appearance: he adds, that whosoever attempts to depress such a cataract is baffled, as it reappears behind the pupil soon after the operation; he recommends breaking it freely with the curved extremity of the couching needle, and pushing its fragments into the anterior chamber, where they are gradually absorbed in the course of about three weeks.

No other topical application is generally requisite, after the operation, than a small compress of fine linen; the patient ought to be kept in a quiet, dark room, and in bed. A dose of some mild purgative salt, such as the natron vitriolatum; magnesia vitriolata; soda phosphorata, &c. may usually be administered, with advantage, on the following morning, I shall not enlarge upon the method of treatment, when the inflammation, subsequent to couching, exceeds the ordinary bounds; in hypochondriacal, hysterical, and irritable constitutions, this is more frequently met with, and I have already touched upon the propriety of some preparatory measures, before couching such unfavourable subjects.

I cannot help remarking how judicious it is never to attempt too much at one time of couching. It happens in this, as in most other branches of operative surgery, that celerity is too often mistaken for skill: the operator should not only be slow and deliberate in achieving his purpose; he should be taught to consider, that a repetition of couching may, like the puncture of a vein, be safely and advantageously put into practice again and again; and with far greater security than if, for the sake of appearing expeditious, or avoiding the temporary semblance of failure, a bolder use of the couching needle should be made, than the delicate structure of the eye warrants. We read, in Mr. Hey's *Practical Observations on Surgery*, that he couched one eye seven times, before perfect success was obtained; had he been less heedful, and struggled to effect by one or two rough applications of the instrument, what he achieved by seven efforts of a gentler description, it is highly probable that the structure of the eye would have been so impaired, as well as the con-

sequent ophthalmy so violent, as to have utterly prevented the restoration of sight.

Critical Reflections on several important practical points relative to the Cataract, 1805. On the subject of Cataract consult particularly the writings of *Celsus, Pott, Hey, Daviel, Wenzel, Richter, Ware, and Scarpa.*

CATHETER (from καθιημι, to thrust into.) A tube which is introduced through the urethra into the bladder, for the purpose of drawing off the urine. (See *Urine, Retention of.*) Of course there are two kinds of catheters, one intended for the male, the other for the female urethra. The common catheter is a silver tube, of such a diameter as will allow it to be introduced with ease into the urethra, and of various figure and lengths, according as it is intended for the young or adult, the male or female, subject. A common male catheter, is ten or eleven inches long. In general, a large instrument of this kind, like a large bougie, will enter the bladder with more ease than a small one, because less likely to be entangled in the lacunæ of the urethra. One third of the male catheter, towards its point, should be moderately curved; the other two thirds, towards its handle, should be straight. The instrument, when gently curved, is found to be more easy of introduction than when it is very much bent. The female catheter is straight, excepting a slight curvature towards its point, and it is about six inches long.

The catheter, as it need not enter far into the neck of the bladder, though it should always be as big as the urethra will easily admit, should not, says John Bell, be long, and should have a very gentle and simple curve. (*Principles of Surgery. Vol.* 2, *p.* 193.)

The common flexible catheter is only a hollow bougie, and the elastic one contains in its composition elastic gum. The two last descriptions of catheters have the advantage of being less irritating to the urethra, and less apt to become covered with calculous incrustations, than silver tubes. They can also be frequently introduced when an inflexible metallic one will not pass.

Flexible catheters are now generally made of wove silk cylinders, covered with a coat of elastic gum. The best have hitherto been fabricated by M. Bernard, of Paris; but they are at present well manufactured by Mr. Walsh, of London. Their size and form vary, according to the age or sex of the patient. Bernstein, in his Dictionary of Surgery, gives the following account of this instrument, as it is fabricated in Germany: "One of the most useful inventions which have been made, with respect to these instruments, is to construct them of elastic gum, and the merit of this invention is to be ascribed, without doubt, to Theden. *Neue Bemerkungen u. Erfahrungen, &c. Th.* 2. *Berlin*, 1782. *p.* 143. They were afterwards improved by a silversmith at Paris, of the name of Bernard, who directed not to apply the dissolved elastic gum to a wire cylinder, as Theden had done, but to one made of knitted silk; and these catheters certainly deserve to be recommended in preference to all others. But with respect to their price, the elastic catheters, that are prepared by Pickel, of Wirzburg, (*Richter's Chir. Bibliothek.* B. 6, *p.* 512,) deserve particular recommendation. These consist of silk cylinders, plaited, or worked upon a probe, and afterwards covered with the following varnish: three parts of white-lead, minium, or sugar of lead, with boiled linseed oil, which is the common varnish used by cabinet-makers, mixed with one part of melted amber, and the same quantity of oil of turpentine. With this varnish he spreads the silk cylinders, and repeats this three times, as soon as the former coating has dried in the open air; after which he puts the catheters into a baker's oven 24 hours, when bread has been baked in it the last time, and when it retains the temp. of 60.70. Reaum. Here he lets them remain 10 or 12 hours. When he has taken the catheter out of the oven, he rubs the inequalities off with a little pumice-stone, sews up the end, cuts into it the oblong lateral aperture, and then spreads it 12 or 15 times more with the varnish. Every time, however, the catheter must be well dried in the open air, before the varnish is spread upon it again, and after every third coating which it has received, it must be put into the oven again, so that it must in all have received from 15 to 18 coatings with varnish, and have been laid five or six times in the oven. The end is smoothed off will oil. Each of these catheters costs a dollar." *Cyclopædia by Rees. Art. Catheter.*

Sometimes it is difficult to introduce the inflexible catheter, in consequence

of the urethra and neck of the bladder being affected with spasm. In this case a dose of opium should be administered, before a second attempt is made. When inflammation prevails in the passage, the introduction may often be facilitated by a previous bleeding.

The operation of introducing the catheter may be performed, either when the patient is standing up, sitting, or lying down.

In doing it, one of the most important maxims is, never to force forward the instrument, when it is stopped by any obstacle. If there are no strictures, the stoppage of the catheter is always owing to one of the following circumstances. Its beak may be pushed against the os pubis. This chiefly occurs when the handle of the instrument is prematurely depressed. Here the employment of force can obviously do no good, and may be productive of serious mischief. The back of the catheter may take a wrong direction, and push against the side of the urethra, especially at its membranous part, which it may dilate into a kind of pouch. In this circumstance, if force were exerted, it would certainly lacerate the urethra, and occasion a false passage. The end of the catheter may get entangled in a fold of the lining of the urethra, and here force would be equally wrong. Lastly, the point of the instrument may be stopped by the prostate gland, in which case force can be of no service, and may do great harm. Hence it is always proper to withdraw the instrument a little, and then push it gently onward in a different position.

The operation may be divided into three stages. In the first, the catheter passes, in the male subject, that portion of the urethra which is surrounded by the corpus spongiosum; in the second, it passes the membranous part of the canal, situated between the bulb and the prostate gland; and in the third, it enters this gland, and the neck of the bladder.

In the first stage, little trouble is usually experienced; for the canal is here so supported by the surrounding corpus spongiosum, that it cannot easily be pushed into the form of a pouch, in which the end of the instrument can be entangled. The operator need only observe the following circumstance: the penis should be held, by placing the corona glandis between the thumb and the index finger of the left hand: in this way the entrance of the urethra will not be at all compressed. The penis is then to be drawn upward: the catheter being well oiled, is now to be introduced, with the concavity towards the abdomen, into the urethra, directly downward, until its point reaches the bulb. As soon as this is accomplished, and the beak of the instrument has passed under the arch of the pubis, the surgeon must very slowly bring the handle of the catheter forwards, between the patient's thighs, and, as he is doing this, the beak of the instrument becomes elevated, and glides into the bladder. In this stage of the operation the penis must be allowed to sink down, and not be kept tense, as this would only drag the membranous part of the urethra against the os pubis, and render the passage of the instrument more difficult.

The operation, however, is not always successfully accomplished in this manner. The beak of the catheter may be stopped by the os pubis; it may take a wrong direction, so as to push the membranous part of the urethra to one side or the other; or it may be stopped by a fold of the lining of the passage.

The first kind of impediment is best avoided, by not depressing the handle of the catheter too soon; that is, before the point has passed beyond the arch of the pubis. When the membranous part of the urethra is pushed to one side or the other, the instrument ought to be withdrawn a little, and then pushed gently on in a different direction. When this expedient is unavailing, the index finger of the left hand may be introduced into the rectum, for the purpose of supporting the membranous part of the urethra, and finding the extremity of the catheter.

When the prostate gland is enlarged, the diameter of the urethra does not undergo any diminution as it passes through the diseased body; but it turns up very suddenly, just as it approaches the bladder. In such cases, the end of the catheter should be more bent upward, than the rest of its curvature.

In the third stage of the operation, the beak of the instrument has to pass the prostate gland and neck of the bladder. The principal obstacles to its passage, in this situation, arise from spasm of the neck of the bladder,

and from the instrument being pushed against the prostate gland. The first impediment may generally be obviated by waiting a few moments, and gently rubbing the perineum, before pushing onward the catheter. The hindrance, caused by the prostate, is best eluded by using an instrument the point of which is more curved than its other part. Sometimes the surgeon himself presses the prostate towards the os pubis, by means of his finger in the rectum, and thus prevents the passage of the catheter, by increasing the sudden curvature at this part of the urethra. Hence, as Richter observes, it is a very important maxim, never to introduce the finger so far into the rectum, as to press on the prostate gland itself.

When the catheter has turned round the pubis, and is just about to enter the neck of the bladder, is the critical moment, in which may be seen, whether a surgeon can or cannot pass a catheter; for, if he knows how to pass it, he suddenly, but not violently, changes its direction. He depresses the handle with a particular kind of address, and raises the point, which, as if it had suddenly surmounted some obstacle, starts into the neck of the bladder, and the urine bursts out in a jet from the mouth of the catheter.

Those, who are unskilful, press the tube forward, and persist, as they had begun, in drawing up the penis, on the supposition that by stretching this part they lengthen the urethra, and make it straight, whereas they elongate only that part of the canal, along which the catheter has already passed. (*John Bell's Principles of Surgery, Vol. 2. p.* 213.)

Mr. Ware passes the catheter in the following manner: the instrument being first thoroughly oiled, he introduces it into the urethra, with its convex part uppermost, and carries it as far as it will pass without using force. He then turns it *slowly* round, so as to bring its concave side uppermost; and in doing this he makes a large sweep with the handle of the instrument, and at the same time keeps his attention steadily fixed on its apex, which he takes particular care not to retract, nor to move from its first line of direction. When the catheter is turned, it must still be pressed onward, and its handle at the same time gently depressed. By this method, says Mr. Ware, it will be made to enter the bladder.

The catheter, made use of by Mr. Ware, is twelve inches long, which is more than an inch above the ordinary length; and the curvature is larger than common. With this instrument he has often succeeded, when with others of a different size and curvature it was not possible to succeed.

A great number of excellent modern surgeons prefer introducing the catheter as far as the perineum, as Mr. Ware does, with its convexity towards the abdomen. They then keep the point stationary while they make the handle describe a semicircular movement upward, so as to bring the concavity of the instrument towards the pubis. The catheter becomes situated just as it is in the other method.

Mr. Hey has offered some good practical remarks on the introduction of the catheter. If, says he, the point of the catheter be less turned than the urethra, the point will be pushed against the posterior part of the passage, instead of following the course of the canal. The posterior part of the urethra has nothing contiguous to it which can support it; and no considerable degree of force will push the point of the catheter through that part between the bladder and the rectum. If this accident is avoided, still the point will be pushed against the prostate, and cannot enter the bladder. Mr. Hey tells us, that the truth of this is illustrated, by the assistance which is derived, whenever the catheter stops at the prostate, from elevating the point of the instrument with a finger introduced in the rectum.

Mr. Hey takes notice of the impropriety of pushing forwards the point of the catheter, before its handle is sufficiently depressed, as the point would move in a horizontal direction, and be likely to rupture the posterior side of the urethra.

The difficulty, arising from the inflamed and dry state of the passage, Mr. Hey says, is greatly obviated by the previous introduction of a bougie well covered with lard.

In order to pass the catheter, Mr. Hey places his patient on a bed, in a recumbent posture, his breech advancing to, or projecting a little beyond, the edge of the bed. If the patient's feet cannot rest upon the floor, Mr. Hey supports the right leg by a stool, or by the hand of an assistant. The patient's head and shoulders are elevated

by pillows; but the lower part of the abdomen is left in a horizontal position. Mr. Hey commonly introduces the catheter with its convexity towards the abdomen, and having gently pushed down the point of the instrument, till it becomes stopped by the curvature of the urethra, under the symphysis pubis, he turns the handle towards the navel, pressing at the same time its point. In making the turn he sometimes keeps the handle at the same distance from the patient's abdomen, and sometimes makes it gradually recede; but, in either method, he avoids pushing forwards the point of the catheter any farther than is necessary to carry it just beyond the angle of the symphysis pubis. When he feels that the point is beyond that part, he pulls the catheter gently towards him, hooking, as it were, the point of the instrument upon the pubis. He then depresses the handle, making it describe a portion of a circle, the centre of which is the angle of the pubis. When the handle of the catheter is brought into a horizontal position, with the concave side of the instrument upwards, he pushes forwards the point, keeping it close to the interior surface of the symphysis pubis; for when passing in this direction, it will not hitch upon the prostate gland, nor injure the membranous part of the urethra.

If the surgeon uses a flexible catheter, covered with elastic gum, it is of great consequence to have the stilet made of some firm metallic substance, and of a proper thickness. Mr. Hey always makes use of brass wire for the purpose. If the stilet is too slender, the catheter will not preserve the same curvature during the operation; and it will be difficult to make the point pass upwards behind the symphysis pubis in a proper direction. If the stilet is too thick, it is withdrawn with difficulty.

When the stilet is of a proper thickness, this instrument has one advantage over the silver catheter, which is, that its curvature may be increased while it is in the urethra, which is often of great use, when the point approaches the prostate gland.

When the proper manœuvres with an inflexible catheter do not succeed, the surgeon must change it, taking a bigger or more slender one, with a greater or less curve, according to what observations he may have made in his first attempt. But if the catheter has been of a good form or commodious size, yet has not passed easily, he should, instead of choosing a rigid catheter of another size or form, take a flexible one for his second attempt. The flexible catheter is generally slender, and of sufficient length, and its shape may be accommodated to all occasions, and to all forms of the urethra; for, having a stiff wire, we can give that wire, either before or after it has passed into the catheter, whatever shape we please; and what is of still greater importance, we can introduce the instrument without, or with the wire, as circumstances may require; or what is more advantageous, we can introduce the wire particularly so as not quite to reach the point of the catheter, but to within two inches or a little more of this part, by which contrivance the point, if previously warmed, and wrought in the hand, has so much elasticity, that it follows the precise curve of the urethra, and yet has sufficient rigidity to surmount any slight resistance. If this too fail, and especially, if there be the slightest reason to suspect, that the resistance is not merely spasmodic, but arises from stricture near the neck of the bladder in a young man, or swelling of the prostate in an old one, we may take a small bougie, turn up the extremity of it with the finger and thumb, so as to make it incline towards the pubis, and allowing no time for the wax to be softened, pass it quickly down to the obstruction, turn it with a vertical or twisting motion, and make it enter the constricted part. On withdrawing it in about ten minutes or a quarter of an hour, the urine generally escapes, or the catheter may now be introduced. (*John Bell's Principles of Surgery, Vol. 2. p.* 215.)

Mr. Hey has found, that in withdrawing the stilet of an elastic gum catheter, the instrument becomes more curved; and he has availed himself of this information, by withdrawing the stilet, as he is introducing the catheter beyond the arch of the pubis, by which artifice the point is raised into the due direction.

Mr. Hey says, you may sometimes, though not always, succeed in introducing an elastic gum catheter, by using one which has acquired a considerable degree of curvature and firmness, by having had a curved stilet kept in it a long while. Introduce this without the

stilet, with its concavity, towards the abdomen, taking care not to push on the point of the instrument, after it has reached the symphysis pubis, until its handle is depressed into a horizontal position.

When it is necessary to draw off the urine frequently, and the surgeon cannot attend often enough for this purpose, a catheter must be left in the urethra, till an attendant, or the patient himself, has learnt the mode of introducing the instrument. (*Hey.*)

Mr. Hey imputes the formation of a false passage, or the rupture of the membranous part of the urethra, generally to the method of pushing forwards the catheter, before its handle has been depressed. In this manner the course of the instrument crosses that of the urethra, and the point of the catheter, pressing against the posterior side of the membranous part of the urethra, is easily forced through the coats of that canal. The want of the curvature in the catheter, and of sufficient bluntness in its point, greatly contribute to facilitate this injury. In this case the point of the instrument passes more readily into the wound, than onward along the urethra against the symphysis pubis. Without this pressure, the point is apt to recede, and not readily enter the membranous part of the urethra.

Mr. Hey surmounted a difficulty of this kind, by bending upwards the point of a silver catheter, so as to keep it more closely in contact with the anterior part of the urethra, and thereby pass over the wound made in the posterior side of the canal. In the instance alluded to, as it was necessary to leave an elastic gum catheter in the urethra, Mr. Hey procured some brass wire of a proper thickness, with which he made a stilet, and having given it the same curvature as that of the silver catheter, he introduced it about four hours after the preceding operation, and fixed it by tying it to a bag truss.

Mr. Hey sometimes succeeded by partly withdrawing the stilet, at the moment when he wished to increase the curvature of the catheter.

In an instance in which the urethra had suffered a violent contusion, Mr. Hey drew off the urine with a silver catheter of unusual thickness, after he had failed with instruments of a smaller bore. He suspected that the urethra was ruptured, and was obliged to raise the point of the catheter by a finger introduced into the rectum, and to use bleeding, purgatives, the warm bath and opium, before it could be made to pass. The elastic gum catheter was afterwards employed. It is an unsettled point, whether it is best to leave the catheter in the urethra, until the power of expelling the urine is regained, or to draw off the urine twice a day, and withdraw the catheter after each operation. Mr. Hey thinks that no general rule can be laid down; some patients cannot bear the catheter to remain introduced; others seem to suffer no inconvenience from it. On the whole, however, Mr. Hey commonly prefers removing the catheter. In this manner, he is of opinion, that the power of expelling the urine again is soonest acquired.

To one acquainted with anatomy, the introduction of the female catheter is exceedingly simple. From motives of regard to the sex, the instrument should always be passed without any exposure. The surgeon should hold the catheter in his right hand, while he introduces the forefinger of his left hand between the nymphæ so as to feel upon the upper surface of the passage the little papilla, which surrounds, and denotes to the touch, the precise situation of the orifice of the meatus urinarius. Holding the concavity of the catheter forward, the surgeon, guided by the forefinger of his left hand, is then to introduce the instrument upward into the bladder. (See *Urine, Retention of.*) (See *Hey's Practical Observations on Surgery. John Bell's Principles, Vol. 2. Ware on the Catheter. Richter's Anfangsgr. de Wundarzneykunst. Rees's Cyclopædia, art. Catheter.*)

CATHETERISMUS, (from καθετηρ the instrument.) A technical word, employed by P. Ægineta, to denote the operation of introducing the catheter.

CATULOTICA, (from κατελοω, to cicatrize.) Medicines, for healing wounds.

CAUSTICS, (from καιω, to burn.) *Caustica.* Medicines, which destroy parts by burning, or chemically decomposing them.

CAUTERIZATION, (from καυτηριαζω, to cauterize.) *Cauterisatio.* The burning any part with a cautery.

CAUTERY, (from καιω, to burn.) *Cauterium.* Cauteries are of two kinds; viz. *actual* and *potential.* By the first term is implied a heated iron; by the

second, surgeons understand any caustic application.

CELE, (from κηλεω, to swell out.) A tumour.

CELOTOMIA, (from κηλη, a tumour or hernia, and τεμνω, to cut.) This has two meanings; viz. the operation for a hernia, and castration.

CERATMALGAMA, (from κηρος, wax, and αμαλγαμα, a mixture.) A cerate.

CERATOTOME, (from κερας, a horn, and τεμνω, to cut.) This is the name which Wenzel has given to the knife, which he was in the habit of using to divide the cornea, or horny coat of the eye.

CERATE, (from κηρος, wax, the usual basis of its composition.) *Ceratum.* A composition rather harder than ointment, and softer than plaster.

In this work we need only mention a few particular ones.

CERATUM CALOMELANOS. ℞ *Calom.* ʒi. *Cerati Lapid. Calimin.* ℥ss. M.

Some practitioners are partial to this as a dressiug for chancres.

CERATUM CICUTÆ. ℞. *Unguenti Cicutæ* lbj. (See *Unguentum.*) *Spermatis Ceti* ℥ij. *Ceræ Albæ*, ℥iij. M. One of the formulæ at St. Bartholomew's Hospital, occasionally applied to cancerous, scrophulous, phagedenic, herpetic, and other inveterate sores.

CERATUM SABINÆ. ℞. *Sabinæ Recentis Contusæ, Ceræ Flavæ*, sing. lbj. *Adipis Suillæ*, lbiv. Mix the savin with the melted wax and hog's lard, and strain the composition.

This is the famous application for keeping open blisters, on the plan recommended by Mr. Crowther. We have noticed in the article *Blisters*, what he says on the subject in the last edition of his work.

CERATUM SAPONIS. *(L.)* ℞. *Lithargyri lævigati lib.* j. *Aceti cong.* j. *Saponis unc.* viij. *Olei olivæ. Ceræ. flavæ sing. lib.* j.

This is the *soap cerate* of St. Bartholomew's Hospital, and adopted by the College. In preparing it, the utmost caution must be used. The three first ingredients are to be mixed together and boiled gently till all the moisture is evaporated; after which the wax and oil, previously melted together, must be added. The whole composition, from first to last, must be incessantly and effectually stirred, without which the whole will be spoiled. This formula was introduced into practice by Mr. Pott, and is found to be a very convenient application in fractures, and also as an external dressing for ulcers; being of a very convenient degree of adhesiveness, and at the same time possessing the usual properties of a saturnine remedy.

In applying this cerate, spread on linen, in fractures of the leg or arm, one caution is necessary to be observed, namely, that it be in two distinct pieces; for if, in one piece, the limb be encircled by it, and the ends overlap each other, it will form a very inconvenient and partial constriction of the fractured part, in consequence of the subsequent tumefaction. *Pharm. Chirurg.*

CERCOSIS, (from κερκος, a tail.) An enlargement of the clitoris, which hangs from the vagina like a tail.

CEREBRUM. The brain; for concussion of; compression of, &c. see *Head, Injuries of.* For inflammation of, see *Phrenitis.* For hernia of, see *Hernia Cerebri.*

CERION, (from κηρος, wax.) A honey-comb. A small sore, with an orifice like the cell of a honey-comb.

CHALAZIUM, (from χαλαζα, a hail-stone.) This signifies a little tubercle on the eye lid, which has been whimsically supposed to resemble a hail-stone. It is the same as the hordeolum or stye. (See *Hordeolum.*)

CHANCRE, (from καρκινος, *cancer venereus.*) A sore which arises from the direct application of the venereal poison to any part of the body. Of course it almost always occurs on the genitals. Such venereal sores, as break out from a general contamination of the system, in consequence of absorption, never have the term *chancre* applied to them. (For an account of the nature and treatment of chancres, see *Venereal Disease.*)

CHARPIE, (French) Scraped linen, or lint.

CHEMOSIS, (from χαινω, to gape.) When ophthalmy or inflammation of the eye, is very violent, it frequently happens, that one or more vessels become ruptured on the side next the eye ball, and a quantity of blood is effused into the cellular membrane, which connects the conjunctiva with the anterior hemisphere of the eye. Hence, the conjunctiva becomes gra-

dually elevated upon the eye ball, and projects towards the eye lids, so as to conceal within it the cornea, which appears, as if it were depressed. (*Scarpa.*) In this way the middle of the eye assumes the appearance of a gap, or aperture.

When blood is extravasated under the tunica conjunctiva, there cannot be an easier or more effectual remedy than æther. A few drops are to be poured into the palm of the hand, and diffused over it, which may be immediately done by pressing the other hand against it. The hand is then to be applied to the eye, and kept so close to it, that the spirit, as it evaporates, may insinuate itself into the part affected, and act on the blood, so as to disperse it. (*Ware on Ophthalmy.*)

In a few instances of chemosis, in which the swelling and inflammation of the conjunctiva have been great, the following application has been found particularly beneficial, after free evacuations: ℞. *Interiorum foliorum recentium Lactucæ Sissilis*, ℥iij. *Coque cum Aq. Pur.* ℥ss. *In balneo mariæ pro semihora; tunc exprimatur succus, et applicetur paululum ad oculos et ad palpebras, sæpe in die.* (*Ware.*)

Ophthalmy, attended with chemosis, demands the most rigorous employment of the antiphlogistic treatment. Both general and topical bleedings should be speedily and copiously put in practice, with due regard however, to the age and strength of the patient. Leeches should be applied to the vicinity of the eye lids, or, what is preferable, the temporal artery should be opened. When the chemosis is very considerable, the distention of the conjunctiva may be relieved by making an incision into this membrance, near its junction with the cornea. (See *Ophthalmy.*)

CHILBLAINS are the effect of inflammation, arising from cold. A chilblain, in the mildest form, is attended with a moderate redness of the skin, and a sensation of heat and itching, all which symptoms, after a time, spontaneously disappear. In a more violent degree, the swelling is larger, redder, and sometimes of a dark blue colour; and the heat, itching, and pain, are so excessive, that the patient cannot use the part. In the third degree small vesicles arise upon the tumour, which burst and leave excoriations. These are soon converted into ill-conditioned sores, which sometimes penetrate even as deeply as the bone, discharge a thin ichorous matter, and generally prove very obstinate. The worst stage of chilblains is attended with sloughing.

Chilblains are particularly apt to occur in persons, who are in the habit of going immediately to the fire, when they come home in winter with their fingers and toes very cold; they are also particularly frequent in persons, who often go suddenly into the cold, while very warm. Hence, the disease most commonly affects parts of the body, which are peculiarly exposed to these sudden transitions; for instance, the nose, ears, lips, hands, and feet. Richter remarks that they are still more frequently occasioned, when the part, suddenly exposed to cold, is in a moist perspiring state, as well as a warm one. Young subjects are much more liable to this troublesome complaint than adults; and females brought up in a very delicate manner, are generally more afflicted, than the other sex.

The most likely plan of preventing chilblains is to accustom the skin to moderate friction: to avoid hot rooms and making the parts too warm; adapt the quantity and kind of clothing to the state of the constitution, so as to avoid extremes, both in summer and winter; to wash the parts frequently with cold water; to take regular exercise in the open air in all weathers; and to take particular care not to go suddenly into a warm room, or very near the fire, out of the cold air.

Although chilblains of the milder kinds are only local inflammations, yet they have some peculiarity in them, for they are not most benefited by the same antiphlogistic applications, which are most effectual in the relief of inflammation in general.

One of the best modes of curing chilblains of the milder kind is to rub them with snow, or ice-cold water, or to bathe them in the latter, several times a day, keeping them immersed each time, till the pain and itching abate. After the parts have been rubbed or bathed in this way, they should be well dried with a towel, and covered with flannel or leather socks.

This plan is perhaps as good a one as any; but it is not that which is always congenial to the feelings and caprice of patients; with the constitutions of some it may even disagree. In such cases, the parts affected may be rubbed

with spirit of wine, linimentum saponis, tinctura myrrhæ, or a strong solution of alum, or vinegar. A mixture of oleum terebinthinæ and balsamum copaivæ, in equal parts, is a celebrated application. A mixture of two parts of camphorated spirit of wine, and one of the aqua lithargyri acetati, has also been praised.

When chilblains have suppurated and ulcerated, the sores require stimulating dressings, such as lint dipped in a mixture of the aqua lithargyri acetati, and aqua calcis; in tinctura myrrhæ, or warm vinegar. If a salve be employed, one which contains the hydrargyrus nitratus ruber, is best. Ulcers of this kind frequently require being touched with the argentum nitratum, or dressed with a solution of it.

Chilblains, attended with sloughing, should be poulticed, till the dead parts are detached. The sores should then be first dressed with some mildly stimulating ointment, such as the unguentum resinæ flavæ. With this, in a day or two, a little of the hydrargyrus nitratus ruber may be mixed; but the surgeon should not venture on the employment of very irritating applications, till he sees what the parts will bear, and whether such will be requisite at all. Were he too bold, immediately he leaves off the poultices, he might even bring on sloughing again.

The reader may find a long list of applications for chilblains in Rees's Cyclopædia, article chilblains. See *also Richter's Anfangsgr. der Wundarzn. Band.* I.

CHIMNEY SWEEPER'S CANCER. See *Scrotum.*

CHORDEE, (French, from χορδὴ, a chord.) When inflammation is not confined merely to the surface of the urethra, but affects the corpus spongiosum, it produces in it an extravasation of coagulable lymph, as in the adhesive inflammation, which uniting the cells together, destroys the power of distention of the corpus spongiosum urethræ, and makes it unequal in this respect to the corpora cavenrosa penis, and therefore a curvature takes place at the time of an erection, which is called a *chordee.* The curvature is generally in the lower part of the penis. When the chordee is violent, the inner membrane of the urethra is so much upon the stretch, that it may be torn, and cause a profuse bleeding from the urethra, that often relieves the patient, and even sometimes proves a cure. (*Hunter on Venereal.*)

This is the *inflammatory* chordee; there is another kind, which has been named *spasmodic.*

In the beginning of the inflammatory chordee, bleeding from the arm is often of service: but it is more immediately useful to take away blood from the part itself by leeches; for we often find, that when a vessel gives way, and bleeds a good deal, the patient is greatly relieved. Relief may often be obtained by exposing the penis to the steam of hot water. Poultices have also beneficial effects; and both fomentations and poultices will often do more good when they contain camphor. Opium, given internally, is of singular service; and if it be joined with camphor, the effect will be still greater.

When the chordee continues, after all inflammation is at an end, no evacuations are required. The consequence of the inflammation will cease gradually by the absorption of the extravasated coagulating lymph. Mercurial ointment rubbed on the part will considerably promote this event. Cicuta has seemed to do considerable good, after the common methods of cure have not availed. Electricity may be of service. A chordee is often longer in going off, than any other consequence of a gonorrhœa, but it disappears at last.

Camphorated mercurial ointment is better than the simple unguentum hydrargyri, to bring about the removal of the extravasated lymph

The *spasmodic chordee* is very much benefited by bark. (*Hunter on the Venereal.*)

CHRONIC, (from χρονος, time.) *Chronicus.* Of long continuance; opposed to acute.

CHYMOSIS. See *Chemosis.*

CICATRISANTIA, (from *cicatrico,* to skin over.) Epulotic medicines, or such as dispose wounds and ulcers to heal, and become covered with skin.

CICATRIX. The scar remaining on the skin, after the healing of a wound or ulcer.

CICATRIZATION. The process by which wounds and sores heal. Granulations having been formed, the next object of nature is to cover them with skin. The parts which had receded by their natural elasticity, in consequence of the breach made in them now begin to be brought together, by

the contraction of the granulations. The contraction takes place in every point, but principally from edge to edge, which brings the circumference of the sore towards the centre, so that the sore becomes smaller and smaller, even although little, or no new skin is formed.

The contracting tendency is in some degree proportioned to the general healing disposition of the sore, and looseness of the parts. When granulations are formed upon a fixed surface, their contraction is mechanically impeded; as, for instance, on the skull, the shin, &c. Hence, in all operations on such parts, as much skin should be saved as possible.

When there has been a loss of substance, making a hollow sore, and the contraction of the granulations has begun, and made a good deal of progress, before they have had time to rise as high as the skin, then the edges of the skin are generally drawn down, and tucked in by it, in the hollow direction of the surface of the sore.

The contraction of the granulations continues, till the healing is complete; but it is greatest at first. That there is a mechanical resistance to such contraction, is proved by the assistance, which may be given to the process by the application of a bandage.

Besides the contractile power of the granulations, there is also a similar power in the surrounding edge of the cicatrizing skin, which assists the contraction of the granulations, and is generally more considerable than that of the granulations themselves, drawing the mouth of the wound together, like a purse. The contractile power of the skin is confined principally to the very edge, where it is cicatrizing, and, as Mr. Hunter believed, to those very granulations, which have already cicatrized; for, the natural or original skin surrounding this edge does not contract, or at least not nearly so much, as appears by its having been thrown into folds and plaits, while the new skin is smooth and shining,

The uses of the contraction of granulations are various. It facilitates the healing of a sore, as there are two operations going on at the same time, viz. contraction and skinning.

It avoids the formation of much new skin, the advantage of which is evident; for it is with the skin as with all other parts of the body, viz. that such as are originally formed are much fitter for the purposes of life, than those that are newly formed, and not nearly so liable to ulceration.

When the whole surface of a sore has skinned over, the substance, the remains of the granulations, on which the new skin is formed, still continues to contract, till hardly any thing more is left than what the new skin stands upon. This is a very small part, in comparison with the first formed granulations, and it in time loses most of its apparent vessels, becoming white and ligamentous. All new healed sores are at first redder than the common skin, but in time they become much whiter.

As the granulations contract, the surrounding old skin is stretched to cover the part, which had been deprived of skin.

When a sore begins to heal, the surrounding old skin, close to the granulations, becomes smooth, and rounded with a whitish cast, as if covered with something white. This, Mr. Hunter supposed to be a beginning cuticle, and it is as early and sure a symptom of healing as any. While the sore retains its red edge all round, for perhaps a a quarter, or half an inch in breadth, we may be certain it is not a healing one.

Skin is a very different substance, with respect to texture, from the granulations upon which it is formed; but it is not known, whether it is a new substance formed by the granulations, or a change in the surface of the granulations themselves.

The new skin most commonly takes rise from the surrounding old skin, as if elongated from it; but not always. In very large sores, but principally old ulcers, in which the edges of the surrounding skin have but little tendency to contract, and the cellular membrane underneath to yield, or the old skin to become drawn over the ulcerated surface, the nearest granulations do not acquire a cicatrizing disposition. In such cases, new skin forms in different parts of the ulcer, standing on the surface of the granulations, like little islands.

Whatever change the granulations undergo to form new skin, they are generally guided to it by the surrounding skin, which gives this disposition to the surface of the adjoining granulations.

The new formed skin is never so large as the sore was, on which it is formed, owing to the contraction of the granulations, and the yielding of the surrounding old skin. If the sore is situated where the adjoining skin is loose, as in the scrotum, then the contractile power of the granulations being quite free from obstruction, a very little new skin is formed; but if the sore is situated where the skin is fixed or tense, the new skin is nearly as large as the sore.

The new skin is at first commonly on the same level with the old. This however is not the case with scalds and burns, which frequently heal with a cicatrix, higher than the skin, although the granulations have been kept from rising higher than this part.

The new-formed cutis is neither so yielding nor so elastic as the original is; it is also less moveable. It gradually becomes, however, more flexible and loose. At first it is very thin and tender, but it afterwards become firmer and thicker. It is a smooth continued skin, not formed with those insensible indentations, which are observed in the natural or original skin, and by which the latter admits of any distention, which the cellular membrane itself will allow of.

This new cutis, and indeed all the substance which had formerly been granulations, is not nearly so strong, nor endowed with such lasting and proper actions, as the originally formed parts. The living principle itself is less active; for when an old sore breaks out, it continues to yield, till almost the whole of the new formed matter has been absorbed, or has mortified.

The young cutis is extremely full of vessels; but these afterwards disappear, and the part becomes white.

The surrounding old skin, being drawn towards the centre by the contraction of the granulations, is thrown into loose folds, while the new skin itself seems to be upon the stretch, having a smooth shining appearance.

The new cuticle is more easily formed from the cutis, than the cutis itself from granulations. Every point of the surface of the cutis is concerned in forming cuticle, so that this is forming equally every where at once: but the formation of the cutis is principally progressive from the adjoining skin.

The new cuticle is at first very thin, and rather pulpy than horny. As it becomes stronger, it looks smooth and shining, and is more transparent than the old cuticle.

The rete mucosum is later in forming than the cuticle, and in some cases never forms at all. In blacks who have been wounded, or blistered, the cicatrix is a considerable time before it becomes dark; and in one black, whom Mr. Hunter saw, the scar of a sore, which had been upon his leg when young, remained white when he was old. Many cicatrices of blacks, however, are even darker than any other parts of the skin. (*Hunter on the Blood, Inflammation, &c.*)

CILLOSIS, (from *cilium*, the eyelid.) A spasmodic trembling of the eyelids.

CIONIS, (from κιων, the uvula.) A diseased and painful enlargement of the uvula.

CIRCUMCISION, (from *circumcido*, to cut round.) The operation of cutting off a circular piece of the prepuce, sometimes practised in cases of phymosis. (See *Phymosis.*)

CIRSOCELE, (from κιρσος, a varix, and κηλη, a tumour.) The cirsocele is a varicose distention and enlargement of the spermatic vein; and whether considered on account of the pain, which it sometimes occasions, or on account of a wasting of the testicle, which, now and then follows it, may truly be called a disease. It is frequently mistaken for a descent of a small portion of omentum. The uneasiness which it occasions, is a dull kind of pain in the back, generally relieved by suspension of the scrotum. It has been resembled to a collection of earthworms; but whoever has an idea of a varicose vessel, will not stand in need of an illustration by comparison. It is most frequently confined to that part of the spermatic process, which is below the opening in the abdominal tendon; and the vessels generally become rather larger, as they approach the testis. Mr. Pott never knew any good effect from external applications of any kind.

In general the testicle is perfectly unconcerned in, and unaffected by, this disease; but it sometimes happens, that it makes its appearance very suddenly, and with acute pain, requiring rest and ease; and sometimes after such symptoms have been removed, Mr. Pott has seen the testicle so wasted as hardly to be discernible. He has also observed the same effect from the injudicious application of a truss to a true cir-

socele; the vessels, by means of the pressure, became enlarged to a prodigious size, but the testicle shrunk to almost nothing. (*Pott's Works, Vol.* 2.)

The cirsocele is more frequently than any other disorder, mistaken for an omental hernia. As Mr. Astley Cooper remarks, when large it dilates upon coughing; and it appears in an erect, and retires in a recumbent, posture of the body. There is only one sure method of distinguishing the two complaints: place the patient in a horizontal posture, and empty the swelling by pressure upon the scrotum; then put the fingers firmly upon the upper part of the abdominal ring, and desire the patient to rise; if it is a hernia, the tumour cannot reappear, as long as the pressure is continued at the ring; but if a cirsocele, the swelling returns with increased size, on account of the return of blood into the abdomen being prevented by the pressure. (*A. Cooper on Inguinal Hernia.*)

The cirsocele can generally only be palliated, and seldom radically cured. When the complaint is attended with pain, cold saturnine, and alum, lotions may be applied to the testicle and spermatic cord. At the same time, blood should be repeatedly taken away by means of leeches: the bowels should be kept gently open; the patient should be placed in a horizontal posture; and the testicle should be supported in a bag-truss.

In general, the patient only finds it necessary to keep up the testicle by this kind of suspensory bandage.

Gooch, and other writers, have related cases of cirsocele, in which the pain was so intolerable and incurable, that nothing but castration could afford the patient any relief.

CIRSOS, (from κιρσοω, to dilate.) A varix, or preternatural distention of any part of a vein.

CLAUDICATIO, (from *claudico*, to halt.) Halting or limping.

CLAVICLE, (*dim.* of *clavis*, a key.) *Clavicula* or *Claviculus*. The collarbone, so named from its likeness to an ancient key. (See *Dislocations* and *Fractures*.)

CLITORISMUS, (from κλειτορις, the clitoris.) A morbid enlargement of the clitoris.

CLUNESIA, (from *clunes*, the buttocks.) An inflammation of the buttocks.

CLYSTER, (from κλυζω, to cleanse,) *Clysma*, *Clysterium*. An enema, or liquid injected into the anus. (See *Enema*.)

COALESCENCE, (from *coalesco*, to grow together.) *Coalescentia*. The union or growing together of parts, which before were separated.

CODOCELE, (from κοδια, a bulb, and κηλη, a tumour.) A bubo.

CŒLOMA, (from κοιλος, hollow.) A round hollow ulcer on the cornea.

COLLISION, from *collido*, to beat together.) When any part of the body, and some hard substance are driven at the same time against each other, a collision is said to take place.

COLLOBOMA, (from κολλαω, to glue together.) An adhesion between the eyelids.

COLLUTORIUM, (from *colluo*, to cleanse.) A gargle, or wash for the mouth.

COLLUVIES, (from *colluo*, to cleanse.) The discharge from an old sore.

COLLYRIS, (κολλυρις, a little round cake.) A lump, caused by a blow.

COLLYRIUM, (from κωλυω, to restrain, because it stops the inflammation.) An application to the eyes, and generally an eye water.

The following are some of the most useful collyria.

COLLYRIUM ALUMINIS. ℞. Aluminis purif. ℈j. Aq. rosæ ℥vj. This is a good astringent collyrium, employed at Guy's Hospital.

COLLYRIUM AMMMONIÆ ACETATÆ. ℞. Aq. ammon. acet. Aq. rosæ ℥j. M.

COLLYRIUM AMMONIÆ ACETATÆ CAMPHORATUM. ℞. Collyrii ammon. acet. Misturæ camphoratæ sing. ℥ij. M.

COLLYRIUM AMMONIÆ ACETATÆ OPIATUM. ℞. Collyrii ammon. acet. ℥iv. Tinct. opii. gutt. xl. M.

COLLYRIUM CUPRI VITRIOLATI CAMPHORATUM. ℞. Aq. Cupri vitriolati camphoratæ ʒij. Aq. distillatæ ℥iv. M. Recommended by Mr. Ware, for the purulent ophthalmy of children.

COLLYRIUM HYDRARGYRI MURIATI. ℞. Hydrarg. muriati grss. Aq. distillat. ℥iv. M. This collyrium is fit to be employed, after the acute stage of the ophthalmy has for some time subsided, and it will disperse many superficial opacities of the cornea.

COLLYRIUM LITHARGYRI ACETATI. ℞. Aq. distillatæ ℥iv. Aq. litharg. acet. gutt. x. M.

COLLYRIUM ZINCI VITRIOLATI. Zinci vitriol. gr. v. Aq. distillatæ ℥iv. M. This is the most common collyrium of all: it may be gradually made stronger.

COLLYRIUM ZINCI VITRIOLATI CUM MUCILAGINE SEMINIS CYDONII MALI. ℞. Aq. plantaginis ℥iv. zinci vitriol. gr. v. et mucil. sem. cydon. mal. ℥ss. M.

In order to check the morbid secretion from the eyelids, in cases of fistula lachrymalis, or what Scarpa calls *il flusso palpe brale puriforme*, this celebrated Professor recommends a few drops of the above collyrium to be insinuated between the eyelids and eye.

COLPOCELE, (from κολπος, the vagina, and κηλη, a tumour.) A tumour, or hernia situated in the vagina.

COLPOPTOSIS, (from κολπος, the vagina, and πιπτω, to fall down.) A bearing or falling down of the vagina (See *Vagina, Prolapsus of.*)

COMA, (from κω or κειω, to lie down.) Anciently any total suppression of the powers of sense; but now it means a lethargic drowsiness. It is a symptom of several surgical disorders.

COMATOSE. *Comatosus.* Lethargic.

COMMINUTED, (from *comminuo*, to break in pieces.) A fracture is termed *comminuted*, when the bone is broken into several pieces.

COMPRESS, (from *comprimo*, to press upon.) *Compressa.* A compress. Folded linen, lint, or other materials, making a sort of pad, which surgeons place over those parts of the body on which they wish to make particular pressure, and for this purpose, a bandage is usually applied over the compress Compresses are also frequently applied to prevent the ill effects, which the pressure of hard bodies, or tight bandages, would otherwise occasion.

COMPRESSION OF THE BRAIN. (See *Head, Injuries of.*)

CONCUSSION, (from *concutio*, to shake together.) *Concussio.* A concussion, or shock.

CONCUSSION OF THE BRAIN. (See *Head, Injuries. of.*)

CONDUCTOR, (from *conduco*, to guide.) A surgical instrument for directing the knife in certain operations. It is more commonly called a *director.*

CONDYLOMA, (from κονδυλος, a tubercle, or knot.) A small very hard tumour. The term is generally applied to excrescences of this description about the anus. The practitioner may either destroy them with the lapis infernalis, tie their base with a ligature, so as to kill them, or remove them at once, with a knife: the first is generally the worst; the last the best and most speedy method.

CONGESTION, (from *congero*, to amass.) *Congestio.* A collection of pus, particularly one of the chronic kind.

CONGLUTINANTIA, (from *conglutino*, to glue together.) Such medicines as heal and unite parts.

CONSTIPATION, (from *constipo*, to crowd together.) *Constipatio.* Costiveness.

CONTRA-APERTURA, (from *contra*, against, and *aperio*, to open.) A counter-opening. An opening made opposite to one that already exists.

CONTRA-FISSURA, (from *contra*, against, and *findo*, to cleave.) A crack in the skull opposite to the part on which the blow was given.

CONTUSED WOUNDS. See *Wounds.*

CONTUSION, (from *contundo*, to bruise.) *Contusio.* A bruise.

Slight bruises seldom meet with much attention; but when they are severe, very bad consequences may ensue, and these are the more likely to occur, when such cases are not taken proper care of.

In all severe bruises, besides the inflammation which the violence necessarily occasions, there is an instantaneous extravasation, in consequence of the rupture of many of the small vessels of the part. In no other way can we account for those very considerable tumours, which often rise immediately after injuries of this nature. The black and blue appearance, instantly following many bruises, can only be explained by their being an actual effusion of blood from the small vessels, which had been ruptured. Even large vessels are frequently burst in this manner, and very considerable collections of blood are the consequence. Blows on the head very often cause a large effusion of blood under the scalp I have seen four or five ounces thus extravasated.

Besides the rupture of an infinite number of small vessels and extravasation, which attend all bruises, in a greater or less degree, the tone of the fibres and vessels which have suffered contusion, is considerably disordered. Nay, the violence may have been so

great, that the parts are from the first deprived of vitality, and must slough.

Parts at some distance from such as are actually struck, may suffer greatly from the violence of the contusion. This effect is what the French have named a *contre-coup*.

The bad consequences of bruises are not invariably proportioned to the force which has operated; much depends on the nature and situation of the part. When a contusion takes place on a bone, which is thinly covered with soft parts, the latter always suffer very severely, in consequence of being pressed, at the time of the accident, between two hard bodies. Hence, bruises of the shin so frequently cause sloughing and troublesome sores. Contusions affecting the large joints are always serious cases; the inflammation occasioned is generally obstinate, and abscesses and other diseases, which may follow, are consequences truly enough to excite alarm.

In the treatment of bruises, the practitioner has three indications, which ought successively to claim his atten in the progress of such cases.

The first is to prevent and diminish the inflammation, which, from the violence done, must be expected to arise. The bruised parts should be kept perfectly at rest, and be covered with linen, constantly wet with the lotio aq. litharg. acet. When there are muscles bruised, they are to be kept in a relaxed position, and never used.

If the bruise should have been very violent, it will be proper to apply leeches, and this repeatedly, and even, in some cases, particularly, when joints are contused, to take blood from the arm. In every instance, the bowels should be kept well open with saline purgatives.

A second object in the cure of contusions, is to promote the absorption of the extravasated fluid by discutient applications. These may at once be employed in all ordinary contusions, not attended with too much violence; for then nothing is so beneficial as maintaining a continual evaporation from the bruised part, by means of the cold saturnine lotion, and, at the same time, repeatedly applying leeches. In common bruises, however, the *lotio salis ammoniaci* (See *this article*) is an excellent discutient application; but most surgeons are in the habit of ordering liniments for all ordinary contusions, and certainly they do so much good in accelerating the absorption of the extravasated blood, that the practice is highly praiseworthy. The linimentum saponis or the linimentum camphoræ, are as good as any that can be employed. (See *Linimentum.*)

In many cases, unattended with any threatening appearances of inflammation, but in which there is a good deal of blood and fluid extravasated, bandages act very beneficially, by the remarkable power which they have of exciting the action of the lymphatics, by means of the pressure which they produce.

A third object in the treatment of contusions, is to restore the parts to their proper tone. Rubbing the parts with liniments has a good deal of effect in this way. But, notwithstanding such applications, it is often observed, that bruised parts continue for a long while weak, and even swell, and become œdematous, when the patient takes exercise, or allows them to hang down, as their functions in life may require. Pumping cold water two or three times a day, on a part thus circumstanced, is the very best measure which can be adopted. A bandage should also be worn, if the situation of the part will permit. These steps together with perseverance in the use of liniments, and in exercise gradually increased, will soon bring every thing into its natural state again.

CORNEA TUNICA, (from *cornu*, a horn.) The anterior transparent convex part of the eye, which in texture is tough, like horn. *Opacities of.*—Opacity of the cornea is one of the worst consequences of obstinate ophthalmy. Scarpa distinguishes the superficial and recent species of opacity from the *albugo* and *leucoma*, (see *these words*,) which are not in general attended with inflammation, assume a clear colour, affect the very substance of the cornea, and form a dense speck upon this coat of the eye. The *nebula*, or slight opacity, here to be treated of, is preceded and accompanied by chronic ophthalmy; it allows the iris and pupil to be discerned through a kind of cloudiness, and consequently does not entirely bereave the patient of vision, but permits him to distinguish objects, as it were, through a mist. The nebula is an effect of protracted or illtreated chronic ophthalmy. The veins of the conjunctiva, much relaxed by the long continuance of the inflammation, become pre-

ternaturally turgid and prominent; afterwards they begin to appear irregular and knotty, first in their trunks, then in their ramifications, near the union of the cornea with the sclerotica, and lastly in their most minute ramifications, returning from the delicate layer of the conjunctiva, spread over the cornea. It is only, however, in extreme relaxation of the veins of the conjunctiva, that these very small branches over the cornea become enlarged.

When this happens, some reddish streaks begin to be perceptible, in the interspaces of which, very soon afterwards, a thin milky albuminous fluid is effused, which dims the diaphanous state of the cornea. The whitish, delicate, superficial speck, thence resulting, forms precisely what is termed, *nebula*, or that kind of opacity here to be considered. And since this extravasation may happen only at one point of the cornea, or in more places, the opacity may be in one speck, or in several distinct ones, but which all together diminish, more or less, the transparency of this membrane.

The cloudiness of the cornea, which sometimes takes place in the inflammatory stage of the violent acute ophthalmy, essentially differs from the species of opacity expressed by the term *nebula*. The first is a deep extravasation of coagulating lymph into the internal cellular texture of the cornea, or else the opacity proceeds from an abscess between the layers of this membrane about to end in ulceration. On the other hand, the nebula forms slowly upon the superficies of the cornea, in the long protracted chronic ophthalmy; is preceded first by a varicose enlargement of the veins in the conjunctiva, next of those in the delicate lamimina of this tunic, continued over the front of the cornea; and finally, it is followed by an effusion of albuminous lymph into the texture of this thin layer, expanded over the transparent part of the eye. This effusion never elevates itself in the shape of a pustule. Wherever the cornea is affected with the species of opacity, termed *nebula*, the part of the conjunctiva, corresponding to it, is constantly occupied by a network of varicose veins, more knotty and prominent than other vessels of the same description, and though the cornea be clouded at more points than one, there are distinct corresponding fasciculi of varicose veins in the white of the eye. Scarpa injected an eye affected with chronic ophthalmy, and *nebula*, and he found that the wax easily passed, both into the enlarged veins of the conjunctiva, and of that part of the surface of the cornea where the opacity existed; the inosculations all round the margin of the cornea were beautifully variegated, without trespassing that line, which bounds the sclerotica, except on that side, where the cornea was affected with this species of opacity.

This kind of opacity of the cornea, from its very origin, requires an efficacious plan of treatment; for though at first it may only occupy a small portion of the cornea, when left to itself it advances towards the centre of this membrane, and the ramifications of the dilated veins upon this coat growing still larger, at length convert the delicate continuation of the conjunctiva upon the surface of the cornea, into a dense opaque membrane, obstructing vision, either partially or totally.

The curative indication in this disease is to make the varicose vessels resume their natural diameters, or if that be impracticable, to cut off all communication between the trunk of the most prominent varicose veins of the conjunctiva, and the ramifications coming from the surface of the cornea, the seat of the opacity. The first mode of treatment is executed by means of topical astringents and corroborants, especially Janin's ophthalmic ointment, and success attends it, when the opacity is in an early state, and not extensive. But when advanced to the centre of the cornea, the most infallible treatment is the excision of the fasciculus of varicose veins near their ramifications, that is, near the seat of the opacity. By means of this excision, the blood retarded in the dilated veins of the cornea is voided; the varicose veins of the conjunctiva have an opportunity to contract and regain their tone, no longer having blood impelled into them; and the turbid secretion effused in the texture of the layer of the conjunctiva continued over the cornea, or in the cellular substance, connecting these two membranes, becomes absorbed. The celerity, with which the nebula disappears, after this operation, is surprising, commonly in twenty-four hours. The extent, to which the excision of the varicose veins of the conjunctiva must be performed, depends upon the

extent of the opacity of the cornea. Thus, should there be only one set of varicose vessels, corresponding to an opacity of moderate extent, it is sufficient to cut a portion of them away. Should there appear several dim specks upon the cornea, with as many distinct sets of varicose vessels, arranged round upon the white of the eye, the surgeon must make a circular incision into the conjunctiva, near the margin of the cornea, by which he will certainly divide every plexus of varicose vessels. But let it be observed, that a simple incision through the varicose vessels is not permanently effectual in destroying all direct communication between the trunks and ramifications of these vessels upon the cornea, after such an incision made, for instance, with a lancet; though it be true that a separation of the mouth of the divided vessels follows in opposite directions, it is no less true, that in the course of a few days after the incision, the mouths of the same vessels approximate each other, and inosculate, so as to resume their former continuity. Hence, to derive from this operation all possible advantage, it is essential to extirpate with the knife a small portion of the varicose plexus, together with the adherent particle of the tunica conjunctiva.

To do this operation properly, the plan of passing a needle threaded with silk through the varicose plexus is to be dispensed with. The eyelids are to be separated from the affected eye by a skilful assistant, who is, at the same moment, to support the patient's head upon his breast. The surgeon is then to take hold of the varicose vessels, with a pair of small forceps, near the edge of the cornea, and to lift them a little up, which the lax state of the conjunctiva renders easy; then, with a pair of small curved scissars, he is to cut away the plexus of varicose vessels, together with a small piece of the conjunctiva, making the wound of a semilunar form, and as near as possible to the cornea. If it should be necessary to operate upon more than one plexus of varicose vessels, situated at some distance apart, the surgeon must elevate them one after the other with the forceps, and remove them. But when they are very close together, and occupy every side of the eye, he must make an uninterrupted circular incision into the conjunctiva, guiding it closely to the margin of the cornea all round, thus dividing, with the conjunctiva, all the varicose vessels.

This being done, he may allow the cut vessels to bleed freely; even promoting the hemorrhage by fomenting the eyelids, until the blood discontinues to flow. Then the eye is to be covered with an oval piece of the emplastrum saponis, and a retentive bandage. The eye ought not to be opened till twenty-four hours after the operation, when, usually, the opacity of the cornea will be found completely dispersed; for during the ensuing days, the patient is to be enjoined to keep the eye shut, and covered with a bit of fine rag. A collyrium of milk and rose-water warm, may be applied two or three times a day. It is worthy of observation, when the inflammation of the conjunctiva happens, about the second or third day after the operation, particularly in cases in which the incision is made all round, that while the greater part of the sphere of the eye reddens, a whitish circle, in the place of the incision, forms a line of boundary to the redness which does not extend further upon the cornea. This inflammation of the conjunctiva, with the aid of internal antiphlogistic remedies, and topical emollients, abates in a few days, and then pus is secreted along the track of the incision in the conjunctiva. The wound contracts, and growing smaller and smaller, soon cicatrizes. Bathing the eye with warm milk and rose-water is the only local treatment necessary in this state of the complaint.

Thus not only the transparency of the cornea is revived, but also the preternatural laxity of the conjunctiva is diminished, or even removed. When afterwards the conjunctiva appears yellowish and wrinkled, the use of topical astringents and corroborants, and of Janin's ophthalmic ointment, will yet prove highly beneficial, in preventing the recurrence of the varicose state of the vessels. (*Scarpa sulle malattie degli occhi.*)

For other opacities of the cornea refer particularly to *Albugo*, *Leucoma*, and *Staphyloma*.

CORNEA, *Ulcer of.* This is a very common consequence of the bursting of a small abscess, which not unfrequently forms beneath the delicate layer of the conjunctiva continued over the cornea, or in the very substance of the cornea itself, after violent ophthal-

my. At other times, the ulcer of the cornea is produced by the contact of corroding matter, or sharp-pointed bodies insinuated into the eyes, such as quick lime, pieces of glass, or iron, thorns, &c. The little abscess of the cornea is attended with the same symptoms, as the severe acute ophthalmy; especially with a troublesome sensation of tension in the eye, eyebrow, and nape of the neck; with ardent heat; copious secretion of tears; aversion to light; intense redness of the conjunctiva, particularly near the point of suppuration. The inflammatory pustule, compared with similar ones, in any other part of the body, is slow in bursting after the matter is formed. Experience has nevertheless evinced, that it is improper to puncture the small abscess; for, though it assumes the appearance of being perfectly maturated, the matter contained in it, is so tenacious, and adherent to the substance of the cornea, that not a particle issues out of the artificial aperture, and the wound exasperates the disease, increases the opacity of the cornea, and often occasions another small abscess to form in the vicinity of the first. The safest plan, in this case, is to temporize, until the pustule spontaneously bursts, promoting it by means of frequent fomentations, bathing the eye with warm milk and water, and applying emollient poultices. The spontaneous bursting of the little abscess is usually denoted by a sudden increase of all the symptoms of ophthalmy: particularly by an intolerable burning pain at the point of the cornea, where the abscess first began, greatly increased by motion of the eye, or eyelid. The event is confirmed by ocular inspection, and at the spot where the white pustule existed, a cavity appears, as may best be seen, when the eye is viewed in the profile. Extraneous bodies in the eye, which have simply divided a part of the cornea, or lodged in it, when soon extracted, do not in general cause ulceration, as the injured part heals by the first intention. Those which destroy, or burn the surface of this membrane, or which, when lodged, are not soon extracted, excite acute ophthalmy, suppuration at the injured part, and at length ulceration.

The ulcer of the cornea has this, in common with all solutions of continuity in the skin, where it is delicate, tense, and endowed with exquisite sensibility, that, at its first appearance, it is of a pale ash-colour; has its edges high, and irregular; creates sharp pain; discharges, instead of pus, an acrid serum, and tends to spread widely and deeply. Such is the precise character of ulcers upon the cornea, and such is that of those upon the nipples of the mammæ; the glans penis; lips; apex of the tongue; the tarsi; the entrance of the meatus auditorius externus; nostrils; &c. Ulcers of this description, neglected, or ill-treated, speedily enlarge, make their way deeply, and destroy the parts in which they are situated. If they spread superficially upon the cornea, the transparency of this membrane is destroyed; if they proceed deeply, and penetrate the anterior chamber of the aqueous humour, this fluid escapes, and a fistula of the cornea may ensue; and if it should form a larger opening in it, besides the exit of the aqueous humour, it occasions another more grievous malady than the ulcer itself, namely, a prolapsus of a portion of the iris; an escape of the crystalline lens and vitreous humour, in short, a total destruction of the whole organ of sight. This afflicting accident is not unfrequent, in consequence of acute ophthalmy from gonorrhea, when neither internal nor external means avail, to arrest the progress of ulceration. It is therefore of the highest importance, as soon as an ulcer appears upon the cornea, to impede its growing larger, as much as the nature of it will permit; the morbid process should be converted into a healing one, and the surgeon must exert his skill with more attention, the more extensive and deep the ulceration has proceeded. The cicatrix of a large ulcer impairs the texture of the cornea so much, that the injury is irreparable.

They, who inculcate, that no external application can be adopted with benefit, for the cure of this disease, before the acute ophthalmy has been subdued, or, at least, diminished, are, in Scarpa's opinion deceived. Experience teaches, that local remedies ought, in the very first instance, to be applied to the ulcer, such as are appropriate to lessen the increased morbid irritability, and stop the destructive process going on; afterwards such means should be taken, as will cure the ophthalmy, if it does not subside gradually, as the ulcer heals. It is a fact, confirmed by repeated observa-

tion, that it is the ulcer which keeps up the ophthalmy, not the ophthalmy the ulcer.*

On opening the little abscess of the cornea, it is true the symptoms of acute ophthalmy become aggravated; the redness of the conjunctiva is increased, as well as the turgid state of its vessels; but it is equally certain, that it happens from no other cause, than an increased inflammation in the part, in consequence of the augmented sensibility in the ulcerated spot of the cornea. As soon as this increase of sensibility in the ulcer of the cornea ceases, or abates, in violence, the ophthalmy retreats with equal speed, and, finally, when the ulcer heals, the inflammation vanishes gradually, or, at most, requires only the use of an astringent, and corroborant collyrium, for a few days. Analogous examples every day occur in practice, in ulcers of other parts, besides the cornea; particularly in little foul ulcers on the inside of the lips, on the apex of the tongue, on the nipples, on the glans penis, which, as was described above, at their first appearance, assume an ash-coloured surface, excite inflammation of the part in which they are seated, and cause a very troublesome itching and ardent heat in the part affected. To subdue this inflammation, we do nothing more, and the vulgar do the same, than repel the excessive irritability in these ulcers, and convert the ulcerative process into cicatrization. This done, the surrounding inflammation immediately disappears of itself.

The resource of art, productive of such speedy and such good effects, in these cases, is the caustic. It immediately destroys the naked extremities of the nerves in the ulcerated part, and soon removes that diseased irritability prevalent in the part affected; it converts the ash-coloured surface of the ulcer, and the serous discharge upon it, into an eschar and scab, which, as a kind of epidermis, moderates the contact of the neighbouring parts upon the ulcer, and at length, converts the process of ulceration into that of granulation and cicatrization.

To cauterize the ulcer of the cornea, the caustic to which Scarpa gives the preference, is the argentum nitratum. It must be scraped to a point, like a crayon pencil, and the eye lids being opened perfectly, and the upper eye lid suspended, by means of Pellier's elevator, the ulcer of the cornea is to be touched with the apex sufficiently to form an eschar. Should any of the caustic dissolve in the tears, the eye must be copiously bathed with warm milk. At the instant the caustic is applied, the patient complains of a most acute pain; but this aggravation is amply compensated, by the ease experienced a few minutes after the operation: the burning heat of the eye ceases, as it were, by a charm; the eye and eye lids become capable of motion without pain; the flux of tears and the turgidity of the vessels of the conjunctiva decrease: the patient can bear a moderate light, and enjoys repose. These advantages last while the eschar adheres to the cornea.

On the separation of the eschar, sometimes at the end of two, three, or four days after the application of the caustic, the primary symptoms of the disease recur, especially the smarting and burning pain at the ulcerated part of the cornea; the effusion of tears; the restraint in moving the eye and eye lids; and the aversion to light; but all these inconveniences are less in degree than before. At their recurrence, the surgeon, without delay, must renew the application of the argentum nitratum, making a good eschar, as at first, upon the whole surface of the ulcer, which will, as before, be followed by perfect ease in the eye. The application of the caustic is, if required, to be repeated a third time, that is, if upon the separation of the eschar, the extreme irritability in the ulcer is not exhausted, and its progressive mischief checked. When the case goes on favourably, it is a constant phenomenon in the cure of this disease, that, at every separation of the eschar, the diseased sensibility of the eye is decreased, the ulcer also, abandoning its pale ash-colour, assumes a delicate fleshy tint, a certain sign that the destructive process which prevailed, is turned into a healing one.

* Except the case, in which the ulcer makes its appearance in the height of a severe ophthalmy; here the first indication is to abate inflammation, before attempting to heal the ulcer.

The turgid state of the vessels of the conjunctiva, and the degree of ophthalmy, disappears, in proportion as the ulcer draws near to a cure. At this epoch, when the formation of granulations has begun, the surgeon would act very wrongly, did he continue longer the use of the argentum nitratum; it would now reproduce pain, effusion of tears, and inflammation in the eye; and the ulcer would take on that foul ash-coloured aspect, with swelled and irregular edges, which it had at the beginning. Platner has noticed this fact. *Necesse est, ut hoc temperatâ manu, nec crebrius fiat, ne nova inflammatio, novaque lachryma hic acrioribus concitetur. Inst. Chirurg.* § 314. As soon as ease is felt in the eye, and granulations begin to rise, whether after the first, second, or third application of the caustic, the surgeon must refrain from the use of every strong caustic, and use no other application than the vitriolic collyrium. ℞ *Zinci Vitriol. gr.* iv. *in Aq. Rosæ* ℥iv *cum* ʒss *mucil. Sem. Cydon. mali. M.* To be used every two hours, defending the eye, in the intervals, from the contact of the air and light, by means of a slight compress, and retentive bandage. In cases in which, besides the ulcer of the cornea, a slight relaxation of the conjunctiva remains, Janin's ointment, towards the end of the treatment, introduced between the eye and eye lids, morning and evening, proves extremely serviceable. It must be qualified in strength and quantity to the particular sensibility of the patient.

To cure those superficial excoriations of the cornea, which make no incavation in the substance of this membrane, and which, in reality, are only a detachment of the cuticle, covering the layer of the conjunctiva continued over the cornea, the use of caustic is not requisite. The above vitriolic collyrium, combined with the mucilage, is sufficient. The symptoms which accompany such slight excoriations, or detachments of the cuticle, are unimportant, and when the patient takes care to bathe his eye, every two or three hours, with the solution of vitriol, and to avoid too much light, and the impression of the atmosphere, they soon get well.

Thus far of the ulcer of the cornea, and the best mode of curing it in ordinary cases. However, sometimes, in consequence of ill treatment, the ulcer, already very extensive, assumes the form of a fungous excrescence upon the cornea, appearing to derive its nourishment from a band of blood-vessels of the conjunctiva; and, on this account, it occasions, not unfrequently, a serious mistake in being taken for a real pterygium. Left to itself, or treated with slight astringents, it produces, in general, a loss of the whole eye. It requires the speedy adoption of some active and efficacious plan, to destroy all the fungus upon the cornea, to annihilate the vessels of the conjunctiva tending to it, and to impede the progress of ulceration. This consists first in cutting away the fungus, with a pair of small scissars, to a level with the cornea, continuing the incision far enough upon the conjunctiva, to remove, with the excrescence, that string of blood-vessels, from which it seems to derive its supply. Having effected this, and allowed the blood to flow freely, it is proper to apply the argentum nitratum to all the space of the cornea, which appears to have been the seat of the fungus, so as to make a complete eschar; and if, upon its separation, the whole morbid surface should not be destroyed, the caustic must be repeated, until the ulcerative process changes into a healing one. To execute commodiously such a full application of the caustic, it is not in general enough to have the upper eyelid raised by an assistant, and the lower one depressed; it is also further requisite, that the operator, by means of a spatula, introduced between the upper eyelid and the eyeball, should hold the same elevated with his own left hand, while, with the right, he applies the caustic, so as to form a strong deep eschar.

It must be acknowledged, the action of the caustic cannot always be calculated with precision, and therefore a portion of the whole thickness of the cornea may be destroyed with the fungus, which never fails to be followed by a prolapsus of part of the iris, through the aperture made in the cornea. The accident may seem to some very grievous; it is, however, not irreparable, as shall be shewn in the article *Iris, prolapsus of;* and when the surgeon can produce a firm cicatrix at the point, where the excrescence was situated, which resists a reproduction of the fungus, and a total destruction of the eye, he has fulfilled the indications required. (*Scarpa sulle Malattie degli Occhi.*)

CORNS. A corn, technically called

clavus, from its fancied resemblance to the head of a nail, is a brawn-like hardness of the skin, with a kind of root sometimes extending deeply into the subjacent cellular substance. When this is the case, the indurated part is fixed; but while the hardness is more superficial, it is quite moveable. Some corns rise up above the level of the skin, in the manner of a flat wart. They are hard, dry, and insensible, just like the thickened cuticle, which forms on the soles of the feet, or on the hands of labouring people.

Corns are entirely owing to repeated and long-continued pressure. Hence, they are most frequently in such situations as are most exposed to pressure, and where the skin is near bones, as on the toes, soles of the feet, &c. However, corns have occasionally been seen over the crista of the ilium, from the pressure of stays, and even on the ears, from the pressure of heavy ear rings.

Corns of the feet are usually owing to wearing tight shoes, and, consequently, they are more common in the higher classes, and in women, than other subjects. In females, indeed, the ridiculous fashion of wearing high-heeled shoes, was very conducive to this affliction; for, certainly, it merits the appellation. In shoes thus made, the whole weight of the body falls principally upon the toes, which become quite wedged, and dreadfully compressed in the end of the shoes.

Though some persons, who have corns, suffer very little, others occasionally endure such torture from them, that they are quite incapable of standing or walking. Doubtless the great pain proceeds from the irritation of the hard corn on the tender cutis beneath, which is frequently very much inflamed, in consequence of the pressure. It is observed, that every thing which accelerates the motion of the blood, which heats the feet, which increases the pressure of the corn on the adjacent parts, or the determination of blood to the feet, or which promotes its accumulation in them, exasperates the pain. Hence, the bad effects of warm stockings, tight shoes, exercise, long standing, drinking, &c. The pain in warm weather is always much more annoying, than in winter.

If a person merely seeks temporary relief, it may be obtained by pulling off his tight shoes, sitting down, placing his feet in a horizontal posture, and becoming a little cool, the prominent portion of the corn should be cut off, as far as it can be done without exciting pain, or bleeding, and the feet should be bathed in warm water.

The radical cure essentially requires the avoidance of all the above causes, and, particularly, of much walking, or standing. Wide, soft shoes, should be worn. Such means are not only requisite for a radical cure; but they alone very often effect it. How many women become spontaneously free from corns in child-bed, and other confinements? Though the radical cure is so easy, few obtain it, because their perseverance ceases as soon as they experience the wished-for relief.

When business, or other circumstances, prevent the patient from adopting this plan, and oblige him to walk, or stand a good deal, still, it is possible to remove all pressure from the corn. For this purpose from 8 to 12 pieces of linen, smeared with an emollient ointment, and having an aperture cut in the middle, exactly adapted to the size of the corn, are to be laid over each other, and so applied to the foot, that the corn is to lie in the opening, in such a manner, that it cannot be touched by the shoe, or stocking. When the plaster has been applied some weeks, the corn commonly disappears, without any other means. Should the corn be in the sole of the foot, it is only necessary to put in the shoe a felt-sole, wherein a hole has been cut, corresponding to the situation, size, and figure, of the induration.

A corn may also be certainly, permanently, and speedily eradicated, by the following method, especially, when the plaster, and felt-sole with a hole in it, are employed at the same time. The corn is to be rubbed twice a day with an emollient ointment, such as that of marshmallows; or with the volatile liniment, which is still better; and in the interim, is to be covered with a softening plaster. Every morning and evening, the foot is to be put for half an hour in warm water, and whilst there, the corn is to be well rubbed with soap. Afterwards, all the soft, white, pulpy outside of the corn, is to be scraped off with a blunt knife; but, the scraping is to be left off, the moment the patient begins to complain of pain from it. The same treatment is to be persisted in, without interruption, until the corn is totally extirpated,

which is generally effected in eight or twelve days. If left off sooner, the corn grows again.

A multitude of other remedies for curing corns are recommended. They all possess, more or less, an emollient and discutient property. The principal are green wax, soap, mercurial, and hemlock plasters, a piece of green oil-skin, &c. They are to be applied to the corn, and renewed as often as necessary. An infallible composition consists of two ounces of gum ammoniacum, the same quantity of yellow wax, and six drams of verdigrease. In a fortnight, if the corn yet remain, a fresh plaster is to be applied.

It is frequently difficult, and hazardous to cut out a corn. The whole must be completely taken away, or else it grows again; and the more frequently it is partially cut away, the quicker is its growth rendered. When the skin is moveable, and, consequently, the corn not adherent to the subjacent parts, its excision may be performed with facility and safety, but, not without pain. But, in the opposite case, either leaving a piece of the corn behind, or wounding the parts beneath, can seldom be avoided. The latter circumstance may excite serious mischief.

A person, entirely cured of corns, is sure to be affected with them again, unless the above mentioned causes be carefully avoided. Some subjects are, indeed, more or less, disposed to have the complaint. There are persons, who for life wear tight shoes, and take no care of their feet, and, yet, are never incommoded with corns. On the contrary, others are constantly troubled with them, though they pay attention to themselves. Many are for a time vexed with corns, and then become quite free from them, though they continue to wear the same kind of shoes, and stockings.

The above account is chiefly taken from *Richters Anfangsgr. der Wundarzn. B.* 1.

COUCHING. The depression of the cataract, or the introducing of an instrument into the eye, for the purpose of pressing the opaque crystalline lens downward, out of the axis of sight. (See *Cataract.*)

COXENDIX, (from *coxa*, the hip.) The ischium; the hip-joint. For an account of the disease of the hip-joint, see *Articulation.*

CRANIUM, (quasi καρανιον, from κρα, the head.) The skull. For an account of its fractures, see *Head, Injuries of.*

CREMOR LITHARGYRI ACETATI. ℞ Cremoris lactis ℥j.
Aq. litharg. acet. ʒj. M.
Employed by Kirkland in ophthalmies, and other inflammations.

CREPITUS, (from *crepo*, to make a noise.) This term is applied by surgeons to the grating sensation, occasioned by the ends of a fracture, when they are moved and rubbed against each other. A crepitus is one of the most positive symptoms of the existence of such an accident.

CRYSTALLINE LENS, (from κρυσταλλος, crystal.) See *Cataract.*

CYSTIDES, (from κυστις, a bag.) Encysted tumours, (see *Tumours, Encysted.*)

CYSTITIS, (from κυστις, the bladder.) Inflammation of the bladder.

CYSTITOME, (from κυστις, and τεμνω, to cut.) An instrument, made on the same principle as the pharyngotomus, and intended to open the capsule of the crystalline lens. This name should more properly be applied to an instrument for cutting the bladder; but, *M. de la Faye*, who invented the cystitome, has rather ungrammatically chosen its name, and it will now probably continue for ever as it is. The sheath of the instrument conceals a little lancet, which is capable of darting out to the distance of one, two, or three lines, by means of a small spring, contained in the body of the instrument. In describing the modern plan of extracting the cataract, we have mentioned, that a gold needle is recommended by Baron Wenzel and Mr. Ware for puncturing the capsule of the crystalline lens. The cystitome is certainly not a bad instrument, and it might still be useful, in cases, in which the iris is very irritable, and disposed to contract in an unusual degree. It is, now, however, never employed. (See *Encyclopédie Méthodique, Partie Chirurg.*)

CYSTOCELE, (from κυστις, the bladder, and κηλη, a tumour.) A Hernia, formed by a protrusion of the bladder. (See *Hernia.*)

CYSTOTOMIA, (from κυστις, the bladder, and τεμνω, to cut.) Making an opening into the bladder, to take out a stone. (See *Lithotomy.*)

CUPPING. (See *Bleeding.*)

CURETTE, (French.) A very small instrument, shaped like a spoon, or scoop, and used by operators, who extract the cataract, for taking away any opaque matter, which may remain behind the pupil, immediately after the crystalline has been taken out.

D

DACRYOMA, (from δακρυω, to weep.) An impervious state of one, or both the puncta lachrymalia, causing an effusion of tears.

DARSIS, (from δερω, to excoriate.) An excoriation.

DEASCIATIO, from *de*, and *ascio*, to cut with a hatchet.) A kind of fracture, in which a piece of bone is, as it were, chipped off.

DECOLLATIO, (from *decollo*, to behead.) The having a part of the skull taken away with the scalp, in a wound of the head.

DECUSSORIUM, (from *decusso*, to divide.) An instrument to depress the dura mater after trepanning.

DEFLUXION, (from *defluo*, to flow down.) *Defluxio*. A falling down of humours from a superior to an inferior part. Many writers mean nothing more by it, than inflammation.

DELIGATIO, (from *deligo*, to bind up.) The application of bandages.

DEPETIGO, (from *de*, and *petigo*, a running scab.) A ring-worm, or tetter.

DEPRESSION, (from *deprimo*, to press down.) *Depressio*. This word in surgery means the sinking inwards of some part of the skull, in consequence of external violence. In this manner, pressure is often made on the brain, and, hence, it frequently becomes necessary to raise the depressed portion of bone with an elevator, or to take it away altogether, with a trephine, or one of Mr. Hey's saws. (See *Head, Injuries of*.)

DEPRESSORIUM, (from *deprimo*, to press down.) An instrument for depressing the dura mater after trepanning.

DESQUAMATIO, (from *desquamo*, to scale off.) The separation of scales of bone. Exfoliation.

DESQUAMATORIUM, (from *desquamo*.) An instrument for taking out a piece of the skull. A trephine, or trepan.

DEUSTIO, (from *deuro*, to burn.) The scar of a scald, or burn.

DIÆRESIS, (from διαιρεω, to divide.) A division of substance: a solution of continuity. This was formerly a sort of generic term, applied to every part of surgery, by which the continuity of parts was divided.

DIAGNOSIS, (from διαγιγνωσκω, to distinguish.) The discrimination, or forming a judgment of a disease, from its symptoms.

DIGESTION, (from *digero*, to dissolve.) *Digestio*. By the *digestion* of a wound or ulcer, the old surgeons meant bringing it into a state, in which it formed healthy pus.

DIGESTIVES. Applications, which promoted this object.

DIGITIUM, (from *digitus*, a finger.) The contraction of a finger-joint. A sore on the finger: a whitlow.

DILATORIUM, (from *dilato*, to enlarge.) A surgical instrument for dilating any part.

DIOPTRA, (from διοπτομαι, to see through.) An instrument, with which any cavity was dilated, and inspected.

DIORTHROSIS, (from διορθοω, to direct.) One of the ancient divisions of Surgery: it signifies the restoration of parts to their proper situations.

DIRECTOR, (from *dirigo*, to direct.) One of the most common instruments of surgery; it is long, narrow, grooved, and made of silver, in order that it may be bent into any desirable shape. Its use is to direct the knife, and protect the parts underneath from the edge or point of the latter instrument. The surgeon introduces the director under the parts, which he means to divide, and then either cuts down, along the groove of the instrument, with a common bistoury, or cuts upward with a narrow, curved, pointed bistoury, the point of which is turned upwards, which he carefully introduces along the groove of the director. This instrument and the crooked bistoury are commonly employed for opening sinuses, for cutting fistulæ in ano, and other situations, and for dilating the stricture in cases of hernia.

DISLOCATION, (from *disloco*, to put out of place.) *Dislocatio. A Luxation.* When the articular surfaces of the bones are forced out of their proper situation, the accident is termed, a *dislocation*, or *luxation*.

Luxations differ from one another, 1. with respect to the articulation, in which they take place; 2. the extent of the dislocation; 3. the direction, in which the bone is displaced; 4. the length of time they have continued; 5. the circumstances, which accompany them, and which make them simple, or compound; 6. and, lastly, with respect to their causes.

1. The loose joints, which admit of motion in every direction, are those, in which dislocations occur most frequently: such is that of the humerus with the scapula. On the contrary, the ginglymoid joints, which only allow motion in two directions, are seldom dislocated. The articular surfaces of the latter are of great extent, and, consequently, the heads of the bones must be pushed a great way in order to be completely dislocated; and the ligaments are numerous and strong.

2. With respect to the extent of the dislocation, luxations are either *complete*, or *incomplete*. The latter term is applied, when the articular surfaces still remain partially in contact. Incomplete dislocations only occur in ginglymoid articulations, as those of the foot, knee, and elbow. In these the luxation is almost always incomplete; and very great violence must have operated, when such joints are completely dislocated. In the orbicular articulations, the luxations are almost invariably complete.

3. In the orbicular joints, the head of the bone may be dislocated at any point of their circumference; the luxations, are named accordingly *upward*, *downward*, *forward*, and *backward*. In the ginglymoid articulations, the bones may either be dislocated laterally, or forward, or backward.

4. The length of time, a dislocation has existed, makes a material difference. Recent dislocations may, in general, be easily reduced; but, when the heads of the bones have been out of their places, for several days, the reduction becomes exceedingly difficult, and, in older cases, very often impossible. The soft parts, and the bone itself, have acquired a certain position; the muscles have adapted themselves in length to the altered situation of the bone, to which they are attached, and, sometimes, cannot be lengthened sufficiently to allow the bone to be reduced. The opening in the capsular ligament, very often, in the course of a short time, becomes closed, so that the head of the bone cannot return into its original situation. Lastly, the luxated bone may become adherent to the parts, on which it has been forced.

5. The difference is immense, in regard to the danger of the case, arising from the circumstance of a dislocation being attended, or unattended, with a wound, communicating, internally with the joint, and externally with the air. When there is no wound of this kind, the danger is generally trivial, and the dislocation is termed a *simple one*: when there is such a wound, together with the dislocation, the case is denominated *compound*, and is frequently accompanied by the most imminent peril. Indeed, the latter kind of accident often renders amputation proper.

6. The causes of dislocations are external and internal. A predisposition to such accidents may depend on circumstances natural or accidental. The great latitude of motion, which the joint admits of; the little extent of the articular surfaces; the looseness and fewness of the ligaments; the lowness of one side of the articular cavity, as, at the anterior and inferior part of the acetabulum; and the shallowness of the cavity, as of that of the scapula; are natural predisposing causes to luxations.

A paralytic affection of the muscles, around the joint, and a looseness of its ligaments, are also predisposing causes. When the deltoid muscle has been paralytic, the mere weight of the arm has been known to cause such a lengthening of the capsular ligament of the shoulder-joint, that the head of the os brachii has descended two or three inches from the glenoid cavity.

The looseness of the ligaments sometimes makes the occurrence of dislocations so easy, that the slightest causes produce them. Some persons cannot yawn, or laugh, without running a risk of having their lower jaw luxated.

Such diseases, as destroy the cartilages, ligaments, and articular cavities, of the bones, may give rise to a dislocation. The knee is sometimes, but not frequently, partially luxated in consequence of a white-swelling; the thigh

is often dislocated in consequence of the acetabulum and ligaments being destroyed by what is commonly named the disease of the hip-joint. Such dislocations have been called *spontaneous*.

An enarthrosis joint can only be dislocated by external violence, a blow, a fall, or the action of the muscles, when the axis of the bone is in a direction, more or less oblique, with respect to the surface, with which it is articulated.

Any external force may occasion a dislocation (generally incomplete) in the ginglymoid joints; but, in the ball and socket articulations, the action of the muscles is constantly concerned in producing such an accident. So, when a person falls on his elbow, while his arm is raised outwards from his side, the force, thus applied, will undoubtedly contribute very much to push the head of the os brachii out of the glenoid cavity, at the lower and internal part. Still, the sudden action of the pectoralis major, latissimus dorsi, and teres major, which always takes place from the alarm, will also aid in pulling downward and inward the head of the bone. The violent action of the muscles alone can, under certain circumstances, produce a dislocation, without the conjoint operation of any outward force.

Dislocations are always attended with more or less laceration of the ligaments: in such accidents of the shoulder and hip, the capsules are always torn.

SYMPTOMS OF DISLOCATIONS.

Pain, and inability of moving the limb, are only equivocal ones. In a dislocation of an orbicular joint, the limb must generally be either lengthened, as is the case, when the head of the thigh-bone is thrown downwards and inwards upon the obturator foramen; or else shortened, as is the case, when the same bone is luxated upwards and backwards.

The absence of such symptoms in luxations of the ginglymoid joints, however, is amply compensated by the superficial situation of the bones, which makes it easy to ascertain their relative situations.

The dislocation of the head of the bone, necessarily causes a change in the direction of the limb. So, when the os brachii is dislocated downwards and inwards, the arm, instead of hanging perpendicularly by the side, has its direction downwards and outwards. The bone being out of its natural situation, many muscles, inserted into it, necessarily become stretched, and others, relaxed. In dislocations of the humerus, the deltoid may always be observed to be tense and stretched.

The eminences of a dislocated joint become changed in relation to each other. Projections occur, where there should be depressions; and depressions, where there should be projections. So, when the arm is dislocated downwards and inwards, the head of the os brachii causes a hard tumour in the hollow of the axilla, while the part of the shoulder, just below the acromion, which is naturally prominent, now presents a vacancy.

In short, the chief diagnostic signs of a dislocated joint principally consist of circumstances, arising from the functions of the affected joint being interrupted, and from the lodgment of the articular extremity of the bone in an unnatural situation, among parts, which it compresses, and renders painful.

Hence, there is a loss of motion in the joint; the limb, or part, is either shortened, lengthened, or distorted to one side, or another; the pressure of the dislocated head of the bone on the surrounding parts causes considerable pain, which is immensely increased, when the surgeon attempts to move the limb, in order to examine the case. The head of the dislocated bone may sometimes be distinctly felt, forming a preternatural tumour, or projection, while in the situation of the articular cavity, there is an unusual depression, or want of fulness.

PROGNOSIS.

Dislocations of enarthrosis joints are generally much less dangerous, than those of ginglymoid ones. The action of the muscles has a great share in producing the former; the violence done to the external parts is less; and the laceration of the soft parts is not so considerable. Even, in the same kind of joints, the seriousness of the case depends on the largeness of the articular surfaces, and the number and strength of the muscles and ligaments.

Dislocations of ginglymoid joints, however, are more easily reduced, than those of enarthrosis ones, the muscles of which are frequently very powerful,

and capable of making great resistance to the efforts of the surgeon. This is often very obvious in luxations of the shoulder, and thigh.

Dislocations from disease, termed *spontaneous*, cannot admit of reduction: when this accident happens in the hip-disease, it is not merely in consequence of the ligaments being destroyed, the brim of the acetabulum itself is often annihilated.

TREATMENT OF DISLOCATIONS IN GENERAL.

We shall first introduce the valuable remarks of Mr. Pott upon this part of the subject, and then add such others, as seem entitled to attention. Mr. Pott says, that the principle, concerning the extended or relaxed, that is, the resistant or non-resistant state of the muscles, as depending on the position of the limb, may be applied with equal truth and equal advantage to dislocations, as to fractures. Neither of them can indeed be rightly understood, or judiciously treated, without such consideration. In both, a perfect knowledge of the disposition, force, attachments and uses of the muscles, at least those of the limbs, are indispensably necessary.

Mr. Pott observes: By what our forefathers have said on the subject of luxations, and by the descriptions and figures which they have left us of the means they used, of what they call their organa and machinemata, it is plain that force was their object, and that whatever purposes were aimed at or executed by these instruments or machines, were aimed at and executed principally by violence.

Many, or most of them indeed, (says Mr. Pott) are much more calculated to pull a man's joints asunder, than to set them to rights. Hardly any of them are so contrived as to execute the purpose for which they should be used, in a manner most adapted to the nature or mechanism of the parts on which they are to operate. The force or power of some of the instruments is not always determinable, as to degree, by the operator, and consequently may do too little or too much, according to different circumstances in the case, or more or less caution or rashness in the surgeon.

Many of these instruments are now laid aside, and some few have been so altered, as to become useful; but before Mr. Pott, the same kind of principle, on which these instruments were originally founded and constructed, very generally prevailed, and violence was used, to the great fatigue, pain, and inconvenience of the patient in many cases, in which dexterity joined to a knowledge of the parts, would have executed the same purpose with facility and ease.

In dislocations, as in fractures, says Pott, our great attention ought to be paid to the muscles belonging to the part affected. These are the moving powers, and by these the joints, as well as other moveable parts, are put into action; while the parts to be moved are in right order and disposition, their actions will be regular and just, and generally determinable by the will of the agent, (at least in what are called voluntary motions;) but when the said parts are disturbed from that order and disposition, the action or power of the muscles does not therefore cease; far from it, they still continue to exert themselves occasionally; but instead of producing regular motions, at the will of the agent, they pull and distort the parts they are attached to, and which by being displaced cannot perform the functions for which they were designed.

"Hence principally, (says this author,) arise the trouble and difficulty which attend the reduction of luxated joints. The mere bones composing the articulations, or the mere connecting ligaments, would in general afford very little opposition; and the replacing the dislocation would require very little trouble or force, was it not for the resistance of the muscles and tendons attached to and connected with them: for by examining the fresh joints of the human body, we shall find that they not only are all moved by muscles and tendons, but also, that although what are called the ligaments of the joints do really connect and hold them together, in such a manner as could not well be executed without them, yet, in many instances, they are, when stript of all connexion, so very weak and lax, and so dilatable and distractile, that they do little more than connect the bones and retain the synovia; and that the strength, as well as the motion of the joints, depends in great measure on the muscles and tendons connected with and passing over them; and this

in those articulations which are designed for the greatest quantity, as well as the celerity of motion. Hence it must follow, that as the figure, mobility, action, and strength of the principal joints, depend so much more on the muscles and tendons in connexion with them, than on their mere ligaments; that the former are the parts which require our first and greatest regard, these being the parts which will necessarily oppose us in our attempts for reduction, and whose resistance must be either eluded or overcome; terms of very different import, and which every practitioner ought to be well apprised of."

Mr. Pott lays great stress on the necessity of examining the joints in the recent subject, not merely those of the skeleton, in order to understand the subject of dislocations.

The following are principles laid down by this author.

1. Although a joint may have been luxated by means of considerable violence, it does by no means follow, that the same degree of violence is necessary for its reduction.

2. When a joint has been luxated, at least one of the bones of which it is composed is detained in that its unnatural situation by the action of some of the muscular parts in connexion with it; which action, by the immobility of the joint, becomes as it were, tonic, and is not under the direction of the will of the patient.

3. That the mere bursal ligaments of some of the joints, endued with great mobility, are weak, distractile, and constantly moistened; that for these reasons they are capable of suffering considerable violence without being lacerated; but that they are also sometimes most certainly torn.

4. That, did the laceration of the said ligaments happen much more frequently than Mr. Pott believes it does, yet it cannot be a matter of very great consequence, as it neither totally prevents reduction, when timely and properly attempted, nor a consequent cure. The difficulty of reduction arising from this circumstance will be noticed again, when we speak of dislocations of the shoulder.

5. That supposing such accident to be frequent, yet as it is impossible to know, with any kind of certainty, whether it has happened or not, or in what part of the ligament, it cannot be admitted as a rule for our conduct, nor ought such mere conjecture to produce any deviation from what we ought to do, were there no such supposition. Could we know with certainty when and where this had happened, very useful information might indeed be drawn from it.

6. That all the force used in reducing a luxated bone, be it more or less, be it by hands, towels, ligatures or machines, ought always to be applied to the other extremity of the said bone, and as much as possible to that only. Some eminent surgeons have disputed this maxim, especially, in France.

In every joint capable of dislocation, the same circumstance which renders it liable to be displaced, is also a very considerable assistance in its reduction. Mr Pott means the dilatability or distractile power of the ligaments, or their capacity of giving way when stretched or pulled at.

This is perhaps the strongest argument which can be produced, why all the force made use of in reducing a dislocated joint should be applied to that bone only, and not to the next. By the yielding nature of the ligaments of the luxated joint, reduction is to be accomplished. The ligaments of the other articulation, which is not luxated, are yielding also; and all the force which is applied to the bone below or adjoining, must necessarily be lost in the articulation which is not luxated, and can be of little or no service in that which is. This remark, though made by Pott, and generally received as true, is very incorrect; for, it tends to state, that if you pull at the ankle, or wrist, the force does not operate on the hip, or shoulder.

"Let this principle (says Pott) be applied to the dislocation of the joint of the shoulder, and it will shew us why the ambi, in which the whole arm is tied down, and subjected to the extending power of the said instrument, is defective, and may be pernicious. Why instruments built on the same general principle, but in which the forearm is not fastened down, but left at liberty and not subjected to the ligature, execute their purpose with a great deal less force. Why the vulgar but frequently very successful method of reducing this joint, by placing the operator's heel in the axilla of the supine patient, sometimes fails, the surgeon not having proper assistance, and contenting himself with pulling at the pa-

tient's wrist only. It will also shew us, why, in the case of a luxated os femoris at the joint of the hip, the strength of five or six people divided between the joint of the knee and that of the ankle, shall be insufficient; and that of four, nay three of the same assistants, shall in the same case prove sufficient, by being all, and properly applied to the knee and femur only."

Mr. Pott's next principle is, 7. That in the reduction of such joints, as are composed of a round head, received into a socket, such as those of the shoulder and hip, the whole body should be kept as steady as possible, for the same reason as in the foregoing.

8. That in order to make use of an extending force with all possible advantage, and to excite thereby the least pain and inconvenience, it is necessary that all parts serving to the motion of the dislocated joint, or in any degree connected with it, be put into such a state as to give the smallest possible degree of resistance.

This, Mr. Pott considers as the first and great principle by which a surgeon ought to regulate his conduct in reducing luxations. This, says he, will shew us why a knowledge of all the muscular and tendinous parts, acting upon, or in connexion with the articulations, is absolutely necessary for him who would do his business scientifically with satisfaction to himself or with ease to his patient. It will shew us, that the mere position of the limb below the luxated joint, is what must either relax or make tense the parts in connexion with that joint, and consequently that posture is more than half of the business. It will shew us, why sometimes the luxated os humeri slips in, as it were, of its own accord, by merely changing the position of the arm, when very violent attempts, previous to this, have proved successless. It will shew us, why extending the arm in a straight line horizontally, or so as to make a right angle with the body, must in some instances render all moderate attempts fruitless. Why the method of attempting reduction by the heel in the axilla is so often successful, notwithstanding two very considerable disadvantages under which it labours, viz. part of the force being lost in the elbow, and the tense state of one head of the biceps cubiti. Why the tying down the fore-arm in the common ambi is wrong, for the same reasons. Why the fore-arm should at all times (let the method of reduction be what it may) be bent, viz. because of the resistance of the long head of the biceps in an extended posture. Why, when the os humeri is luxated forward, or so that its head lies under the great pectoral muscle, the carrying the extended arm backward, so as to put that muscle on the stretch, renders the reduction very difficult, and why, on the contrary, the bringing the arm forward, so as to relax the said muscle, removes that difficulty, and renders reduction easy. Why the reduction of a luxated elbow should always be attempted by bending the said joint. Why, when the inner ankle is dislocated in consequence of a fracture of the fibula, it is extremely difficult at all times, and sometimes impracticable, either to reduce or to keep reduced the said joint, while the leg is in an extended posture; and why a bent posture of the leg enables us with ease to accomplish both those ends. Why in the case of dislocation of the head of the os femoris (be it in what manner it may,) a straight position of the leg and thigh will always increase the difficulty of reduction; and why that very distorted and bent position, in which the patient will always place it for his own ease, is and must be the posture most favourable for reduction; because it is and must be that posture in which the muscles, most likely to make opposition, are most relaxed and rendered least capable of resistance.

9. That in the reduction of such joints as consist of a round head, moving in an acetabulum or socket, no attempt ought to be made for replacing the said head, until it has by extension been brought forth from the place where it is, and nearly to a level with the said socket.

This will shew us, continues Mr. Pott, another fault in the common ambi, and why that kind of ambi, which Mr. Freke called his commander, is a much better instrument than any of them, or indeed than all; because it is a lever joined to an extensor; and that capable of being used with the arm, in such position as to require the least extension, and to admit the most; besides which it is graduated, and therefore perfectly under the dominion of the operator.

It will shew us, says Pott, why the old method by the door or ladder, sometimes produced a fracture of the

neck of the scapula; as he has seen it do himself.

Why if a sufficient degree of extension be not made, the towel over the surgeon's shoulder, and under the patient's axilla, must prove an impediment rather than an assistance, by thrusting the head of the humerus under the neck of the scapula, instead of directing it into its socket.

Why the bar, or rolling-pin, under the axilla produces the same effect.

Why the common method of bending the arm (that is, the os humeri) downward, before sufficient extension has been made, prevents the very thing aimed at; by pushing the head of the bone under the scapula, which the continuation of the extension for a few seconds only would have carried into its proper place.

I know it is said, observes Mr. Pott, that mere extension only draws the head of the bone out from the axilla, in which it was lodged, but does not replace it in the acetabulum scapulæ. To which I will venture to answer, that when the head of the os humeri is drawn forth from the axilla, and brought to a level with the cup of the scapula, it must be a very great and very unnecessary addition of extending force, that will or can keep it from going into it. All that the surgeon has to do, is to bring it to such level; the muscles attached to the bone will do the rest for him, and that whether he will or not.

Indeed, continues this author, if all the rational means and methods for reducing a luxated shoulder be examined, they will be found to act upon this principle, however differently this matter may appear to those who have not attended to it. Even the common ambi succeeds by means of the extension, which the carrying the arm down with it produces, and not by its lever. That part of the instrument, so far from helping, is often a considerable hindrance, and even sometimes frustrates the operator's intention, by pushing the head of the bone against the scapula, before it is sufficiently drawn out from the axilla.

10. "The last of Pott's principles is, that whatever kind or degree of force may be found necessary for the reduction of a luxated joint, that such force be employed gradually; that the lesser degree be always first tried, and that it be increased gradatim."

Whoever, says Pott, reflects on what is intended by extension, what the parts are which resist, and how that resistance may be best overcome, will want little argument to induce him to accede to this principle; the advantages deducible from attending to it, and the disadvantages which may and do follow the neglect of it, are so obvious.

They who have not made the experiment, will not believe to how great a degree a gradually increased extension may be carried without any injury to the parts extended; whereas great force, exerted hastily, is productive of very terrible and very lasting mischief.

Mr. Pott concludes with expressing his disapprobation of, what was termed, the *vis percussionis*. (See *Remarks on Fractures and Dislocations.*)

Dislocations in general require some trouble to be reduced; but they are easily kept so. Fractures, on the contrary, are generally easily reduced, but, kept so with difficulty.

The extending force has been recommended to be applied by all the ancient writers to the luxated bone; for instance, to be applied above the knee in dislocations of the thigh-bone, and above the elbow in those of the humerus. We have stated, that Pott advised this plan, and the same practice is approved by J. L. Petit and Duverney, and adopted almost generally in our own country.

However, many of the best modern surgeons in France, for instance, Fabre, D'Apouy, Desault, and Boyer, have advised the extending force not to be applied on the luxated bone, but, on that, with which it is articulated, and as far as possible from it. It is said, that this plan has two most important advantages: first, the muscles, which surround the dislocated bone, are not compressed, nor stimulated to spasmodic contractions, which would resist the reduction; secondly, the extending force is much more considerable, than in the other mode; for, by using a longer lever, we obtain a greater degree of power.

In Pott's remarks, we find even him influenced by the prevailing prejudice against the above practice, that part of the extending force is lost on the joint, intervening between the dislocation, and the part, at which the extension is made. This notion is quite unfounded, as every man, who reflects, for one

moment, must soon perceive. When extension is made at the wrist, the ligaments, muscles, &c. which connect the bones of the fore-arm with the os brachii, have the whole of the extending force operating on them, and they must obviously transmit the same degree of extension, which they receive, to the bone above, to which they are attached. This matter, indeed, seems so plain, that I think it would be an insult to the reader's understanding to say any more about it, than that such eminent surgeons, as have contrary sentiments, can never have taken the trouble to reflect for themselves on this particular subject. Whether the force necessary to be exerted in some instances, might not have a bad effect on the intervening joint, I cannot pretend to say; but, as Desault's practice was very extensive, and he did not find any objection of this kind, we have, perhaps, no right to conclude, that such a one would exist.

Extension may either be made by means of assistants, who are to take hold of napkins, or sheets, put round the part, at which it is judged proper to make the extension; or else a multiplied pulley may be used. In general, the first plan is preferred. Nothing more need be added to what Mr. Pott has stated, concerning the propriety of using moderate force in the first instance, and increasing the extending power very gradually.

The extension should always be first made in the same direction, into which the dislocated bone is thrown; but, in proportion as the mucles yield, the bone is to be gradually brought back into its natural position. Thus the head of the bone becomes disengaged from the parts, among which it has been placed, and brought back to the cavity, which it has left, by making it describe the same course, which it took in escaping from it.

The extension will prove quite unavailing, unless the bone, with which the dislocated head is naturally articulated, be kept motionless by counter-extension, or a force at least equal to the other, but, made in a contrary direction.

The mode of fixing the scapula and pelvis, in luxations of the shoulder and thigh, will be described in speaking of dislocations of the arm and thigh.

In dislocations of ginglymoid joints, extension and counter-extension are only made, for the purpose of diminishing the friction of the surfaces of the joints, so as to be enabled to put them in their natural situation.

When the attempts at reduction fail, the want of success is sometimes owing to the extension not being powerful enough, and the great muscular strength of the patient, whose muscles counteract all the efforts to replace the bone.

In the latter case, the patient may be freely bled, and put in a warm bath, so as, if possible, to make him faint; hence the opening in the vein should be made large, because a sudden evacuation of blood is more likely to produce swooning, than a gradual discharge of it; and the patient, for the same reason, may be bled as he stands up. In very difficult cases, some authors have even recommended intoxication, which is certainly a very favourable opportunity for eluding the resistance, made to reducing dislocations, in very powerful subjects.

[The practice of copious bleeding in cases of obstinate luxations was first employed in this city many years ago by Dr. Physick with the happiest effect. It has been since adopted by many practitioners and has proved a valuable remedy. Dr. Monro recommended it, in his lectures many years ago.]

However, long continued, unremitting, not too violent, extension, will at last overcome the muscles of the most athletic man, and such practice is the most entitled to praise.

Dislocations of orbicular joints can seldom be reduced, after a month, though Desault used to succeed, with great violence, at the end of three or four. Dislocations of ginglymoid ones are, in general, irreducible after twenty, or twenty-four days, in consequence of anchylosis having taken place.

The reduction of a dislocation is known by the limb recovering its natural length, shape, and direction, and being able to perform certain motions, not possible while the bone was out of its place. The patient experiences a great and sudden diminution of pain; and, very often, the head of the bone makes a noise at the moment, when it returns into the cavity of the joint.

In order to keep the bone from slipping out of its place again, we have only to hinder the limb from moving. When splints can act powerfully in

steadying the joint, they are, however, very often used, as in dislocations of the ankle, wrist, &c. As the humerus cannot be luxated, except when at some distance from the body, a return of its dislocation will be prevented by confining the arm in a sling in such a way, that it cannot be raised from the side of the trunk. The spica bandage, applied after such an accident, is more satisfactory to the patient, than really efficacious. Whatever bandage is used to keep the arm from moving, should be put on the other end of the bone, as far as possible from the centre of motion.

COMPOUND DISLOCATIONS.

Compound Dislocations, as we have said, are those, which are attended with a wound communicating with the cavities of the injured joints. These accidents, like compound fractures, are frequently attended with great danger; and the same nicety of judgment is requisite in determining, whether amputation ought to be immediately performed, or an effort made to preserve the limb, as in cases of compound fractures. What we shall state of the latter subject, will, for the most part, be applicable to the present one. The degree of violence and laceration, done to the soft parts, the great, or little chance of healing the wound by the first intention, and the youth, or advanced age of the patient, are circumstances, which ought to influence the judgment in this difficult part of surgery. In the country, also, many cases would recover, which in town would not do so, without amputation.

It is a most important object, in all compound dislocations, to effect (if possible) an union of the wound by the first intention, as the injury can afterwards only be regarded, as one of a simple nature. The lips of the wound are, therefore, to be brought accurately together with sticking plaster, and the joint kept perfectly quiet in splints.

PARTICULAR DISLOCATIONS.

Dislocations of the Lower Jaw.

The lower jaw can only be luxated forward, and either one, or both of its condyles may become displaced in this direction. Every dislocation, except the one forward, is rendered impossible by the formation of the parts. The lower jaw cannot even be dislocated forward, unless the mouth, just before the occurrence of the accident be very much open. Whenever the chin is considerably depressed, the condyles slide from behind forward, under the transverse root of the zygomatic process. The cartilaginous cap, which envelopes the condyles, and follows them in all their motions, still affords them an articular cavity; but, the depression of the bone continuing, the ligaments give way, the condyles glide before the *eminentiæ articulares*, and slip under the zygomatic arches. Hence, a dislocation mostly happens, while the patient is laughing, gaping, &c. A blow on the jaw, when the mouth is wide-open, may easily cause the accident. The case has occasionally arisen from the exercise of great force in drawing out the teeth. Whenever the jaw has once been dislocated, the same causes more easily reproduce the occurrence. There have been persons, who could scarcely ever laugh heartily, without having their lower jaws luxated, in consequence of so doing. But, of all the causes of this occurrence, yawning alone, even without the combination of any external force, is by far the most common.

When the jaw is depressed, and its angles, to the external sides of which the masseters are attached, are carried upwards and backwards, if these muscles contract, the greater part of their force is employed to bring the condyles into the zygomatic depression. *(Boyer.)*

Dislocations of the lower jaw are attended with a great deal of pain, which Boyer imputes to the pressure produced by the condyles on the deep-seated temporal nerves, and those going to the masseters, which nerves pass before the roots of the zygomatic processes. The mouth is wide-open, and cannot be shut. It is more open in recent dislocations, than in those, which have continued for some time. An empty space is felt before the ear, the natural situation of the condyles. The coronoid process forms under the cheek-bone a prominence, which may be felt through the cheek, or from within the mouth. The cheeks and temples are flattened by the lengthening of the temporal, masseter, and buccinator muscles. The saliva flows in large quantities from the mouth, the secretion of which fluid is greatly increased by the

irritation of the air. The arch, formed by the teeth of the lower jaw, is situated more forward, than that formed by the teeth of the upper jaw. The patient can neither speak, nor swallow, during the first days after the accident. (*Boyer.*) When only one condyle is dislocated, the mouth is distorted, and turned towards the opposite side, while the fellow teeth of the jaws do not correspond. Hey says, however, the chin is frequently not altered. (*Practical Observations, p.* 322.)

The symptoms are not so well marked, when the accident has remained unreduced for several days or weeks. In such instances, the chin becomes gradually approximated to the upper jaw: the patient recovers by degrees the faculty of speaking and swallowing; but, he stammers, and the saliva dribbles from his mouth. The sufferings induced by a dislocated jaw are certainly great enough to be sometimes fatal, if the case continue unrectified; but, we are not to believe Hippocrates, when he positively declares the accident mortal, if not reduced before the tenth day.

Dislocations of the lower jaw are to be reduced in the following manner: The surgeon is first to wrap some linen round his thumbs to keep them from being hurt by the patient's teeth, and then introduce them into the mouth, as far as possible on the grinding teeth. At the same time, he is to place his fingers under the chin and base of the jaw, and while he depresses the molares with his thumbs, he raises the chin with his fingers, by which means the condyles become disengaged from their situation under the zygomas: at which instant the muscles draw these parts so rapidly back into the articular cavities again, that the surgeon's thumbs would very probably be hurt, did he not immediately move them outward between the cheek and the jaws.

The reduction being accomplished, a recurrence of the accident is to be prevented by applying a four-tailed bandage, as recommended for the fractured jaw. The patient should for some time avoid eating food, which requires much mastication.

The ancients used to place two pieces of stick between the grinding teeth, and while they used these as levers to depress the back part of the bone, they raised the chin by means of a bandage. Devigo has described this method. It is not preferable to the modern plan, in regard to efficacy; and it has the disadvantage of exposing the teeth to be broken by the sticks.

DISLOCATIONS OF THE VERTEBRÆ.

The large surfaces, with which these bones support each other; the number and thickness of their ligaments; the strength of their muscles; the little, which each vertebra naturally moves; and the vertical direction of their articular processes; make dislocations of the dorsal and lumbar vertebræ quite impossible, unless there be also a fracture of the processes just mentioned. Of those cases I shall only remark, that they can only result from immense violence; that the symptoms would be an irregularity in the disposition of the spinous processes, retention or incontinence of the urine and fæces, paralysis and a motionless state of the lower extremities, the effects of the pressure, or other injury, to which the spinal marrow is subjected. Similar symptoms may also arise, when the spinal marrow has merely undergone a very violent concussion, without any fracture or dislocation whatever; and, it is certain, that most of the cases mentioned by authors as dislocations of the lumbar and dorsal vertebræ, have only been concussions of the spinal marrow, or fractures of such bones.

The cervical vertebræ, however, not having such extensive articular surfaces, and having more motion, are occasionally luxated. The dislocation of the head from the first vertebra, and of the first vertebra from the second, particularly the last accident, is the most common; but luxations of the cervical vertebræ lower down, though very rare, are possible. (*Boyer.*)

DISLOCATION OF THE HEAD FROM THE FIRST VERTEBRA, OR ATLAS.

The os occipitis, and first cervical vertebra are so firmly connected by ligaments, that there is no instance of their being luxated from an external cause, and, were the accident to happen, it would immediately prove fatal by the compression and injury it would occasion of the spinal marrow.

DISLOCATIONS OF THE FIRST CERVICAL VERTEBRA FROM THE SECOND.

Every surgeon is aware, that the rotatory motion of the head is chiefly performed by the first vertebra moving on the second. When this motion is forced beyond its proper limits, the ligaments which tie the processus dentatus to the edges of the foramen magnum are torn, and, supposing the head to be forced from the left to the right, the left side of the body of the vertebra is carried before its corresponding articulating surface, while the right side falls behind its corresponding surface. Sometimes the processus dentatus, whose ligaments are ruptured, quits the foramen formed for it by the transverse ligament and the anterior arch of the first vertebra, and presses on the spinal marrow. In other instances, the processus dentatus does not leave its natural situation; but the diameter of the vertebral canal is always diminished at this place, and the spinal marrow consequently compressed, and otherwise injured. Patients cannot survive mischief of this kind in so high a situation. M. Louis found, that in persons hanged, the first vertebra was dislocated from the second, when the executioner twisted their bodies at the moment of their being suspended.

Many dislocations of the cervical vertebræ do not prove fatal; but these occur at the third, fourth, fifth, or sixth of these bones, and only one articular process is luxated. In these instances the vertebral canal is not so much lessened as to compress the spinal marrow, and occasion death.

If the luxation produce no symptom, which indicates a compression of the spinal marrow, it is prudent to abstain from all attempts to reduce it. When the symptoms are urgent and alarming, and some attempt to relieve the patient is the only chance he has of living, we are to begin by inclining the head to the side towards which it is directed, in order to disengage the articulating process of the upper vertebra: this part of the operation is extremely dangerous, as it may instantly produce death by increasing the pressure on the spinal marrow. When the process is disengaged, the head and neck are brought to their right direction, by making them perform a rotatory motion, the contrary of that, which had taken place in the luxation. A relapse is to be prevented by keeping the head and neck perfectly motionless. (*Boyer.*)

There can be no doubt of the rationality of attempting an immediate reduction of the processus dentatus, if signs of life should exist. This process is thrown back, so as to compress or injure the spinal marrow, while the atlas and the head itself are thrown forward. The recollection of these circumstances will enable a surgeon to do what is proper, better than any detailed directions.

DISLOCATIONS OF THE CLAVICLE.

These are much less common, than fractures, which are said to occur six times more frequently.

The clavicle may be luxated at its sternal extremity, forwards, backwards, and upwards, but never downwards, on account of the situation of the cartilage of the first rib. The luxation forward is the most frequent, and almost the only one ever met with. It may arise from the other end of the clavicle being forced very much backward. Dislocations backwards and upwards are very unusual. To cause the first sort of accident, the shoulder must have been violently driven forwards, and at the same time depressed with great force. The dislocation backward, is more rare than the one upward.

If the dislocation be forwards, a hard circumscribed tumour is felt, or even seen, on the front and upper part of the sternum. When the shoulder is carried forward and outward, this tumour disappears, and, previously, there is a vacancy where the head of the clavicle ought to be.

When the luxation is upwards, the distance between the sternal ends of the clavicles is diminished.

When the dislocation is backwards, there is a depression where the end of the clavicle ought to be, and the head of the bone forms a projection at the front and lower part of the neck, which, as J. L. Petit remarks, may compress the trachea, œsophagus, jugular vein, carotid artery, and nerves. The head is inclined towards the side, on which the accident is.

In reducing these dislocations of the sternal end of the clavicle, we are to make a lever of the arm, by means of which the shoulder is brought out-

wards; and when thus brought outwards, it is to be pushed forwards, if the dislocation is in that direction; backwards, if the dislocation be behind; and upwards, if the dislocation be above.

It is as difficult to keep the bone reduced, as it is easy to reduce it, so smooth and oblique are the articular surfaces.

The same position of the arm, and the same apparatus, as in fractures of the clavicle, are to be employed. The end of the clavicle, however, can never be kept from rising a little, and this would be the case even were the tourniquet used, which was proposed by Brasdor, to make a pressure on the end of the bone.

The dislocation of the scapular end of the clavicle from the acromion is much less common. The luxation upwards is almost the only one that ever occurs. It is possible, however, for the accident to take place downwards, and for the end of the clavicle to glide under the acromion. The rarity of the dislocations of the scapulary end of the clavicle, is owing to the strength of the ligaments tying the clavicle and acromion together.

A fall on the top of the shoulder may cause the dislocation upwards. The scapulary end of the clavicle then slides upwards on the acromion, and the shoulder is drawn inwards by the muscles which approximate the arm to the body.

The violent action of the trapezius muscle, in pulling upward the clavicle, may tend to produce the accident.

Pain at the top of the shoulder, and a projection of the end of the clavicle, under the skin covering the acromion, are symptoms indicating what has happened. The patient also inclines his head to the affected side, and avoids moving his arm or shoulder.

This dislocation is reduced by carrying the arm outwards, putting a cushion in the axilla, and applying Desault's bandage for fractures of the clavicle, making such turns as ascend from the elbow to the shoulder, and press the luxated end of the bone downward, so as to keep it in its due situation. (See *Boyer's Lectures on the Diseases of the Bones.*)

Most surgeons, in this country, would be content with applying a compress, and supporting the arm in a sling.

DISLOCATIONS OF THE OS BRACHII.

Nature, which varies, according to the necessities of different animals, the number of their joints, has also been provident enough to vary the structure of these parts, according to the use of the different portions of their economy. To great moveableness some unite considerable solidity; for instance, the vertebral column. Others are very strong, but only admit of a slight yielding motion, as we observe in the carpus, tarsus, &c. Lastly, other joints admit of a great latitude of motion; but their strength is easily overpowered by the action of external bodies. Such are, in man, the shoulder-joint, and that between the sternum and clavicle.

The last kinds of articulation are particularly subject to dislocations, and, of all, not one is so often luxated as the shoulder-joint. Bichat mentions, that it appears, from a comparative table, that, in some years, this accident, at the Hôtel-Dieu, has been as frequent, and even more so, than dislocations of all the other bones taken collectively.

Here every thing seems to facilitate the escape of the bone from its natural cavity. An oval shallow cavity, surrounded by a margin of little thickness, receives a half-spherical head, which is twice as broad as the cavity in the perpendicular direction, and three times as extensive from before backward. With respect to the ligaments, the joint is only strengthened by a mere capsule, which is thin below, where nothing opposes a dislocation; but thicker above, where the acromion, coracoid process, and triangular ligament, form an almost insurmountable obstacle to such an accident. With regard to the muscles, and motions of this joint, strong and numerous fasciculi surround the articular surfaces, make them easily move in all directions, and pushing the head of the os brachii against the different points of the capsule, distend this ligamentous bag, and, when their power exceeds the resistance, actually lacerate it. As for external bodies, what bone is more exposed than the os brachii, to the effect of their force?

Thus subjected to the influence of these predisposing causes, the os brachii would be in continual danger of being dislocated, if the scapula, which

is as moveable as itself, did not furnish a point of support for it, by accompanying its motions. This point of support accommodates itself to the variations in the position of the head of the os brachii, so that to the moveableness of the articular surfaces, their strength is in a great measure owing.

DIFFERENT KINDS OF DISLOCATION.

The shoulder-joint, very liable to luxations in a general sense, is not equally so at all points. There are some, where a dislocation cannot occur; there are others, where, though possible, such an accident has never been observed. Hence, before examining the mechanism of dislocations of this joint, it is essential to determine with precision the directions in which they may take place. Here, indeed, authors differ in a very singular manner. Sometimes, they have employed different terms to express the same thing: and, sometimes, they have employed the same words to signify different things. Invariably agreed about certain kinds of dislocations, they entertain opposite sentiments concerning others; and, in the midst of these differences, the perplexed surgeon often cannot decide on what basis to found his practice.

DIVISION ADOPTED BY AUTHORS.

The ancients, who knew very little of the natural relation of the parts surrounding the joint, were totally ignorant of the accidental relations, which such parts present in the case under consideration. Hence, no doubt, arose the confusion in their doctrines.

Many admitted four kinds of dislocations; many only three; some acknowledged only two; while others only allowed the possibility of one kind.

The first distinguished the different directions, in which the bone can be luxated. The dislocations, were termed *upward, downward, forward,* and *backward.* Such was the opinion of the predecessors of Hippocrates, who, in informing us of it, demonstrates its inaccuracy. Others divided the dislocations of the shoulder into such as take place *downward, upward, outward,* and *forward.* This division is adopted by Galen, who, however, only cites an example of the luxation forward, and does not illustrate what he means by dislocations upward, and inward.

The second class of writers distinguished the species of dislocation, sometimes into those which occur *downward, forward,* and *backward.* Oribasius was one of these. Sometimes, they named the luxations *downward, outward,* and *inward.* Paul of Ægina followed this plan, and, no doubt, his meaning is the same as that of Oribasius, only expressed by different terms. Sometimes, they called the dislocations *downward, forward,* and *upward.* Albucasis did so, and thought the latter case exceedingly uncommon.

The third set believed, that when the head of the os brachii was displaced, it could only be carried *downward into the armpit,* a very common case; and *forward,* which is less frequently seen. Celsus is almost the only one, who has established this difference; he remarks, *Humerus modo in alam excidit, modo in partem priorem.*

Lastly, the fourth body of men only believed in the dislocation downward; which was the sentiment of Hippocrates, who had only seen this one sort of case in his practice. *At vero humerus inferiorem in partem excidit; aliam in partem excidere non audivi.*

The moderns borrowed from the ancients their divisions of dislocations of the shoulder-joint, and, at first, like their predecessors, they only determined in a vague manner the precise situations of these accidents. However, they afterwards fixed it with more determination, in proportion as they became enlightened by anatomy, and, in particular, took notice of the essential difference between primitive and consecutive luxations.

Petit admits four kinds of dislocations. 1, Downward on the inferior costa of the scapula, very rarely met with. 2, Outward, under the spine of this bone; a case which as a primitive one, can only occur with difficulty. 3, Inward, into the armpit. 4, Forward, between the coracoid process and the clavicle. Heister, like this eminent practitioner acknowledged four dislocations; but with a difference both of expression and meaning. One is downward, in the axilla; one forward, under the great pectoral muscle; another backward, under the scapula; and a fourth outward, under the spine of this bone. According to Duverney,

primitive luxations never occur in any other direction than downward; the others being the constant effect of muscular action.

DIVISION ADOPTED BY DESAULT.

In the midst of these very confused ways of viewing a very simple subject, it is, in the first place, necessary, in order to have determinate ideas, to divide dislocations of the humerus into *primitive* ones, which are the sudden effect of external violence, and into *consecutive ones*, which follow the first, by the influence of causes, which will be investigated.

Let the oval surface of the glenoid cavity be included within four lines; one representing its upper edge; another its lower; a third its inner edge; and a fourth its external one.

It is manifest, that the head of the humerus cannot be displaced towards the upper edge. There are situated the acromion and coracoid process, the triangular ligament stretched between them, the tendons of the triceps, supraspinatus, and the fleshy portion of the deltoid, insurmountable obstacles to the luxation of the head of the bone, propelled by any force upward. Besides, what power could this be? Supposing there were such a force, the head of the bone must necessarily be driven outward as well as upward, ere its head could be displaced. This is impossible, because the trunk prevents the lower part of the arm from being directed sufficiently inward to produce this effect.

On the contrary, at the other margins, there is little resistance. At the inferior one, the long portion of the triceps; at the internal one, the tendon of the subscapularis; and at the external edge, those of the infraspinatus, and teres-minor; are capable of easily yielding to any power directed against them, and of allowing primitive luxations to take place, downward, inward, or outward. Downward, between the tendon of the long portion of the triceps, and the tendon of the subscapularis; inward, between the fossa subscapularis, and muscle of this name; outward, between the fossa infraspinata, and infraspinatus muscle.

After being pushed out of its cavity, and first placed in one of these three directions, the head of the humerus often changes its position; and then, to primitive luxations, downward, or inward, a consecutive one succeeds. But, the latter could never follow the primitive dislocation outward, were this to exist; as the spine of the scapula would form an obstacle.

A consecutive luxation inward may succeed a primitive one downward: indeed, nothing resists the head of the humerus, in the course which it then follows to get between the fossa subscapularis and the muscle similarly named. On the contrary, should it tend outward, it is opposed by the tendon of the triceps, and notwithstanding what Petit has written, there is never a consecutive dislocation in this direction.

It sometimes happens, that, after the head of the bone has escaped from the internal, or inferior part of the capsule, it is carried behind the clavicle, and then forms a consecutive dislocation upward; an event already noticed by Ambroise Pare, perhaps by Galen, and a specimen of which was preserved in Desault's cabinet. But, here, the secondary derangement only takes place slowly, and, when it occurs, it is almost always out of the power of art to rectify it, on account of the strong adhesions, contracted by the surfaces of the bone. Thus, in the instance to which allusion has been made, a new cavity was seen formed behind the clavicle, and the humerus adhered by new kinds of ligaments to the surrounding parts.

It follows from what we have just been saying, that the humerus is subject to four kinds of dislocation. 1. Downward. 2. Outward. In these two directions the accident is always primitive. 3. Inward, which is sometimes primitive, sometimes consecutive. 4. Upward; a case which can never occur, except as a consecutive one.

The second and fourth cases are so very rare in comparison with the others, that these alone claim the practitioner's attention.

CAUSES, &c.

These vary according as the dislocation is primitive, or consecutive.

PRIMITIVE DISLOCATION.

The action of external bodies, directed against the arm; but, particularly, falls, in which this part is forced

against a resisting body, give rise to primitive dislocations, and then the different species of the accident are determined, by the particular position of the humerus at the instant, when the injury takes place.

Should this bone be raised from the side, without being carried either forward, or backward; should the elbow be elevated, and the fall take place on the side; then the weight of the trunk, almost entirely supported by this bone, forces downward its upper part, and this stretches and lacerates the lower part of the capsular ligament. Thus a luxation downward is produced, and its occurrence may also be facilitated by the combined action of the latissimus dorsi, pectoralis major, and teres major, muscles, as Fabre has judiciously remarked. Then, indeed, involuntarily contracted to support the trunk, these muscles act with the power of a kind of lever; in which operation the resistance is the head of the bone, which they draw downward, while the fixed point is the lower end of the bone, resting against the ground. Some authors also consider, as the immediate cause of a dislocation downward, the strong action of the deltoid, which then depresses the head of the bone, and pushes it downward out of the capsule. Certain observations seem incontestably to establish this mode of dislocation. Bichat mentions the well-known case of a notary, who luxated his arm downward, in lifting up a register.

The rationale of the primitive luxation inward differs very little from that of the preceding case. The elbow is both separated from the side, and carried backward: in falling, the weight of the body acts on the humerus, the front part of the capsule is lacerated, and a luxation takes place in this direction.

The dislocation outward is produced in the same sort of way. The elbow is carried forward, towards the opposite shoulder; the capsule is stretched outward, and if a sufficient force should act on the limb, is lacerated. But, how could such a force arise? In a fall, the arm pushed against the trunk, and kept there, could not move extensively enough to cause such a laceration. Hence, the luxation outward must necessarily be exceedingly rare. Indeed, there is no instance recorded of it in surgical books, and Desault, in particular, never had occasion to observe such an accident. Besides, when, in a fall, the arm, raised from the side, is inclined forward or backward, the weight of the body only operates upon it obliquely, and the limb is very little exposed to the action of the latissimus dorsi, pectoralis major, and teres major muscles. No dislocation must occur more frequently, than that downward, in which the influence of both these causes is direct. The luxation inward, however, is very common, and a multitude of cases, which occurred to Desault, confirm this kind of primitive dislocation, doubted by several modern authors, who are of opinion, with Hippocrates, that all dislocations at first take place downward.

The capsule may only be stretched in a primitive luxation, and then the articular surfaces only lose their relations imperfectly; but, most frequently, it is lacerated, and the head of the bone passes through the rupture. Authors have, in general, paid too little attention to this circumstance, which dissections have repeatedly demonstrated to practitioners, and to Desault in particular. This eminent surgeon had two specimens made of wax; one, of a dislocation inward; the other of one downward; both of which were met with in subjects, who died at the Hôtel Dieu. Bell also makes mention of similar facts, and another English surgeon has observed the same occurrence.*

Here the same thing often happens, which is seen to occur in compound fractures, in which the ends of the broken part protrude through the skin. The capsule is sufficiently torn to let the head of the bone escape; but, the opening, afterwards, being too narrow, forms a kind of constriction round the neck of the humerus, so as to prevent the return of the head of the bone into the place, which it originally occupied. Thus, in the fractures, of which we have just been speaking, the opening

* I suppose Bichat alludes to Mr. Thompson, who noticed the laceration of the capsule long ago, and particularly called the attention of surgeons to the subject, in the Medical Observations and Inquiries.

of the skin will not allow the end of the fracture to be reduced, without a previous dilatation of the wound.

In this state, should we endeavour to reduce the dislocation, the capsule being pushed against the glenoid cavity, becomes compressed between it and the head of the bone, which the surgeon now in vain attempts to reduce. Desault, was the first who noticed this practical fact, two examples of which are recorded in his journal, and cases of which have since very often presented themselves at the Hotel Dieu. In these cases, the head is commonly very moveable, because, being entirely on the outside of the capsule, nothing restrains its motions.

CONSECUTIVE DISLOCATION.

When a consecutive luxation follows a primitive one, several causes may concur in producing it. If a fresh fall should happen, when the arm is separated from the trunk, the head of the humerus, which nothing confines, obeys, with the utmost facility, the power displacing it in this manner, and is again pushed out of the situation, which it accidentally occupies.

A man, in going down stairs, meets with a fall, and dislocates the humerus downward: he immediately sends for Desault, who defers the reduction till the evening. In the mean time, the patient, in getting upon a chair, slips and falls again. The pain was more acute, than when the first accident occurred, and Desault, on his return, instead of finding the head of the humerus as it was in the morning, in the hollow of the axilla, finds it behind the pectoralis major muscle.

The action of muscles is a permanent cause of a new dislocation. When the humerus, indeed, is luxated downward, the pectoralis major, and the deltoid draw upward and inward, the upper part of this bone, which only making a weak resistance to their action, changes its position, and takes one in the above double direction.

The various motions imparted to the arm, may also produce the same effect, according to their direction. Thus a luxation inward has often been observed to follow one downward, in consequence of unskilful efforts to reduce the latter.

SYMPTOMS.

The diagnosis of dislocations of the humerus is, in general, attended with no difficulty.

Whatever may be the mode and situation of the dislocation, there always exists, as Hippocrates has remarked, a manifest depression under the acromion, which forms a more evident projection, than in the natural state. Almost all the motions of the arm are painful; some cannot be performed at all; and they are all very limited. The arm cannot move without the shoulder moving also, because the articulation being no longer able to execute its functions, both it and the shoulder form, as it were, one body.

To these symptoms, generally characteristic of every sort of dislocation of the humerus, are to be added such as are peculiar to each particular case. When the luxation is downward, the arm is a little longer, than in the natural state; it is capable of being moved a little outward; but, an acute pain is the inevitable consequence of moving it forward, or backward. The elbow is more or less removed from the axis of the body, by the action of the deltoid, the long head of the biceps, and supraspinatus, muscles, which, being stretched, contract and tend to draw the bone outward. The pains, which result from this position, compel the patient, in order to avoid them, to lean towards the side, on which the dislocation is, to keep the fore-arm half bent, and the elbow supported on his hip, in such a way, that the arm, having a resting place, may be sheltered from all painful motion, and stretching of the muscles. By this posture alone, Desault was in the habit of detecting a luxation downward, and his diagnosis was seldom found to be erroneous. Thus, in a fracture of the clavicle, the leaning posture of the patient is often, at the first glimpse, characteristic of the accident. In the axilla, there is constantly a more or less evident prominence, formed by the head of the humerus.

With the general symptoms of dislocations of the humerus, that inward has the following: the elbow, separated from the axis of the body, is inclined a little backward; the humerus seems to be directed towards the middle of

the clavicle; motion backward is not very painful, but that forward is infinitely so; there is a manifest prominence under the great pectoral muscle; the arm is very little longer than in the natural state; and the posture is the same, as in the foregoing case.

If there should be a dislocation outward, it would be particularly characterized by a hard tumour under the spine of the scapula; by the direction of the elbow forward; by its separation from the trunk; and by the somewhat increased length of the arm.

A projection behind the clavicle; a manifest shortening of the arm; and its direction; would clearly denote a dislocation upward.

The symptoms, distinguishing the nature of dislocations of the humerus, do not always present the same degree of certainty, as those announcing the existence of such an accident. Often nothing is more difficult, than to determine, whether the case is a primitive dislocation inward, or a consecutive one; the same phenomena being observable in both cases. An accurate history of the case, by representing the order in which such phenomena occurred, can alone throw light on this point, which is the more interesting, as in the two cases, the means of reduction should vary. In the first, the head of the bone returns, through a short track, into its natural cavity; in the second, it has to traverse a much greater distance to arrive there.

If, as Petit pretended, there were dislocations backward, sometimes primitive, sometimes consecutive, this remark would be equally applicable to them.

Some analogous symptoms, between dislocations of the humerus, the fracture of its neck, and luxations of the scapular end of the clavicle, might here create some uncertainty, if, in the latter case, the absence of a tumour in the armpit, and of a depression under the acromion, did not prevent an error, which, Hippocrates says, may be easily made; into which, Galen states, the masters of the art fell; and which Pare cautions us to avoid. Uncertainty might arise, if in the fracture of the neck of the humerus, the proper symptoms of a fracture did not prevent a most detrimental mistake, which the occasional direction of the humerus, and a kind of prominence, formed by the lower end of the fracture in the axilla, might cause. (See *Fracture of the Neck of the Humerus.*)

Inflammatory symptoms seldom follow dislocations of the humerus. Many authors, particularly B. Bell, speak of an œdematous swelling of the whole upper extremity, as a very common consequence of a dislocation inward, and it is referred to the compression of the axillary glands. Experience has not often demonstrated this occurrence at the Hôtel Dieu, except in very old luxations; and when the thing has occurred, very beneficial effects have been obtained, in certain instances, by applying, for a few days, a moderately tight bandage from the fingers to the axilla, after the reduction has been accomplished. Bichat relates a case, in which the œdema did not disappear with the cause, but even rather increased; but the day after a bandage had been applied, the swelling was found diminished by one half.

There is another consequence, to which authors have paid but little attention; but, it was known to Avicenna, and was several times observed by Desault. This is a palsy of the upper extremity, arising from the pressure, made by the head of the bone, dislocated inward, upon the axillary plexus of nerves. This consequence sometimes resists all the means of art, as Bichat proves by a case, which he relates.

The affection is very difficult of cure, when the nerves have been a long time compressed. Desault several times applied the moxa above the clavicle. The success, which he first experienced on some patients, did not follow invariably in others.

But, when the head of the humerus has only made, as it were, a momentary pressure on the nerves, and the reduction has been effected, soon after the appearance of the symptoms, the paralytic affection often goes off of itself, and its dispersion may always be powerfully promoted by the use of volatile liniments.

OF THE REDUCTION.

We may refer to two general classes, the infinitely various number of means, proposed for the reduction of the dislocated humerus. The first are designed to push back, by some kind of mechanical force, the head of the bone, in-

to the cavity from which it is displaced, either with, or without making previous extension. The others are merely intended to disengage the head of the bone from the place which it accidentally occupies, leaving it to be put in its natural situation by the action of the muscles.

By the first means, art effects every thing; by the second, it limits its interference to the suitable direction of the powers of nature. In the first method, the force externally applied always operates on the bone in the diagonal of two powers, which resist each other at a more or less acute angle; in the last, the power is only in one direction.

Here it is only necessary to state, that all the means, intended to operate in the first way, act nearly in the following manner. Something, placed under the axilla, serves as a fulcrum, on which the arm is moved as a lever, the resistance being produced by the dislocated head of the humerus, while the power is applied either to the lower part of this bone, or the wrist. The condyles of the humerus being pushed downward and inward, the head of the bone is necessarily moved in the opposite direction, towards the glenoid cavity, into which it slips with more or less facility.

Thus operated the machine, so celebrated among the ancients and moderns, under the name of the ambi of Hippocrates; whether used in the form described by this father of medicine, or with the numerous corrections devised by Paul of Ægina, Ambroise Paré, Duverney, Freke, &c. By this machine, a double motion is communicated to the head of the humerus, as above explained.

The extension usually moves the bone from its unnatural situation, and is executed in different ways. Sometimes the weight of the body on one side, and the dragging of the end of the dislocated bone on the other, tend to produce this effect. Such was the action of the ladder, door, &c. described in Hippocrates's Treatise on Fractures, and repeated in modern works. Sometimes, the trunk is fixed in an unchangeable manner, while the arm is powerfully extended, as is practised in employing the machine of Oribasius, and was one of the methods formerly revered in the public places, where the wrestlers combated.

Sometimes, no extension is sensibly executed, and while the end of the humerus is pushed outward by the body placed under the axilla, the surgeon pushes it upwards into the glenoid cavity.

We shall not here inquire into the inconveniences peculiar to each of these methods. Petit and B. Bell have already done so. We shall only point out the objection, common to all of them.

The exit of the head of the bone, through the lacerated capsule is here necessarily attendant on the dislocation. Nor is it even possible to know with precision the situation of this opening. Why then should we make use of an artificial force to direct the head of the bone towards this opening?

However covered the body placed under the axilla may be, to serve as a fulcrum, there is always a more or less inconvenient chafing, frequently dreadful stretching and laceration of parts, in consequence of its application, when the trunk is suspended upon it, as in the instance of the door, &c. In this way, Petit has seen a fracture of the neck of the humerus produced, and even a laceration and aneurism of the axillary artery.

Few surgeons have ready at hand the different kinds of apparatus. Hence, trouble and loss of time in getting them; time, which is of so much moment in the reduction; for it is always the more easy, the sooner it is accomplished.

When the luxation is consecutive, how can mechanical means bring back the head of the bone through the track it has taken? For instance, if to a dislocation downward one inward has succeeded, the head of the bone must necessarily be brought down, before it can be replaced in its cavity. The above artificial means often act repugnantly to the action of the muscles, which is a chief and essential agent in the reduction.

If the dislocation should be upward, they would obviously be ineffectual.

Perhaps, however, they might be advantageously employed, when a primitive luxation downward is quite recent, and when the head of the bone is very near its cavity. Then the inferior costa of the scapula presents an inclined plane, along which the end of the bone can easily glide, when propelled by any kind of external force. No doubt, it is

to this tendency of the head of the bone to be replaced, that we must attribute the success, certainly exaggerated, but in part real, on which the inventor of such machines endeavours to establish the superiority of his plan.

But, in this case, it is useless to multiply artificial powers, when natural means suffice, and when we can accomplish the reduction with the hands more effectually, because we can vary the motions with more precision.

Thus Desault very often employed the following method with great success. The patient being seated upon a chair of moderate height, he took hold of the hand on the affected side, placed it between his knees, which he moved downward and backward, in order to make the extension, and disengage the head of the bone, while an assistant held back the trunk to effect the counter-extension. This was sometimes executed by the weight of the body, and effort of the patient. At the same time, the surgeon's hands applied to the arm, in such a way, that the four fingers of each were put on the hollow of the axilla, and the thumbs on the outer part of the arm, pushed upward, and a little outward, the head of the humerus, which usually returned with ease into its natural cavity.

Petit explains this plan, though not as here described, but complicated with the use of a napkin, passed under the patient's axilla, and over the surgeon's neck, who contributes to raise the dislocated end of the bone, by lifting up his head. This accessory method is always useless, and little methodical, preventing, also, such variation of the motions, as one may wish. The hands alone are always sufficient, and a multitude of instances attest the efficacy of this method, employed in Desault's way.

When the luxation downward has been very recent, Desault has, two or three times, succeeded in reducing it, by a still more simple process. Marie-Louise Favert fell in going down stairs, dislocated her arm downward, and was conveyed, immediately after the accident, to the Hôtel-Dieu. Desault having recongised the disorder, placed his left hand under the axilla, to serve as a fulcrum, while with the right, applied to the lower and outer part of the arm, he depressed the humerus towards the trunk, and at the same time raised the upper part of the bone. The head of the humerus directed upward and outward by this double motion, returned into the glenoid cavity, without the least resistance. The arm was placed in a sling for two days, and on the fourth, the patient resumed her wonted labour.

Dislocations downward are not the only ones, to which the first of the above simple plans is applicable. Primitive luxations inward sometimes yield to its adoption. Two examples of such success are to be found in the *Journal de Chirurgie*.

REDUCTION BY EXTENSION ALONE.

For the most part, however, such means are inadequate, and extension must be made. This employed alone, forms a second sort of means for reducing dislocations of the shoulder, and a few practitioners have deviated from the beaten path, and tried this latter plan. Celsus had recourse to nothing but extension in the ordinary cases of dislocation downward and forward. Albucasis was acquainted with no other mode. Douey, Douglas, and Heister, among the moderns, absolutely rejected the use of machines, always useless, frequently dangerous. Lastly, Dapoui and Fabre examined with more exactness the process of extension, pointed out the manner of rendering it most advantageous in all cases, by the proper application of the extending force; and, in the dislocation of the humerus in particular, they obviated the inconvenience of pulleys, placed under the arm-pit on the affected side, shewing that the motion, vulgarly termed, coaptation, was of no utility. In these respects, the Art is indebted to them for real improvement, and their doctrine, now universally diffused, was principally put into practice by Desault, who made it the base of his method of reducing all fractures, and dislocations in general.

To reduce a dislocation of the humerus, it is necessary to have a sufficient number of assistants, in order to increase the power according to the resistance which is to be overcome. But, two are usually sufficient for making the extension: in doing which, one should employ a linen pad, of sufficient thickness to project above the level of the pectoralis major, and latissimus dorsi. There must also be two bandages; one made of linen, several times

doubled, four inches wide, and eight or nine feet long; the other being a towel, folded in the same way, and which is often unnecessary.

The patient is to sit on a chair of moderate height, or else he may lie down upon a table, which is firmly fixed, and covered with a mattress.

Desault, for a long while, used to put the patient in the first of these positions, which, though generally employed in practice, is not the best. In it the arm may be advantageously drawn in a transverse direction; but if, as is often the case, there be occasion to make extension upward or downward, the assistant is then obliged to rise up, and depress himself, has not sufficient power, finds himself obstructed, and cannot vary, at the pleasure of the surgeon, the direction in which the arm is to be extended. This position is also much more fatiguing to the patient, than one in which the trunk is equally supported upon a horizontal plane. Hence, Desault, in the latter years of his practice, abandoned the first position, and invariably adopted the last.

The patient being put in the proper position, the linen compress is to be put under the axilla, on the side affected, and upon this compress the middle of the first extending bandage is to be put, while its two heads ascending obliquely before and behind the chest, meet each other at the top of the sound shoulder, and are held there by an assistant, so as to fix the trunk, and make the counter-extension. The action of this bandage does not affect the margin of the pectoralis major and latissimus dorsi, in consequence of the pad projecting higher than them. If this were not attended to, these muscles being drawn upward, would pull in this direction the humerus, to which they are attached, and would thus destroy the effect of the extension, which is to be made in the following manner :—

Two assistants take hold of the forearm, above the wrist, or else the towel, doubled several times, is to be applied to this part. The two ends are to be twisted together, and held by one or two assistants, who are to begin pulling in the same direction in which the humerus is thrown. After this first proceeding, which is designed to disengage the head of the bone from its accidental situation, another motion is to be employed, which differs according to the kind of luxation. If this should be downward, the arm is to be gradually brought near the trunk, at the same time that it is gently pushed upward. Thus, the head of the bone being separated from the trunk, and brought near the glenoid cavity, it usually glides into this situation with very little resistance.

[I cannot omit to mention here, that the counter-extension or at least a part of it should in every instance be made against the acromion scapulæ. This process in all luxations of the shoulder is found very prominent; and it is very easy, by the pressure of an assistant's hand, or by means of a strap passed over it, to make the counter-extension against it. The advantage of the practice is obvious; all the force is directed on the joint, the scapula being completely fixed; whereas, when the counter-extension is made against the thorax or in the manner above recommended, the scapula and clavicle move with the os humeri, and much of the extending force is thereby lost. Mr. Freke and Benj. Bell both advise to secure the scapula, but not precisely in the manner I have taken the liberty to recomend, which I have been induced to do from having repeatedly witnessed its good effects in the Pennsylvania hospital and in my own practice.]

When the luxation is inward, after the extension has been made in the direction of the humerus, the end of this bone should be inclined upward and forward, in order that its head may be guided backward; *vice versa*, when the luxation is outward.

When the head of the bone has been disengaged by the first extension, the motion imparted to it by the rest of the extension, should in general be exactly contrary to the course which the head of the bone has taken, after quitting the glenoid cavity. When there is difficulty experienced in replacing the head of the bone, we should, after making the extension, move the bone about in various manners, according to the different direction of the dislocation, and the principle just noticed. This plan often accomplishes what extension alone cannot; and the head of the bone, brought by such movements towards its cavity, returns into it, while they are being executed.

When the dislocation is a consecutive one, it is the first extension, made in the direction of the displaced bone,

which brings back its head to where it was primitively lodged, in order to act upon the bone afterwards, just as if the luxation were one of the primitive sort. Often it is only at the moment of the reduction, that it is possible to distinguish, whether a luxation is of one or the other kind. Indeed, as the reduction mostly takes place of itself, when the extension is properly made, if the head be situated consecutively inward, it is seen to descend along the internal part of the scapula, then to proceed to the lower part, and, lastly, to ascend towards the opening of the capsule, into which opening it returns.

When the extension is properly made; the reduction is almost spontaneously effected. Indeed, Whatever may be the kind of primitive dislocation, it is clear, that the muscles on one side of the articulation must be put upon the stretch, while those on the other must be relaxed. Hence, a change must necessarily follow both in their directions and contractions, and also in the direction of these contractions. From this change the muscles, when they act, instead of drawing back the head of the bone towards the ruptured capsule, pull it in another direction, and thus produce a consecutive dislocation.

But, if by rectifying things, the extension should chance to restore to the muscles their former direction, then obeying their natural irritability, increased by the stretching of the extending power, they will bring back the head of the bone to the opening in the capsule, and oblige it to enter with much more certainty, than the efforts of the surgeon could do, who is always ignorant of the precise situation of this opening. On the contrary, if the extension, in consequence of not having been properly made, should not have restored to the muscles their natural direction, then the head of the bone will be drawn to some other point of the capsule, away from that which has been lacerated: and hence arise the very frequent difficulties attendant on the reduction of dislocated shoulders.

It follows from what has been said:—1. That all the art of treating dislocations, consists in giving a proper direction to the extending force. 2. That in general the coaptation is useless. 3. That reducing a dislocation does not consist in putting back the head of the bone into its cavity; but, in putting the muscles in a proper state for accomplishing this reduction, and that here, as every where else, art is only the handmaid of nature.

There are cases, however, in which the action of the muscles, being perverted by the oldness of the dislocation, and by the adhesions contracted with the surrounding parts, it becomes necessary to employ such means, as will serve to force, as it were, the head of the bone into its cavity whither the muscles cannot bring it.

With reasoning is combined experience, which is always the most effectual proof of this doctrine, both respecting reductions of the dislocated humerus, and of such accidents in general. Desault only employed extension, variously diversified, till he had put the muscles in a state, favourable for accomplishing reduction. The most prompt success constantly crowned this part of his practice, and, doubtless, much of this success must be imputed to his wisely refusing to interfere in too great a degree.

When the reduction has been accomplished, if the arm should be very moveable, and seem to have a tendency to be dislocated again, it must be fixed, for a few days, in such a way as will prevent all motion.

A sling, well applied, suffices for this purpose; and indeed, the arm should always be kept quietly supported in one, after a dislocation. The French apply the bandage which Desault has recommended for the fractured clavicle.

OF SOME CIRCUMSTANCES, RENDERING THE REDUCTION MORE DIFFICULT.

1. *Narrowness of the Opening of the Capsule.*

The opening of the capsule, being too narrow to allow the head of the bone to return into the glenoid cavity, is one of the chief impediments to reduction. The obvious indication is to enlarge such an opening, by lacerating its edges. This is fulfilled by moving the bone about freely, in every direction, particularly in that in which the dislocation has taken place. Now, by pushing the head of the bone against the capsule already torn, the latter becomes lacerated still more, in consequence of being pressed between two hard bodies. The reduction, which is

frequently impracticable before this proceeding often spontaneously follows, immediately after it has been adopted. In the *Journal de Chirurgie* are two cases, by Anthaume, and Faucheron, establishing this doctrine.

2. *Oldness of the Dislocation.*

This is a second impediment to reduction, still more difficult to surmount than the foregoing one. The head of the bone, which has lodged a long while in its accidental situation, contracts adhesions to it. The surrounding cellular substance becomes condensed, and forms, as it were, a new capsule, which resists reduction, and which, when such reduction cannot be accomplished, supplies, in a certain degree, the office of the original joint, by the motion which it allows.

The majority of writers, and Bell in particular, advise, in this case, no attempt at reduction should be made, as it would be useless in regard to the dislocation, and might be injurious to the patient, from the excessive stretching of parts. This was for some time the doctrine of Desault; but, in his latter years, experience led him to adopt a bolder practice.

Complete success, obtained in dislocations, which had existed from fifteen to twenty days, encouraged him to attempt reduction at the end of thirty, and thirty-five days, and, in the two years, preceding his death, he succeeded, three or four times, in reducing dislocations which had existed two months and a half, and even three months, both when the head of the bone was situated at the lower, and at the internal part of the scapula.

However violent or protracted the extension may have been, none of the terrible consequences with which authors threaten us, ever occurred. One phenomenon, which it was difficult to foresee, and of which we shall speak presently, only took place in two instances.

In these cases it is necessary, before making the extension, to move the bone about extensively in all directions, for the purpose of first breaking its adhesions, lacerating the condensed cellular substance, serving as an accidental capsule, and of producing, as it were, a second dislocation, in order to remove the first. Extension is then to be made in the ordinary way, but with an additional number of assistants.

The first attempts frequently fail, and the dislocated head of the bone continues unmoved, notwithstanding the most violent efforts. In this case, after leaving off the extension, the arm is to be again moved about most extensively. The humerus is to be carried upward, downward, forward, and backward. Force the resistances. Let the arm describe a large segment of a circle, in the place where it is situated. Let it be once more rotated on its axis; then let the extension be repeated, and directed in every way. Thus, the head of the bone will be first disengaged by the free motion, and will afterwards be reduced.

In these cases, when the dislocation, in consequence of being very old, presents great obstacles in the way of reduction, even though the attempts made for this purpose should fail, they are not entirely useless. By forcing the head of the bone to approach the glenoid cavity, and even placing it before the cavity, and making it form new adhesions, after the destruction of the old ones, the motions of the arm are rendered freer. Indeed, they are always the less obstructed, the nearer the head of the bone is to its natural situation.

3. *Contraction of the Muscles.*

A third impediment to the reduction of every kind of dislocation, is the power of the muscles, which is augmented beyond the natural degree, in consequence of their being on the stretch. Sometimes, this power is so considerable, that it renders the head of the bone immoveable, though the most violent efforts are made. Here the means to be adopted are such as weaken the patient, bleeding, the warm bath, &c. Extension unremittingly, but not violently, continued for a length of time, will ultimately fatigue the resisting muscles, and overcome them with more safety and efficacy, than could be accomplished by any sudden exertion of force.

The swelling about the joint, brought on by the accident, usually disappears without trouble.

Another consequence, which seldom occurs in practice, concerning which, authors have scarcely said any thing, and which Desault several times had occasion to observe, is a considerable emphysema, suddenly originating at the time of reduction. In the middle of such violent extension, as the long

standing of the dislocation requires, a tumour suddenly makes its appearance under the great pectoral muscle. Rapidly increasing, it spreads towards the armpit, the whole extent of which it soon occupies. It spreads backward, and, in a few minutes, it sometimes becomes as large as a child's head. A practitioner, unacquainted with this accident, might take it for an aneurism, occasioned by the sudden rupture of the axillary artery, from the violent extension. But, if attention be paid to the elasticity of the tumour, to its fluctuation, to the situation where it first appears, commonly under the great pectoral muscle, and not in the axilla; to the continuance of the pulse; and to the unchanged colour of the skin; the event may easily be discriminated from any rupture of the artery.—(*Œuvres Chirurgicales de Desault, par Bichat. Tome* 1.)

The saturnine lotion, and gentle compression with a bandage, are the most advantageous means for dispersing the above kind of swelling.

DISLOCATIONS OF THE FORE-ARM FROM THE HUMERUS.

Notwithstanding the extent of the articular surfaces of the radius and ulna with the os humeri, the strength of the muscles and ligaments surrounding the joint, and the mutual reception of the eminences, which makes it a perfect angular ginglymus, a dislocation of these two bones off the humerus, may take place at the same time. They are most frequently luxated backward; sometimes laterally, but very rarely forward: the latter luxation cannot occur without a fracture of the olecranon*. Luxation backwards is facilitated by the small size of the coronoid process, which may slide behind the humerus, when this is forcibly pushed downwards and forwards, and ascend as high as the cavity, which receives the olecranon during the extension of the fore-arm.

Luxations laterally are much less frequent, and are always incomplete. The great extent of the articular surfaces in the transverse direction, the reciprocal union of their inequalities, and especially the strength of the ligaments and muscles, which, arising from the internal and external condyles of the inferior extremity of the humerus, go to the fore-arm and hand, give great strength to the articulation, and render it impossible to effect by any violence, a complete luxation laterally.

In the luxation backwards, the radius and ulna may ascend more or less behind the humerus; but the coronoid process of the ulna is always carried above the articular pulley, and is found lodged in the cavity destined to receive the olecranon. The head of the radius is placed behind and above the external condyle of the humerus. The annular ligament, which confines the superior extremity of the radius to the ulna, may be lacerated: in which case, even when the bones are reduced, it is difficult to keep them in their proper places, as the radius tends constantly to separate from the ulna.

This luxation always takes place from a fall on the hand; for, when we are falling, we are led by a mechanical instinct to bring our hands forwards to protect the body. If in this case the superior extremity, instead of resting vertically on the ground, be placed obliquely with the hand nearly in a state of supination, the repulsion which it receives from the ground will cause the two bones of the fore-arm to ascend behind the humerus, whilst the weight of the body pressing on the humerus, directed obliquely downwards, forces its extremity to pass down before the coronoid process of the ulna.

The fore-arm, in this luxation, is in a state of half-flexion, and every attempt to extend it occasions acute pain. The situation of the olecranon, with respect to the condyles of the humerus, is changed. The olecranon, which in the natural state is placed on a level with the external condyle, which is itself situated lower than the internal, is even higher than the latter.

This luxation may be mistaken for a fracture of the olecranon, of the head of the radius, or even of the inferior extremity of the humerus. Such a mistake is attended with very bad consequences; for, if the reduction be not effected before the end of fifteen or twenty days, it is often impossible to accomplish it afterwards. The swell-

* This kind of dislocation is so uncommon, that neither Petit nor Desault ever met with it.

ing which supervenes in twenty-four hours after the accident, renders a diagnosis more difficult; but the olecranon and internal condyle, are never so obscured, that the distance between them cannot be found to be increased, though Boyer makes a contrary assertion. It is true, that the rubbing of the coronoid process and olecranon against the humerus, may cause a grating noise, similar to that of a fracture; and some attention is certainly requisite to establish a diagnosis between a fracture of the head of the radius, and a dislocation of the fore-arm backwards.

The following method of reducing the case is advised by Boyer:—The patient being firmly seated, an assistant is to take hold of the middle part of the humerus, and make the counter-extension, while another assistant makes extension at the inferior part of the fore-arm. The surgeon, seated on the outside, grasps the elbow with his two hands, by applying the four fingers of each to the anterior part of the humerus, and the thumbs to the posterior, with which he presses on the olecranon, in a direction downwards and forwards. This method will be in general successful. If the strength of the patient, or the long continuance of the luxation, render it necessary to employ a greater force, a fillet is to be applied on the wrist, to make extension, and a cushion is to be placed in the axilla, and the arm and trunk fixed, as is done in cases of luxation of the humerus.

A bandage may afterwards be applied, in the form of a figure of 8, and the arm is to be kept in a sling. The laceration which always takes place, is always followed by more or less swelling, which is to be combated by antiphlogistic means.

At the end of seven or eight days, when the inflammatory symptoms are nearly gone, the articulation is to be gently moved, and the motion is to be increased every day, in order to prevent an anchylosis, to which there is a great tendency.

In this luxation, the annular ligament which confines the head of the radius to the extremity of the ulna, is sometimes torn, and the radius passes before the ulna. In such cases, pronation and supination are difficult and painful, though the principal luxation has been reduced. The head of the radius may be easily replaced, by pressing it from before backwards, and it is to be kept in its place by a compress, applied to the superior and external part of the fore-arm. The bandage and compresses are to be taken off every two or three days, and reapplied. This is necessary, on account of the necessity of moving the articulation to prevent an anchylosis.

If the luxation be not soon reduced, it becomes irreducible; the heads of the radius and ulna grow to the back part of the humerus, and the patient can neither bend nor extend his arm. However, in some cases, especially in young persons, some motion is acquired in time; the heads of the radius and ulna making in the humerus cavities, in which they perform some motions, but always imperfectly.

The luxation forwards should be treated as a fracture of the olecranon, with which it would be inevitably accompanied. It may be necessary, on account of the great injury done to the soft parts, to bleed the patient copiously, and put him on an antiphlogistic regimen.

As to the lateral luxations, either inwards or outwards, they are always incomplete, and easily discovered. They are reduced by drawing the humerus and fore-arm in contrary directions, and at the same time pushing the extremity of the humerus, and the two bones of the fore-arm in opposite directions.

These luxations cannot be produced without considerable violence; but when the bones are reduced, they are easily kept in their place. It will be sufficient to pass a roller round the part, to put the fore-arm in a middle state, neither much bent nor extended, and to support it in a sling. But much inflammation is to be expected from the injury done to the soft parts. In order to prevent it, or at least mitigate it, the patient is to be bled two or three times, and put on a low diet, and the articulation is to be covered with the lotio aq. litharg. acet.* It is scarcely necessary to repeat, that the arm is to

* Boyer says emollient cataplasms.

be moved as soon as the state of the soft parts will admit of it.*

The dislocation of the fore-arm backward, is said to occur ten times as frequently as lateral luxations; and those forward are so rare, that no comparison whatever can be drawn.†

Lateral luxations have been divided into *complete*, that is, when the articular surfaces have entirely lost their state of reciprocal contact; and into *incomplete*, that is, when only one bone, or a part of it, is thrown off the humerus. But, what cause can operate with sufficient force to produce the first occurrence? The mischief would also be so great, were such a case to happen, that amputation would most likely be requisite.

The incomplete lateral luxation may be produced by a blow, which drives the upper part of the fore-arm violently outward, or inward. A footman, says Petit, in falling from a coach, had his arm entangled in the spokes of a wheel, and a dislocation outward was the consequence. Another man luxated his fore-arm inward, by falling from his horse and driving his arm against an uneven place.

When the ulna is pushed into the situation of the radius, the space, between the olecranon and internal condyle, is much greater, than is natural. These points of bone are always very distinguishable, let the joint be ever so much swollen; and hence, the information to be derived from an examination of them, may be obtained in every case, without exception. Also, when the ulna is pushed into the place of the radius, the latter bone cannot be easily rotated, nor can the fore-arm be bent, and extended, in a perfect manner.

The dislocation inward must be very uncommon, as the form of the bones is almost an insurmountable obstacle to such an accident. It may happen, however, as the authority of Petit confirms.

All recent dislocations of the elbow are very easily reduced, and as easily maintained so; for the reciprocal manner in which the articular surfaces receive each other, and their mutual eminences and cavities, will not readily allow the bones to become displaced again.

The application of a bandage in the form of a figure of 8, and supporting the arm in a sling, are proper in all these cases.

DISLOCATION OF THE RADIUS FROM THE ULNA.

The majority of authors, who have written on dislocations of the fore-arm, have not separately considered those of the radius. Some detached observations, on luxations of its superior extremity, are to be found here and there; a subject, which Duverney alone has fully treated of. The dislocations of its lower end, which are more frequent, and easy of occurrence, have almost escaped the notice of French, and, also, of English writers. At present, cases of this sort have been so numerously collected, that a particular account of them may be offered.

DIFFERENCE OF STRUCTURE, BETWEEN THE TWO JOINTS OF THE RADIUS, WITH THE ULNA.

The radius, the moveable agent of pronation and supination, rolls round the ulna, which forms its immoveable support by means of two articular surfaces; one above, slightly convex, broad internally, narrow outwardly, and corresponding to the little sigmoid cavity of the ulna, in which it is lodged; the other below, concave, semicircular, and adapted to receive the convex edge of the ulna. Hence, there are two joints, differing in their motions, articular surfaces, and ligaments. By ascertaining such differences, we shall be enabled to find out those, which exist between the luxations of the upper and lower head of the radius.

Above, the radius, in pronation and supination, only moves on its own axis; below, it rolls round the axis of the ulna. Here, being more distant from the centre, its motions must be both more extensive and powerful, than they are above. The head of the radius, turning on its own axis in the annular ligament, cannot distend it in any direction. On the contrary, below, the radius, in performing pronation, stretches the posterior part of the capsule, and presses it against the immove-

* Boyer on Diseases of the Bones, vol. ii.

† Œuvres Chirurgicales de Desault. Par Bichat. Tome 1

able head of the ulna, which is apt to be pushed through, if the motion be forced. A similar event, in a contrary sense, takes place in supination. The front part of the capsule, being rendered tense, may now be lacerated.

Add to this disposition, the difference of strength between the ligaments of the two joints. Delicate, and yielding, below; thick, and firm, above; their difference is very great. The upper head of the radius, supported on the smaller immoveable articular surface of the ulna, it is protected from dislocation in most of its motions. On the contrary, its lower end, carrying along with it, in its motions, the bones of the carpus, which it supports, cannot itself derive any solid stability from them.

DIFFERENCES OF DISLOCATION OF THE RADIUS.

From what has been said, the following conclusions may be drawn: 1. That with more causes of luxation, the lower articulation of the radius has less means of resistance; and, that under the triple consideration of motions, ligaments tying the articular surfaces together, and the relations of these surfaces to each other, this joint must be very subject to dislocation. 2. That, for opposite reasons, the upper joint cannot be very subject to such an accident.

Indeed, what could be the cause producing it in this situation? Can it arise from a violent pronation, or supination? The lower joint being the weakest, would give way the first, and however forcible any motion of this kind might be, the upper head of the radius would only be rotated on its own axis. How then can this part be dislocated, without being pushed forward, or backward? All the muscular and ligamentous support of the joint must be broken; and the muscles and ligaments are too strong to admit of this, and the motion itself too feeble. Can the accident originate from any impulse on the radius, from below upward? The immoveable resisting end of the humerus would then prevent the radius from quitting the capsular ligament. Can the accident arise from a violent extension, or flexion of the fore-arm? Here the whole force operating on the ulna, the radius scarcely feels the impulse.

Hence, accidental dislocations of the radius, suddenly produced by an external cause, must, if they ever happen, be exceedingly uncommon at its upper end. This is not the case, with respect to such dislocations, which occur slowly at this joint, especially in whom the ligaments become lax in consequence of repeated efforts. With this kind of case, we have here nothing to do.

Experience sometimes seems to militate against the above reflections. Duverney quotes some instances of dislocations of the radius, suddenly produced by external causes. Some other practitioners mention similar examples. But, in their examination, have these men paid all due attention? An analogous case has been transmitted to the French Academy of Surgery, by one of its fellows; but, doubts have arisen concerning its reality, and there are too few facts for, and too much presumptive evidence against, the truth of such cases, to believe their existence. Desault himself rejected their reality.

DISLOCATION OF THE LOWER END OF THE RADIUS.

The causes are the same, as those of all analogous cases. 1. Violent action of the pronator and supinator muscles. This is, doubtlesss, a very unusual cause, for Desault never knew an instance of it. 2. External force, moving the radius violently into a state of pronation, and rupturing the back part of the capsule; or into a state of supination, and breaking the front part of the capsular ligament.

Hence, there are two kinds of dislocation; one forward, the other backward. The first is very frequent; the second is much less so. The latter case never presented itself to Desault, but once, in the dead body of a man, who had both his arms dislocated, and no particulars could be learnt. The other case occurred very often in the practice of this eminent surgeon. Five examples have been published. Doubtless, this difference is owing to all the principal motions of the radius being in the prone direction.

This observation is confirmed by the fact, that the lower joint of the radius in the dead subject, may be dislocated as easily by a supine, as a prone motion of this bone.

The symptoms of the luxation for-

ward are: 1. Constant pronation of the forearm: 2. An inability to perform supination, and great pain on this being attempted: 3. An unusual projection at the back of the joint, in consequence of the protrusion of the little head of the ulna through the capsule: 4. The position of the radius is more forward than natural: 5. Constant abduction of the thumb, which is also almost always extended: 6. A half-bent state of the forearm, and very often of the fingers. This, indeed, is the position, which the forearm usually assumes in all affections of its bones, and, in the present instance, the posture cannot be changed, without considerable pain: 7. More or less swelling around the joint. This sometimes comes on immediately after the accident, but always afterwards, if the reduction should remain unaccomplished. The condition of the joint may thus be obscured, and the accident mistaken for a sprain; as Desault often observed to have occured with surgeons, who had been called to these accidents before him. The serious consequence of this mistake is, that no attempt at reduction is made, and the articular surfaces having time to contract adhesions, the disorder is frequently rendered irremediable.

A luxation of the radius backward is characterized by symptoms, the reverse of those above mentioned. They are, a violent supination of the limb; inability to put it prone; pain on making the attempt; a tumour in front of the forearm formed by the head of the ulna; a projection backward of the large head of the radius; and abduction of the thumb.

REDUCTION.

When the dislocation is forward, an assistant is to take hold of the elbow, raising the arm a little from the body; another is to take hold of the hand and fingers.

The surgeon is to take hold of the end of the forearm with his hands; one applied to the inside, the other to the outside, in such a manner, that the two thumbs meet each other before, between the ulna and radius, while the fingers are applied behind. He is then to endeavour to separate the two bones from each other, pushing the radius backward and outward, while the ulna is held in its proper place. At the same time, the assistant, holding the hand, should try to bring it into a state of supination, and consequently the radius, which is its support. Thus pushed, in the direction opposite that of the dislocation, by two powers, the radius is moved outward, and the ulna returns into the opening of the capsule, and into the sigmoid cavity.

If chance should present a dislocation of the radius backward, the same kind of proceeding, executed in the opposite direction, would serve to accomplish reduction.*

DISLOCATIONS OF THE WRIST.

The carpal bones may be luxated from the lower ends of the radius and ulna forwards, backwards, inwards, or outwards. The two first cases, especially the one backwards, are the most frequent. The dislocation backwards is rendered easy by the direction of the convex articular surfaces of the scaphoid, semilunar, and pyramidal bones, which sloping more backwards, than forwards, must make them more disposed to slip in this direction, than any other. The accident may be caused by a fall on the back of the hand while much bent; in which event the first row of the carpal bones slide backwards into the oblong cavity of the radius, lacerate the posterior ligament, and form an eminence behind the lower ends of the bones of the forearm. This prominence, the depression in front of the wrist, and the extraordinary flexion of the hand, which cannot be extended, are the characteristic signs of this kind of dislocation.

The dislocation forwards generally arises from a fall on the palm, the fingers being extended, and more force operating on the lower, than upper part of the palm. The luxation is seldom complete; and the hand remains painfully extended. The great many tendons, which run before the wrist, and the annular ligament, being pushed forward, the prominence formed by the

* See *Œuvres Chirurgicales de Desault; par Bichat. Tome I.*

carpal bones, in front of the ends of the radius and ulna, is not easily detected, and the case may be mistaken for a sprain.

Dislocations inwards, or outwards, are never complete. The projection of the carpal bones at the inner, or outer side of the joint, and the distortion of the hand, make such cases sufficiently evident.

All dislocations of the wrist are very easy of reduction. For this purpose, gentle extension must be made, while the two surfaces of the joint are made to slide on each other in a direction contrary to what they took when the accident occurred.

Dislocations of the wrist are always attended with a great deal of spraining of numerous tendons, and laceration of ligaments, and consequently considerable swelling generally follows, and the patient is a long time in regaining the perfect use of the joint. To relieve the symptoms as much as possible, the best plan is to keep the hand and wrist continually covered with linen wet with the saturnine lotion, and to put the forearm and hand in splints, as in the case of a fracture. See *Fractures of the Forearm.* The arm must also be kept perfectly at rest in a sling.

When the ruptured ligaments have united, the use of liniments will tend to remove the remaining stiffness and weakness of the joint.

DISLOCATIONS OF THE BONES OF THE CARPUS AND METACARPUS.

A dislocation of the carpal bones from each other seems almost impossible. The os magnum, however, has been known to be luxated from the deep cavity formed for it by the scaphoides and semilunare, in consequence of too great a flexion of the bones of the first phalanx on those of the second, and it forms a tumour on the back of the hand. (*Chopart; Boyer; Richerand.*)

The metacarpal bones are never luxated from each other. The first one is sometimes, though very rarely, pushed off the trapezium.

DISLOCATION OF THE FINGERS.

The first phalanges may be dislocated backwards off the heads of the metacarpal bones. A luxation forwards would be very difficult, if not impossible, because the articular surfaces of the metacarpal bones extend a good way forwards, and the palm of the hand makes resistance to such an accident. The first phalanges of the thumb and little finger can alone be dislocated inwards; and the first phalanx of the thumb is alone subject to be luxated outwards. This phalanx is also most liable to dislocations backwards, behind the head of the first metacarpal bone, in which case it remains extended, while the second is bent.

These dislocations should be speedily reduced; for, after eight or ten days, they become irreducible. In a luxation of the first bone of the thumb, which was too old to be reduced, Desault proposed cutting down to the head of the bone, and pushing it into its place with a spatula. Dislocations of the thumb and little finger inwards, that of the thumb outwards, and luxations of the first phalanges of the other fingers backwards, are all reduced by making extension on the lower end of the affected thumb, or finger. The first and second phalanges may also be dislocated backwards.

After the reduction, the thumb, or finger, affected, should be rolled with tape, and incased, and supported in pasteboard, till the lacerated ligaments have united; taking care to keep the hand and forearm quietly in a sling.

DISLOCATIONS OF THE BONES OF THE PELVIS.

M. Louis, in Tom. 4, of the *Mem. de l'Acad. de Chir.* relates a case, in which the os ilium of the right side was found separated from the sacrum, so as to pass nearly three inches behind it. This accident was caused by a very heavy sack of wheat falling on a labourer, and the truth of it was ascertained by dissection. Such a case must be exceedingly uncommon.

The os coccygis is not so easily dislocated as fractured. Boyer, however, has seen it displaced in a man, who was greatly emaciated by disease. This subject had considerable ulcerations about the coccyx, and the bone itself was bare. There was an interspace of nearly two inches, between the sacrum and base of the os coccygis. In proportion as the man regained his strength, the bone recovered its right position; and at length united to the os sacrum, notwithstanding the action of the leva-

tores ani, which are inserted into it. (*Boyer.*) This case, however, was not an accidental luxation; and it clearly arose from the destruction of the ligaments by disease.

Authors mention two kinds of dislocation, to which the os coccygis is liable, one inward, the other outward. The first is always occasioned by external violence; the second, by the pressure of the child's head in difficult labours. The nature of these accidents is easily discovered by the preceding cause, and by an examination with the fingers, externally, and within the rectum. Pain, difficulty of voiding the fæces and urine, tenesmus, and inflammation, sometimes ending in abscesses, which interest the rectum, are symptoms, said to attend and follow dislocations of the os coccygis.

These luxations are easily reduced, by means of a finger in the rectum, assisted by the other fingers externally. No more can be done, than in the case of a fracture. See *Fracture.*

DISLOCATION OF THE RIBS.

J. L. Petit was silent on this subject, as he thought such cases never occurred. Since his death, a French surgeon, Buttet, has related an instance, which he supposed to be a dislocation of the posterior extremity of the rib from the vertebræ; but, Boyer clearly shews he had no true reasons for this opinion, and that the case was only a fracture of the neck, or end of the bone, near the spine.

Ambroise Paré, Barbette, Junker, Platner, and Heister, not only admit the occurrence of luxations of the ribs, but, describe different species of them. Lieutaud also termed cases, in which the head of the rib was separated by disease, luxations. On the whole, we may conclude, that the ribs are so rarely dislocated, that the subject is not deserving of much attention in this work.

DISLOCATIONS OF THE THIGH-BONE

The head of the thigh-bone may be dislocated upwards and outwards on the dorsum of the ilium; upwards and forwards on the body of the os pubis; downwards and inwards on the foramen ovale; and downwards and outwards on the os ischium.

The dislocation upwards and outwards, and the one downwards and inwards, are the most frequent. First, of luxations on the ilium.

The common kind of dislocation of the thigh-bone, upward and outward, is attended with the following symptoms. The affected thigh is shorter, than its fellow, is a little bent, and carried inwards. The knee inclines more forwards and inwards, than the opposite one; the leg and thigh are turned inwards, and the foot points in this direction. The trochanter major is brought nearer the anterior superior spinous process of the os ilium, and is at the same time elevated and carried a little forwards. The natural length of the limb cannot be restored, without reducing the luxation; the foot cannot be turned outwards, and any attempt to do so causes pain; but, the inclination of the foot inwards may be increased. (*Boyer.*)

This luxation has nothing in common with a fracture of the neck of the thigh-bone, except the shortness of the limb. The cases are at once discriminated by this difference, that, *in this kind of luxation, the limb and toes are turned inwards, while in all fractures of the thigh-bone, they are invariably turned outwards.*

Many writers have been puzzled how to account for the toes being inclined inwards. We have only to reflect, however, that the trochanter major is situated forwards, and that the head of the bone lies backwards, when we shall immediately perceive, that the limb is mechanically prevented from being rotated outwards.

To reduce this dislocation, the patient should be placed on his opposite side upon a table firmly fixed, or a large four-posted bedstead. A sheet, folded longitudinally, is first to be placed under the perineum, and one end being carried behind the patient, the other, before him, they are to be fastened to one of the legs, or posts of the bed. Thus the pelvis will be fixed, so as to allow the necessary extension of the thigh-bone to be made. Great care must be taken during the extension to keep the scrotum and testicles from being hurt, or the pudenda in women, by the sheet passed under the perineum. The patient must be further fixed by being held by assistants.

The best practitioners of the present day in France, advise the extending force to be applied to the inferior part of the leg, in order to have it as far as possible from the parts, which resist the return of the bone into its natural situation. In this country, surgeons generally prefer making the extension by means of a sheet, fastened round the limb just above the condyles of the os femoris. As soon as the head of the bone has been brought on a level with the acetabulum by the assistants, who are making the extension, the surgeon is to force it into this cavity, by pressing on the great trochanter.

The extension should always be made in a gradual and unremitting manner: at first, gently; but afterwards, more strongly; yet never violently. The difficulty of reduction arises from the great power and resistance of the muscles, and these must at length be fatigued, so as to yield to the extending force, if care be taken, that it be maintained the necessary time, without the least intermission.

In very strong, athletic subjects, it may be proper to bleed them, in order to produce a temporary weakness, for the purpose of facilitating the reduction.

The disappearance of all the symptoms, and the noise made by the head of the bone, when it slips into the acetabulum, denote, that the reduction is effected. The bone is afterwards to be kept from slipping out again, by tying the patient's thighs together with a bandage placed a little above the knees. The patient should be kept in bed for at least three weeks; live low, and rub the joint with the *linimentum camph. et saponis.* Due time must be given for the lacerated ligaments to unite, and the sprained parts to recover; and premature exercise may bring on irremediable disease in the joint.

Mr. Hey gives the following directions, and description of the way, in which he reduced a case of this kind.

"The extension of the limb must be made in a right line with the trunk of the body: and, during the extension, the head of the bone must be directed outwards as well as downwards. A rotatory motion of the os femoris on its own axis, towards the spine, (the patient lying prone) seems likely to elevate the great trochanter, bring it nearer to its natural position, and direct the head of the bone towards the acetabulum. These circumstances led to the following method. A folded blanket was wrapped round one of the bed posts, so that the patient, lying in a prone position, and astride of the bed post, might have the affected limb on the outside of the bed. The bed was rendered immoveable, by placing it against a small iron pillar, which had been fixed for the purpose of supporting the curtain rods. The leg was bent to a right angle with the thigh, and was supported in that position by Mr. Lucas, who, when the extension should be brought to a proper degree, was to give the thigh its rotatory motion, by pushing the leg inwards, that is, towards the other inferior extremity.

Mr. Jones sat before the patient's knee, and was to assist in giving the rotatory motion, by pushing the knee outwards at the same moment. I sat by the side of the patient, to press the head of the bone downwards and outwards during the extension. Two long towels were wrapped round the thigh just above the condyles, one towel passing on the inside of the knee, the other on the outside. Three persons made the extension; but when we attempted to give the thigh its rotatory motion, we found it confined by the towel which passed on the inside of the knee and leg. We therefore placed both the towels on the outside; and in this position the extending force concurred in giving the rotatory motion. The first effort that was made, after the towels were thus placed, had the desired effect, and the head of the bone moved downwards and outwards into the acetabulum." (*Hey's Practical Observations, p.* 313.)

There is another kind of dislocation upward and outward, so rare, that many experienced men have never seen it, and few have mentioned it. I allude to the case, in which the head of the thigh-bone is so situated on the dorsum of the ilium, that it lies forward, the trochanter major backward, and an instance of which I have myself seen in St. Bartholomew's hospital. This case deserves very particular attention, because being attended with a considerable turning of the toes outwards, as well as a shortening of the limb, it is the only example, which is at all likely to be mistaken for a fracture of the neck of the thigh-bone. The case, however, is not difficult of detection; for, you can even feel the head of the

bone projecting forward on the ilium, and you cannot rotate the limb inwards, which can be done in cases of fracture, though doing so is productive of immense suffering.

This rare kind of luxation is to be reduced by the same means, and in the same manner, as the common dislocation upwards and outwards, already treated of.

Another of the most frequent luxations of the thigh-bone, is downwards and inwards, upon the obturator foramen. The occurrence of this accident is facilitated by the great extent of the motion of abduction of the thigh; by the notch at the inferior and internal part of the acetabulum; by the weakness of the orbicular ligament on this side; and by the ligamentum teres not opposing, nor being necessarily ruptured by it. The head of the bone is thrown between the obturator ligament, and obturator externus muscle.

The symptoms are as follows: the affected thigh is longer, than the sound one; the head of the femur being situated lower than the acetabulum, the trochanter major is removed to a greater distance from the anterior superior spinous process of the ilium, and the thigh is flattened, in consequence of the elongation of the muscles. A hard, round tumour is felt at the inner and superior part of the thigh, formed by the head of the femur. The leg is slightly bent; and the knee and foot, are turned outwards, and cannot be brought back into their proper direction.

This case, like a fracture, is attended with a turning of the toes outwards; but, besides being easy of discrimination on every account, the elongation of the limb at once denotes, that there is no fracture, which always causes a shortening of the member.

Dislocations on the obturator foramen, are very easy of reduction. The extension is to be made downwards and outwards, so as just to dislodge the head of the bone, and then the muscles generally draw it in into the acetabulum, on the extending force being gradually relaxed, and the surgeon pushing the upper part of the bone outward.

The thigh-bone is sometimes, though very seldom, luxated upwards and forwards, into the groin. The whole limb is turned outwards and shortened; the the trochanter major is approximated to the anterior superior spinous process of the ilium; the head of the bone forms a tumour in the groin, and pressing on the anterior crural nerves, causes great pain, numbness, and even paralysis; and the knee is carried backwards.

The head of the bone felt in the groin; the inclination of the knee backwards; and the impossibility of rotating the limb inward; distinguish it from a fracture of the neck of the bone.

It is reduced, in the same way, as the luxation downwards and forwards.

Mr. Hey says, that "In this species of dislocation, (downwards and forwards,) as the head of the bone is situated lower than the acetabulum, it is evident, that an extension made in a right line with the trunk of the body, must remove the head of the bone farther from its proper place, and thereby prevent, instead of assisting, reduction. The extension ought to be made with the thigh at a right angle, or inclined somewhat less than a right angle to the trunk of the body. When the extension has removed the head of the bone from the external obturator muscle, which covers the great foramen of the os innominatum, the upper part of the os femoris must then be pushed or drawn outwards; which motion will be greatly assisted by moving the lower part of the os femoris, at the same moment, in a contrary direction; and, by a rotatory motion of the bone upon its own axis, turning the head of the bone towards the acetabulum." (*Hey*, 316.)

The ensuing case illustrates Mr. Hey's practice.

"The lower bed-post, on the right side of the bed on which the patient lay, was placed in contact with a small immoveable iron pillar (about an inch square in thickness,) such as in our wards are used for supporting the curtain rods of the beds. A folded blanket being wrapped round the bed-post and pillar, the patient was placed astride of them, with his left thigh close to the post, and his right thigh on the outside of the bed. A large piece of flannel was put between the blanket and the scrotum, that the latter might not be hurt during the extension.

"The patient sat upright, with his abdomen in contact with the folded blanket which covered the bed-post. He supported himself by putting his arms round the post, and an assistant sat behind him to prevent him from rece-

ding backwards. He was also supported on each side.

"Two long towels were put round the lower part of the thigh, after the part was well defended from excoriation by the application of a flannel roller. The knot, which the towels form, was made upon the anterior part of the thigh, that the motion intended to be given to the leg might not be impeded by the towels.

"The thigh being placed in a horizontal position, or rather a little elevated, with the leg hanging down at right angles to the thigh, I sat down upon a chair, directly fronting the patient, and directed a gentle extension to be made by the assistants standing at my left side. This was done with the view of drawing the head of the bone a little nearer to the middle of the thigh, and the extension had this effect. I then placed the two assistants, who held the towels, at my right side, by which means the extension would be made in a direction a little inclined to the sound limb. Mr. Logan stood on the right side of the patient, with his hands placed on the upper and inner side of the thigh, for the purpose of drawing the head of the bone towards the acetabulum, when the extension should have removed it sufficiently from the place in which it now lay.

"I desired the assistants to make the extension slowly and gradually; and to give a signal when it arrived at its greatest degree. At that moment, Mr. Logan drew the upper part of the bone outwards, while I pushed the knee inwards, and also gave the os femoris a considerable rotatory motion, by pushing the right leg towards the left. By these combined motions, the head of the os femoris was directed upwards and outwards, or, in other words, directly towards the acetabulum, into which it entered at our first attempt made in this manner.

"The scrotum, as the patient assured me, was not hurt in the least by the extension." (*Hey, p.* 318.)

The last dislocation of the thigh remaining to be spoken of, is that downwards and backwards. The head of the bone rests against that part of the ossa innonimata where the ilium and ischium join. The limb is turned outwards. When the luxation is primary, the extremity is lengthened. A hard tumour is felt at the posterior and inferior part of the buttock, and the great trochanter is removed further from the spine of the ilium. When secondary (which is far more frequent,) the primary luxation having been upwards and outwards, the foot is turned inwards. The primary luxation downwards and backwards, with the toes turned outwards, is as unusual, as the case upwards and backwards, with the foot in the same position. The lengthening of the limb, however, at once shews the case not to be a fracture.

The pelvis being fixed, as already described, the extension is to be made downwards and forwards, to dislodge the head of the bone, while the surgeon, with a napkin, placed just below the trochanter minor, pulls the upper part of the femur towards the acetabulum.

DISLOCATIONS OF THE PATELLA.

This bone may be luxated, either inwards, or outwards, when violently pushed in this direction. The luxation outward is the most frequent, because the bone more easily slips in this direction off the outer condyle of the femur, than inwardly. All these cases are easily reduced, on relaxing the extensors of the leg, and bending the thigh; but, owing to a relaxed state of the ligament of the patella, or other predisposing causes, the bone is sometimes difficultly kept in its proper situation, without applying a roller to the part. The inflammatory affection of the joint is to be opposed by bleeding, purging, and using the saturnine lotion. The joint must be kept quiet a few days, and then gently moved to prevent stiffness.

DISLOCATIONS OF THE KNEE.

The tibia may be luxated forward, backward, or to either side.

The dislocation backward is always incomplete, and sometimes is secondary, being a consequence of white-swellings.

The luxation forward is even more rare, than the one backward. Dislocations inward, or outward, are the most frequent, and are always incomplete. The nature of all these cases is so conspicuous at first view, that there is no need of any detail of particular symptoms.

The bones of the leg are sometimes twisted outward, and the internal la-

teral ligament ruptured; but, this may happen without the crucial ligament being broken. On the other hand, when the bones of the leg are violently twisted inward, both the crucial ligaments, and external lateral ligament, must inevitably be ruptured.

These accidents are all most easily reduced, on making gentle extension, and pushing the head of the tibia in the proper direction. The grand object, after the reduction, is to avert inflammation of the knee, and promote the union of the ligaments. The first demands the rigorous observance of the antiphlogistic plan; both require the limb to remain perfectly motionless, supported by one, or two splints. As soon as the ligaments have grown together, and the danger of inflammation is over, which will be in about three weeks, the joint should be gently bent and extended a certain time every day to prevent stiffness. Liniments will now also be of service.

DISLOCATIONS OF THE FOOT.

The foot may be dislocated inwards, or outwards; forwards, or backwards; and either of these luxations may be complete, or incomplete. Dislocations inwards, or outwards, are the most common; the former occurring, however, more frequently, than the latter, which are greatly resisted by the lowness of the malleolus externus.

Many of these accidents are *compound;* that is, attended with a wound communicating with the joint; a circumstance that greatly increases the danger, and is frequently the occasion of the patient losing his limb, and even his life. It is only, however, when the soft parts are very much contused, and extensively lacerated, that amputation should be had recourse to in the first instance. When the bones are reduced, and the edges of the wound brought into contact, the unpromising aspect of the case is very much diminished, and many, who might think amputation advisable at first view of the accident, would change their mind, as soon as the bones have been replaced.

Dislocations inwards, or outwards, are very easily reduced, and require very little extension. In accomplishing the reduction, it is best to relax the strong muscles of the calf by bending the leg on the thigh. The case is afterwards to be treated in the same way as a fracture of the leg.

Mr Pott has called the attention of surgeons to a particular kind of dislocation, in which the utility of relaxing the muscles, is strikingly illustrated. I mean the instance, in which, "by leaping, or jumping, the fibula breaks in the weak part already mentioned, that is, within two or three inches of its lower extremity. When this happens, the inferior fractured end of the fibula falls inward toward the tibia, that extremity of the bone which forms the outer ankle, is turned somewhat outward and upward, and the tibia having lost its proper support, and not being of itself capable of steadily preserving its true perpendicular bearing, is forced off from the astragalus inwards; by which means the weak bursal, or common ligament of the joint, is violently stretched, if not torn, and the strong ones, which fasten the tibia to the astragalus and os calcis, are always lacerated; thus producing at the same time a perfect fracture and a partial dislocation, to which is sometimes added, a wound in the integuments, made by the bone at the inner ankle. By this means, and indeed as a necessary consequence, all the tendons which pass behind or under, or are attached to the extremities of the tibia and fibula, or os calcis, have their natural direction and disposition so altered, that, instead of performing their appointed actions, they all contribute to the distortion of the foot, and that by turning it outward and upward.

"When this accident is accompanied, as it sometimes is, with a wound of the integuments of the upper ankle, and that made by the protrusion of the bone, it not infrequently ends in a fatal gangrene, unless prevented by timely amputation; though I have several times seen it do very well without. But in its most simple state, unaccompanied with any wound, it is extremely troublesome to put to rights, still more so to keep it in order, and, unless managed with address and skill, is very frequently productive both of lameness and deformity ever after.

"After what has been said, a farther explanation why this is so, is unnecessary. Whoever will take even a cursory view of the disposition of the parts, will see that it must be so. By the fracture of the fibula, the dilatation of

the bursal ligament of the joint, and the rupture of those which should tie the end of the tibia firmly to the astragalus and os calcis, the perpendicular bearing of the tibia on the astragalus is lost, and the foot becomes distorted; by this distortion the direction and action of all the muscles already recited are so altered, that it becomes (in the usual way of treating this case) a difficult matter to reduce the joint; and, the support of the fibula being gone, a more difficult one to keep it in its place after reduction. If it be attempted with compress and strict bandage, the consequence often is a very troublesome, as well as painful ulceration of the inner ankle, which very ulceration becomes itself a reason why such kind of pressure and bandage can be no longer continued; and if the bone be not kept in its place; the lameness and deformity are such, as to be very fatiguing to the patient, and to oblige him to wear a shoe with an iron, or a laced buskin, or something of that sort, for a great while, or perhaps for life.

"All this trouble, pain, difficulty, and inconvenience, are occasioned by putting and keeping the limb in such position as necessarily puts the muscles into action, or into a state of resistance, which in this case is the same. This occasions the difficulty in reduction, and the difficulty in keeping it reduced; this distorts the foot, and by pulling it outward and upward makes that deformity which always accompanies such accident; but if the position of the limb be changed, if by laying it on its outside, with the knee moderately bent, the muscles forming the calf of the leg, and those which pass behind the fibula, and under the os calcis, are all put into a state of relaxation and non-resistance, all this difficulty and trouble do in general vanish immediately; the foot may easily be placed right, the joint reduced, and by maintaining the same disposition of the limb, every thing will in general succeed very happily, as I have many times experienced." (*Pott.*)

It occasionally happens in compound luxations of the ankle, that the astragalus only remains attached by a few fibres, in which circumstance, if it be judged prudent to attempt the preservation of the limb, it is best to imitate Ferrand and Desault, by extirpating this bone entirely, so as to allow the tibia to become anchylosed to the upper surface of the os calcis.

Dislocations forwards and backwards are not very common. The first case is the most difficult to produce.

The facility, with which all dislocations of the ankle are recognised by surgeons, acquainted with anatomy, renders a particular account of the symptoms quite superfluous.

Both the latter cases are easy of reduction, when care is taken to relax the muscles of the calf, which attention is most particularly essential to prevent the bones from becoming displaced again. The limb must be put in splints, just as if the case were a fracture.

The os calcis and astragalus are so intimately connected, that they are never completely luxated from each other. But, one, or both of these bones may be dislocated from the scaphoides and cuboides by violent force, when the forepart of the foot is fixed. (*J. L. Petit.*) The astragalus and os calcis, particularly the former, may then be luxated upwards into the cavity on the back of the scaphoides, so as to form a tumour on the back of the foot. The reduction is difficult: Boyer in one case could not succeed; but no lameness remained with the deformity,

The first phalanx of the great toe is sometimes dislocated from the first metatarsal bone. The reduction is too simple to need explanation.

On the subject of Dislocations, consult *Petit, Traité des Maladies des Os. Boyer's Lectures on the Diseases of the Bones, Vol. II. Œuvres Chirurgicales de Desault; par Bichat, Tom. I. Pott's Remarks on Fractures and Dislocations, and Hey's Practical Observations in Surgery. Kirkland's Observations upon Mr. Pott's General Remarks on Fractures, &c. White's Cases in Surgery. Medical Observations and Inquiries, Vol. II. Bromfield's Chirurgical Cases and Observations.*

DISTICHIA, or DISTICHIASIS, (from δις, twice, and στιχος, a row.) Gorrhæus, Heister, and St. Ives, agree in applying this term to an affection of the eyelids, in which each tarsus has a double row of eyelashes, which, inclining inward, irritate the eye, and keep up an ophthalmy. Such authors speak of this, as a very frequent complaint; but, the author of the present article in the French Encyclopædia remarks, that he has never met with it at all,

though, in ulcerations of the eyelids, he has often seen a certain number of the eyelashes incline inward, and cause a good deal of disturbance to the eye, already in a state of inflammation. This disorder cannot be called the true distichiasis. However it may be, all writers recommend plucking out such eyelashes, as assume an unnatural direction. A few of the hairs are to be taken out at a time, one after the other, and a few days are to be allowed to elapse, before this trivial operation is repeated. In order, that the eyelashes may be, with more certainty, extirpated to their roots, and that others may not grow in the same situation, it is advised to touch the places from which they grow with the argentum nitratum. (See *Trichiasis.*) *Encyclopédie Méthodique, Partie Chirurgicale.*

DISTORTION, (from *distorqueo*, to wrest aside.) *Distortio.* The bones of the limbs frequently become distorted, in consequence of an unhealthy, rickety, or scrophulous constitution. Sometimes, they are deformed merely by the contraction of the muscles; and, very frequently, they are naturally distorted by the feet being either turned too much outward, or inward. Mere weakness will sometimes occasion a distortion; for when a child is too soon put to walk, its legs will become crooked from the bones not being strong enough to bear the weight of the body.

Distortions of the limbs are much more easily cured, than those of the spine. As they appear in infancy, when the bones are flexible, they can easily be brought into their proper shape by using machines, sometimes of a very simple kind; but it must always be remembered, that, as the disease, in cases, in which the limbs are not naturally distorted from birth, proceeds from weakness, we must not omit to strengthen the system by tonics. Sometimes, a gentle long continued pressure will be sufficient to make a bone straight; but, generally, some kind of machines, or shoes, or boots, of a particular construction, are necessary.

When the limbs are distorted, by reason of a contraction of the muscles, emollient oils are highly recommended. The muscles and tendons, which are supposed to cause the deformity, are to be rubbed throughout their course, for half an hour, or more, three times a day, during which frequent endeavours must be made to extend the limb; but gradually, and without violence.

Latta's System of Surgery, Vol. 2. 467, 468. See *Mollities Ossium; Rachitis; Vertebræ, Diseased.*

DURA MATER, TUMOURS OF. The dura mater, the outer membrane of the brain, was so named by the ancients, on account of its hardness, and its being formerly supposed to be the source of all other membranes of the body.

Our present observations will be confined to diseases, which, being misunderstood at their first appearance, have led practitioners to commit great errors, as will be presently related. The diseases alluded to are of a chronic nature, and make their appearance gradually, in the form of a tumour, which makes its way through the bones of the cranium, rises up, and insensibly, blends itself with the integuments, which seem, as it were, to make a part of it. Swellings of this kind are named *fungous tumours of the dura mater.* These may originate spontaneously at any part of this membrane; but, they are particularly apt to grow on the surface, which is adherent to the upper part of the skull, or to its basis. They are firm, indolent, and chronic, seeming, as if they were the consequence of a slow inflammation, affecting the vessels, which supply the dura mater, and inosculate with those of the diploe. It is very difficult, one might say, impossible to determine, whether, in an affection of this kind, the disease began in the dura mater, or the substance of the bone itself. The patient, who is the subject of the first case related in a memoir by M. Louis, had received no blow upon the head, and could only impute his complaint to a fall, which he had met with four, or five months before, and in which the head had not struck against any thing; but, from this time, he experienced a stunning sensation, which continued till he died. The cranium and dura mater were found both equally diseased. Though this case may tend to show, that fungous tumours of the dura mater may form spontaneously, yet, it is not the less confirmed by the examination of a vast number of cases, that this affection more frequently follows blows on the head than any other cause. Hence, a slow kind of thickening of the dura mater

is produced, which ends in a sarcomatous excrescence, the formation of which always precedes the destruction of the bone. In the memoir, published by M. Louis in the fifth volume of those of the Royal Academy of Surgery, there is a very interesting case, illustrating the nature of the present disease.

The subject was a young man, aged twenty-one, who had a considerable tumour on the left side of the head, which was taken for a hernia cerebri. (*See this Article.*) The swelling had begun in the region of the temple, and gradually acquired the magnitude of a second head. The external ear was displaced by it, and pushed down as low as the angle of the lower jaw. At the upper part of the circumference of the base of the tumour, the inequalities of the perforated bone, and the pulsations of the brain, could be distinctly felt. Some parts of the mass were elastic and hard, others were soft and fluctuating. A plaster, which had been applied, brought on a suppuration at some points, from which an ichorous matter was discharged. Shiverings and febrile symptoms ensued, and the man died in less than four months, in the year 1764. On dissection, a sarcomatous tumour of the dura mater was detected, together with a destruction of the whole portion of the skull, corresponding to the extent of the disease.

When a tumour of this nature has decidedly formed, it makes its way outward through all the parts, soft or hard, which resist. The swelling, in becoming circumscribed, is partly blended with the dura mater, and its pressure produces an absorption of such parts of the skull, as oppose its enlargement. It unexpectedly elevates itself externally, confounding itself with the scalp, and presents itself outwardly in the form of a preternatural, soft, yielding swelling, which even sometimes betrays an appearance of a decided fluctuation, or a pulsation, which leads some to suppose it to be an aneurismal tumour. When once the swelling has made its exit from the cavity of the cranium, it expands on every side under the integuments, which readily make way for its growth. The scalp becomes distended, smooth, and œdematous over the extent of the tumour, and lastly it ulcerates. The matter which is discharged from such ulcerations, is thin and sanious; the outer part of the tumour is confounded with the integuments and edges of the skull, on which it rests, so that, in this state, it is easy to mistake the tumour for one, whose base is altogether external. While the swelling thus increases in size externally, it also enlarges internally. The latter change takes place in particular, while the opening in the cranium is not large enough to admit the whole mass of the tumour, which then depresses the brain, and lodges in an excavation, which it forms for itself. But, this cavity quickly diminishes, and becomes reduced almost to nothing, as soon as the tumour projects outward. The tables of the skull are absorbed to make way for the swelling to arrive externally; but, it is remarked, that the internal, or vitreous table, is always found much more extensively destroyed, than the external one. Sometimes, new bony matter is found deposited around the opening in the cranium.

The existence of a fungous tumour of the dura mater cannot be ascertained, as long as there is no external change. The effects, produced, may originate from so many causes, that there would be great risk of a gross mistake in referring them to any particular ones. This is not the case, when there is an opening in the skull. Then a hardness, felt from the very first at the circumference of the tumour, denotes that it comes from within. When the swelling is carefully handled, such a crackling sensation is perceived, as would arise from touching dry parchment stretched over the skin. On making much pressure, pain is occasioned, and sometimes a numbness in all the limbs, stupefaction, and other more or less afflicting symptoms. The tumour, in some measure, returns inward, especially, when not very large, and gradually rises up outward again, when the pressure is discontinued. Sometimes, there is pain; at other times, there is none; which may be owing to the manner in which the tumour is affected by the edges of the bone, through which it passes. The pain is often made to go off by compression, but returns as soon as this is taken off. The tumour has an alternate motion, derived from the pulsation of the brain, or of the large arteries at its base. This throbbing motion has led many into mistakes; by making them mistake the disease for an aneur-

ism, as happened in the second case, related in the memoir of M. Louis When the tumour is pushed side ways, and the finger carried between it and the edge of the bone, through which the disease protrudes, the bony edge may be felt, touching the base of the swelling more or less constricting it. This symptom, when distinguishable, added to a certain hardness and elasticity, and sometimes a facility of reduction, forms a pathognomonic mark, which cannot deceive. By uniting all the preceding symptoms, and exercising, in the investigation, the spirit of combination, so necessary in these difficult cases, fungous tumours of the dura mater may be discriminated from herniæ of the brain, external fleshy tumours, abscesses, exostoses, and other affections, which at first sight resemble them.

Generally speaking, fungous tumours of the dura mater are very dangerous, as well on account of their nature, as of the difficulty of curing them in any certain manner, and of the internal and external disorder, which they may occasion. Such as have a pedicle, the base of which is not extensive ; which are firm in their texture, without much disease of the surrounding bone, are moveable, not very painful, and in persons, who are, in other respects quite well, are in general reputed to be the least perilous. These are the cases, in which a cure may be attempted, with a hope of success, though the event is always exceedingly doubtful.

When the contrary of what has been just related occurs, when the disease is of long continuance, and the brain already affected, nothing favourable can be expected.

Compression is the most simple means of cure, and that which has naturally occurred to such practitioners, as have mistaken the disease for an aneurism, or a hernia cerebri. The efficacy of this method has been further misconceived, because the tumour, when not very large, has sometimes been partly, or even wholly reduced, without any bad censequences. This had no little share in leading to errors, concerning the true character of the disease. But, as might be conceived, this reduction, only being attended with temporary success, and having no effect whatever on the original cause of the affection, the symptoms returned, and the tumour rose up again, the moment the compression was discontinued. There is a fact in the memoir by M. Louis, which seems to evince, that good effects may sometimes be produced by compression judiciously employed. A woman, brought to the brink of the grave by the symptoms, occasioned by a tumour of the above kind, having rested with her head, for some time, on the same side as the tumour, found the swelling so suddenly reduced, without any ill effects, that she thought herself cured by some miracle. A compression, artfully kept up, by means of a piece of tin, fastened to her cap, prevented the protrusion of the tumour again. The pressure, however, not having been always very exact, the symptoms every now and then recurred, while the tumour was in the act of being depressed again, and they afterwards ceased, on the swelling having assumed a suitable position. The symptoms were, doubtless, occasioned by the irritation, which the tumour suffered, in passing the inequalities around the opening, through which it protruded. The patient lived in this state nine years, having every now and then trances, in one of which, attended with hiccough and vomiting, she perished.

As compression cannot be depended upon, the following safer method may be tried. It consists in exposing the tumour with a knife, which is certainly preferable to caustics, the action of which can never be limited, nor extended, exactly as one wishes. A crucial incision may be made through the scalp covering the tumour, and the flaps dissected up, and reflected, so as to bring all the bony circumference into view. Then with the trephines repeatedly applied, or with what would be better, Mr. Hey's saws, all the margin of the bone should be carefully removed.

The tumour, thus disengaged on all sides, may be cut off with a scalpel. After this, some recommend applying to the cut surface an ointment containing the hydrarg. nitrat. rub.

When the tumour is sarcomatous, and its pedicle small and narrow, as sometimes happens, one should not hesitate to cut it off.

This method is preferable to tying the base of such tumours with a ligature, as the latter plan cannot be executed, without dragging, and seriously

injuring the dura mater, so as to excite dangerous consequences. The excision is also preferable to caustics, which cause great pain, and very often convulsions. In performing the extirpation, we should remove the whole extent of the tumour, and, if possible, its root, even though it may extend as deeply as the internal layer of the dura mater. This step must not be delayed, for the disease will continue to increase, so as to affect the brain, become incurable, and even mortal. It is to such decision, that we must impute the success, which attended the treatment of the Spaniard Avalos, of whom Marcus Aurelius Severinus makes mention. The above nobleman was afflicted with intolerable headachs, which no remedy could appease. It was proposed to him to trepan the cranium, an operation, to which he consented. This proceeding brought into view, under the bone, a fungous excrescence, the destruction of which proved a permanent cure of the violent pains, which the disease had occasioned. It is not mentioned in this case, whether the internal layer of the dura mater was healthy, or not; but, there is foundation for believing, that if the extirpation of these tumours be undertaken in time, and bold measures be pursued, as in the instance just cited, success would often be obtained. Indeed, reason would support this opinion; for, when the disease is not extensive, it is necessary to expose a much smaller surface of the dura mater. (*L'Encyclopédie Méthodique; Partie Chirurgicale.*)

In this work mention is made of other tumours, which grow from the surface of the dura mater, after this membrane has been denuded, as after the application of the trephine. They only seem to differ from the preceding ones in not existing, before the opening was made in the skull. These cases are not to be confounded with the hernia cerebri. (*See this Article.*)

An account of the inflammation of the dura mater will be found in the article, *Head, Injuries of.*

DYSTŒCHIASIS, (from δυς, bad, and στιχος, order.) An irregular arrangement of the eyelashes.

DYSURIA, (from δυς, difficulty, and ουρον the urine.) A difficulty of discharging the urine.

E

EAR, DISEASES OF.

1. *Of the Meatus Auditorius.*

THIS is the passage, which leads from the cavity of the external ear, called the concha, down to the membrane of the tympanum. This tube, which is partly cartilaginous, and partly bony, has an oblique winding direction, so that its whole extent cannot easily be seen. There are circumstances, however, in which it is proper to look as far as possible into the passage. Such is the case, when the surgeon has to extract any foreign body, to remove any excrescence, or to detect any other occasion of deafness. Fabricius Hildanus gives a piece of advice upon this subject, not to be despised; namely, to expose the ear, to the rays of the sun, in order to enable one's self to see to the very bottom of the meatus auditorius externus.

The surgical operations, practised on the meatus auditorius, are confined to opening it, when preternaturally closed, extracting foreign bodies, washing the passage out with injections, and removing excrescences, which may form there. Foreign bodies met with in this situation are inert substances, which have been introduced by some external force; insects, which have insinuated themselves into the passage; or the cerumen itself, hardened in such a degree, as to obstruct the transmission of the sonorous undulations. Worms, which make their appearance in the meatus auditorius, are always produced subsequently to some ulcerations in the passage, or in the interior of the tympanum, and, very often, such insects are quite unsuspected causes of particular symptoms. In the cases of surgery, published in 1778 at Stockholm, by Olaus Acrel, there is an instance confirming the statement just offered. It is the case of a woman, who having been long afflicted with a hardness of hearing, was suddenly seized with very violent convulsions, without any apparent cause, and soon

afterwards complained of an acute pain in the ear. This affection was followed by a recurrence of convulsions, which were more vehement, than before. A small tent of fine linen, moistened with a mixture of oil and laudanum, was introduced into the meatus auditorius, and, on removing it the next day, several small round worms were observed upon it, and, from that period, all the symptoms disappeared. To this case, we shall add another from Morgagni. A young woman consulted Valsalva, and told him, that when she was a girl, a worm had been discharged from her left ear; that another one, about six months ago, had also been discharged, very much like a small silkworm in shape. This event took place after some very acute pain in the same ear, the forehead, and temples. She added, that since this, she had been tormented with the same pains, at different intervals, and, so severely, that she often swooned away for two hours together. On recovering from this state, a small worm was discharged, of the same shape as, but much smaller than, the preceding, and that she was now afflicted with deafness and insensibility on the same side. After hearing this relation, Valsalva no longer entertained any doubt of the membrane of the tympanum being ulcerated. He proposed the employment of an injection, in order to destroy the nest of worms, which he presumed to exist. For this purpose, distilled water of St. John's wort, in which mercury had been agitated, was used. Morgagni adds, that nothing appears to him more proper, in such cases, to prevent a recurrence of such worms, than to avoid going to sleep, particularly in autumn and summer, without taking care to stop up the affected ear. If this be not done, flies, attracted by the suppuration, enter the meatus auditorius, and, while the patient is unconscious, deposit their eggs in the ear. Acrel, in speaking of worms, generated in the meatus auditorius, observes, that there is no better remedy for them, than the decoction of ledum palustre, injected into the ear, several times a day. However, as it is not always possible to procure this plant, we shall recommend in such cases, in preference to all other remedies, a slight infusion of tobacco in oil of almonds, a few drops of which are to be dropped into the ear, and to be retained there by means of a little bit of cotton. This application, which is not injurious to the lining of the passage, is fatal to insects, and, especially, to worms, as various experiments have convinced naturalists. This method may also succeed in cases, in which caterpillars, ants, and other insects, have insinuated themselves into the meatus auditorius; but, it is always better, first to endeavour to extract them. A piece of lint, smeared with honey, often suffices for this purpose, and when they cannot be extracted by this simple means, they may be taken out with a very small pair of forceps, however little of them may be visible. The latter method serves also for the extraction of cherry-stones, peas, or other seeds, which have been introduced into the meatus auditorius. If such substances should make too much resistance, forceps with stronger blades for breaking the extraneous bodies must be employed, and then the fragments are to be extracted piecemeal. But, in these cases, it is always proper to inject into the ear some oil of almonds, before attempting to extract the extraneous bodies. The presence of these substances often occasions the most extraordinary symptoms, as we may see in the fourth observation of Fabricius Hildanus. Cent. 13.

The cerumen, which is secreted into the meatus auditorius by the sebaceous glands of the part, frequently accumulates there in very large quantities, and becoming harder and harder, at length acquires so great a degree of solidity as entirely to deprive the patient of the power of hearing. Galen has remarked; *è numero eorum, quæ meatum obstruunt, sordes esse quæ in auribus colligi solent.* This species of deafness is one of those kinds, which are the most easy of cure, as is confirmed by observers, especially Duverney. Frequent injections, either with simple olive oil, or oil of almonds, have always been recommended in such cases. The injection is to be retained by a piece of cotton, and, when there is reason to believe that the matter is sufficiently softened, an attempt may be made to extract it by means of a small scoop-like instrument. Whatever success this plan may have obtained, various experiments were made at Chester, in 1769, by Haygarth, from which it appears, that warm water is still preferable. This dissolves the mucous matter,

which connects together the truly ceruminous particles, and which is the cause of their tenacity; other applications only succeeding by reason of the water which they contain.

"The symptoms (says Mr. Saunders) which are attached to the inspissation of the cerumen are pretty well known. The patient, besides his inability to hear, complains of noises, particularly a clash or confused sound in mastication, and of heavy sounds, like the ponderous strokes of a hammer.

"The practitioner is led by the relation of such symptoms to suspect the existence of wax; but he may reduce it to a certainty by examination.

"Any means capable of removing the inspissated wax may be adopted; but syringing the meatus with warm water is the most speedy and effectual, and the only means necessary. As the organ is sound, the patient is instantaneously restored." (*Anatomy of the Human Ear, with a Treatise on its Diseases, by J. C. Saunders.* 1806. *Page* 27, 28.)

Purulent discharges from the ear, either come from the meatus auditorius externus itself, or they originate from suppuration in the tympanum, in consequence of blows on the head, abscesses after malignant fevers, the small-pox, or the venereal disease. In such cases, the little bones of the ear are detached, and escape externally, and complete deafness is most frequently the consequence. However, in a few instances, total deafness does not always follow even this kind of mischief, as I myself have witnessed in one or two instances. There is greater hope, when the disorder is confined to the meatus; as judicious treatment may now avert the most serious consequences. In Acrel's surgical cases, there is a case, relative to the circumstance, of which we are speaking. Suppuration took place in the meatus auditorius externus, in consequence of acute rheumatism, which was followed by vertigo, restlessness, and a violent headach. The matter discharged was yellowish, of an aqueous consistence, and acid smell. The meatus auditorius was filled with a spongy flesh. On introducing a probe, our author felt a piece of loose rough bone, which he immediately took hold of with a pair of forceps, and extracted. From the time, when this was accomplished, the discharge diminished, and with the aid of proper treatment, the patient became perfectly well.

The meatus auditorius, like all other parts of the body, is subject to inflammation. This is frequently produced by exposure to cold. It is hardly necessary to say, that topical bleeding and antiphlogistic means in general are indicated. The meatus auditorius should also be protected from the cold air, particularly in the winter season, by means of a piece of cotton.

Mr. Saunders observes, "When the means employed to reduce the inflammation have not succeeded, and matter has formed, it is generally evacuated; as far as I have observed, between the auricle and mastoid process, or into the meatus. If it has been evacuated into the meatus, the opening is most commonly small, and the spongy granulations, squeezed through a small aperture, assume the appearance of a polypus. Sometimes the small aperture, by which the matter is evacuated, is in this manner even closed, and the patient suffers the inconvenience of frequent returns of pain from the retention of the discharge. When the parts have fallen into this state, it will be expedient to hasten the cure by making an incision into the sinus, between the auricle and mastoid process.

"It occasionally happens, that the bone itself dies, in consequence of the sinus being neglected, or the original extent of the suppuration. The exfoliating parts are the meatus externus of the os temporis or the external lamina of the mastoid process." (*Page* 24, 25.)

Though the membrane, lining the meatus auditorius, is very delicate, it is not the less liable to become thickened, and to form polypous excrescences. This case, however, is not common. As such tumours are ordinarily firmer in their texture than polypi of the nose, they are sometimes not so easily extracted with forceps. When they are situated near the external orifice, and admit of being taken hold of with a small pair of forceps, or a hook, they may easily be cut away, when drawn outward, and this without any reason for fearing hemorrhage. This, indeed, is usually very trivial. When the tumours are more deeply situated, Mr. B. Bell recommends giving the preference to the use of a ligature. Here the same plan may be pursued as will be explained in the article *Polypus*.

But it sometimes happens, that the excrescences cannot be removed in this manner; as, instead of being adherent by a narrow neck, they have a broad base, which occupies a considerable extent of the passage. In such cases, some have been so absurd as to advise the use of escharotics; but, as these applications cannot be used without risk of injuring the membrane of the tympanum, it is better to have recourse to some other method. (*Encyclopédie Méthodique; Partie Chirurgicale, Art. Auditif conduit.*) Mr. B. Bell recommends dilating the passage with bougies: but it is obvious that the pressure of such instruments would also be very likely to irritate and inflame the membrane of the tympanum.

An herpetic ulcerous eruption sometimes affects the meatus auditorius and auricle, producing considerable thickening of the skin, and so great an obstruction of the passage, that a good deal of deafness is the consequence. Mr. Saunders remarks, that, in this case, "the ichor, which exudes from the pores of the ulcerated surface, inspissates in the meatus, and not only obstructs the entrance of sound, but is accompanied with a great degree of fœtor. This disease is not unfrequent, I have seen it resist the effects of alterative medicines," the use of injections containing the hydrargyrus muriatus, and the application of the unguentum hydrargyri nitrati. Mr. Saunders exhibited calomel as the alterative, and, in one instance, employed a solution of the argentum nitratum, as an injection. (*Page* 25, 26.)

2. *Tympanum.*

This is sometimes affected with a puriform ichorous discharge, attended with a loss of hearing, proportionate to the degree of disorganization which this part of the ear has sustained. In general, on blowing the nose, air is expelled at the meatus auditorius externus; and, when this is the case, it is evident, that the discharge is connected with an injury, or destruction of the membrana tympani. However, when the Eustachian tube is obstructed with mucus, or matter, or when it is rendered impervious, and permanently closed by inflammation, the membrana tympani may not be perfect, and, yet, it is clear, no air can in this state be forced out of the external ear in the above manner. An examination with a blunt probe, or with the eye, while the rays of the sun fall into the passage, should therefore not be omitted. If the membrane have any aperture in it, the probe will pass into the cavity of the tympanum, and the surgeon feel that his instrument is in contact with the ossicula.

In this manner the affection may be discriminated from an herpetic ulceration of the meatus auditorius externus. The causes are various: In scarlatina maligna, the membrana tympani occasionally inflames, and sloughs; all the ossicula are discharged, and, if the patient live, he continues quite deaf. An ear-ach, in other words, acute inflammation of the tympanum, is the most common occasion of suppuration in this cavity, in which, and the cells of the mastoid process, a good deal of pus collects. At length, the membrana tympani ulcerates, and a large quantity of matter is discharged; but, as the secretion of pus still goes on, the discharge continues to ooze out of the external ear.

Instead of stimulating applications, inflammation of the tympanum demands the rigorous employment of antiphlogistic means. Unfortunately, it is a too common practice, in this case, to have recourse to acrid spirituous remedies. Above all things the repeated application of leeches to the skin behind the external ear, over the mastoid process, should never be neglected. As soon as the inflammation ceases, the degree of deafness, occasioned by it, will also disappear. This, however, does not always happen.

When an abscess is situated in the cavity of the tympanum, Mr. Saunders seems to think, that the membrana tympani should not be allowed to burst by ulceration, but be opened by a small puncture. (*Page* 31.)

Sometimes the disease, of which we are treating, is more insidious in its attack: slight paroxysms of pain occur, and are relieved by slight discharges. The case goes on in this way, until, at last, a continual discharge of matter from the ear takes place. The disorder is destructive in its tendency to the faculty of hearing, and it rarely stops, until it has so much disorganized the tympanum and its contents, as to occasion total deafness. Hence Mr. Saunders very properly defends the propriety of making attempts to arrest its progress,—attempts which are free

from danger; and he censures the foolish fear of interfering with the complaint, founded on the apprehension, that bad constitutional effects may originate from stopping the discharge.

If the case be neglected, the tympanum is very likely to become carious; before which change, the disease, says Mr. Saunders, is most commonly curable.

Mr. Saunders divides the complaint into three stages; 1. A simple puriform discharge. 2. A puriform discharge complicated with funguses and polypi. 3. A puriform discharge with caries of the tympanum. As the disease is a local one, direct applications to the parts affected are chiefly entitled to confidence. Blisters and Setons may be advantageously employed in aid of topical applications. Mr. Saunders's practice, in these cases, consists in administering laxative medicines and fomenting the ear, while inflammatory symptoms last, and afterwards injecting a solution of zincum vitriolatum, or cerusa acetata.

In the second stage, when there are funguses, he removes or destroys them with forceps, afterwards touches their roots with the argentum nitratum, or injects a solution of alum, zincum vitriolatum, or argentum nitratum.

3. *Obstruction of the Eustachian Tube.*

This is often a cause of a considerable degree of deafness, because it is necessary for perfect hearing, that air should be conveyed from the mouth through this passage into the cavity of the tympanum, which now can no longer happen.

A degree of deafness generally attends a severe cold, which is accounted for by the Eustachian tube being obstructed with thickened mucus. Mr. Saunders tell us, that the obstruction most frequently arises from syphilitic ulcers in the throat, or sloughing in the cynanche maligna. The deafness comes on when such sores are healed, that is, when the obstruction is complete. The descent of a nasal polypus into the pharynx, and enlarged tonsils have also been known to close the tube. (*Page* 42.)

When the Eustachian tube is obstructed, the patient cannot feel the membrana tympani crackle, as it were, in his ear, on blowing forcibly with his nose and mouth stopped. Previous ulceration, or disease of the throat, will sometimes aid in leading to the diagnosis.

Mr. A. Cooper had noticed, that hearing was only impaired, not lost, when suppurations in the tympanum, had injured, and even destroyed the membrana tympani, and that the degree of deafness by no means equalled what resulted from an obstruction of the Eustachian tube. Hence, when the tube was permanently obliterated, he conceived, that a small puncture of the membrana tympani might be the means of enabling the patient to hear. Mr. A. Cooper practised the plan with success, and others have imitated him with the same result.

The operation consists in introducing an instrument into the meatus auditorius externus, and pushing it through the anterior and inferior part of the membrana tympani; a place rendered most eligible, on account of the situation of the manubrium of the malleus. The instrument should not be introduced far, lest it should wound the vascular lining of the tympanum, and cause a temporary continuance of the deafness, by an effusion of blood. When the puncture is made, in proper cases, and in a proper manner, hearing is immediately restored. A small hole in the membrana tympani now conveys the air into the cavity of the tympanum, answering the same purpose as the Eustachian tube.

There is some chance of a relapse in consequence of the opening closing up. But, if a certain tenseness of the membrana tympani be essential to a tolerably perfect state of hearing, I should conceive it would be better to endeavour to keep a small puncture open, on the same principles as the ductus nasalis in the fistula lachrymalis, than to make a larger opening, as Mr. Saunders advises. This gentleman relates, that he instantaneously restored hearing in one case, in which the patient had been deaf thirty years, in consequence of a loss of part of his palate by syphilis. (*Page* 45.) Mr. A. Cooper's cases are in the *Philosophical Transactions for* 1802.

4. *Diseases of Labyrinth.*

No doubt deafness (and that kind of it which so frequently foils the most skilful men) arises from an insensible state of the portio mollis of the auditory nerve, or of the surfaces, on which its filaments are spread. This affec-

tion is analogous to the amaurosis, or gutta serena, in which, though every part of the eye may seem to possess its natural structure, sight is lost, because the rays of light only strike against a paralytic, or insensible retina. Mr. Saunders dissected the ears of two deaf patients, with the greatest care, but, could not discover the least deviation from the natural structure. Mr. Cline, however, found the labyrinth of a person born deaf filled with a caseous substance, in lieu of the natural limpid fluid, found in this situation, and the supposed use of which is to transmit the vibration of sound.

Mr. Saunders remarks, that all the diseases of the internal ear may be denominated nervous deafness; the term, in this sense, embracing every disease, the seat of which is in the nerve, or parts containing the nerve. Nervous deafness is attended with various complaints in different cases, noises in the head of sundry kinds, the murmuring of water, the hissing of a boiling kettle, rustling of leaves, blowing of wind, &c. Other patients speak of a beating noise, corresponding with the pulse, and increased by bodily exertion, in the same degree as the action of the heart. *Saunders, p.* 47.

According to this author, there is a syphilitic species of nervous deafness, attended with a sensation of some of the above peculiar noises: he relates a case, in which the hearing was completely restored, in five weeks, by a mercurial course.

Mr. Saunders has relieved several cases of nervous deafness by confining patients to low diet, giving them calomel freely, repeated doses of natron vitriolatum, or magnesia vitriolata, sometimes twice, sometimes thrice, a week, or according to circumstances, and applying blisters behind the ears at intervals of a week. This plan is to be persevered in.

Were I to offer an opinion, on this subject, I should certainly say, that the analogy, between the deafness arising from paralysis of the nerve, and amaurosis, is so great that the very same treatment, which has been found efficacious in the latter cases, promises to be of most avail in the former. (See *Amaurosis.*) The reader may consult *Duverney sur l'Organe de l'Ouie; A. Cooper, in the Philosophical Transactions for* 1802; *Saunders on the Anatomy and Diseases of the Ear*, 1806.

ECCHYMO'MA, ECCHYMOSIS, from εκχυω, to pour out.) This is a superficial, soft swelling, which makes the skin livid or blue, and is produced by blood extravasated in the cellular substance.

The causes of an ecchymosis are falls, blows, sprains, &c. which occasion a rupture of the small vessels on the surface of the body, and a consequent effusion of blood, even without any external breach of continuity. Ecchymosis is one of the symptoms of a contusion. (See *Contusion.*) A considerable ecchymosis may originate from a very slight bruise, when one of the ruptured vessels is capable of pouring out a large quantity of blood into the interstices of the cellular substance. Ecchymosis does not, in general, make its appearance till several hours after the operation of its cause; at least, it is not till after this time that the black, blue, and livid colour of the skin is most conspicuous. A black eye, which is only an ecchymosis, is always most disfigured six or eight hours after its occurrence.

In the article *Bleeding*, we have noticed how an ecchymosis may arise from the blood getting out of the vein into the adjacent cellular substance.

Common cases of ecchymosis are generally easily cured, by applying discutient lotions, and administering one or two doses of any mild purgative salt. The best topical applications, are vinegar, the lotio salis ammoniaci, spirit. vin. camph. and aq. ammon. acet.

The object is to avert inflammation, and to promote the absorption of the extravasated fluid.

I have seen such success attend the practice of dispersing collections of extravasated blood, by means of absorption, that the plan of evacuating it by an incision, seems to me to be hardly ever proper in cases of ecchymosis. When an opening is made into such tumours, and air is admitted, the portion of blood which cannot be pressed out, soon putrefies, and extensive inflammation and suppuration, are the too frequent consequences.

ECHINOPHTHA'LMIA, (from εχινος, a hedgehog, and οφθαλμια, an inflammation of the eye.) An inflammation of the eyelids, attended with a projection of the eyelashes, which stand out, like the quills of a hedgehog.

ECPYE'MA, (from εκ and πυον, *pus.*) Suppuration; an abscess.

ECSARCO'MA, from σαρξ, *flesh.*) A fleshy excrescence.

ECTRO'PIUM, (from εκτρεπω, *to divert.*) A turning out, or an eversion of the eyelids.

Just as excessive relaxation of the skin of the eyelids, and a morbid contraction of their lining, near their edges, in consequence of ulcerations and cicatrices, occasion a faulty inclination of the tarsus and eyelashes against the eye; so, sometimes, an elongation and swelling of the membranous lining of the eyelids, or too great a contraction and shortening of the skin of the eyelid itself, or neighbouring parts, produce an opposite disorder to *trichiasis*, viz. an eversion of the eyelids, termed *ectropium.*

Of course, in respect to causes, there are two species of this disease; one, produced by an unnatural swelling of the lining of the eyelids, which not only pushes their edges from the eyeball, but also presses them so forcibly, that they become everted; the other, arising from a contraction of the skin covering the eyelid, or of that in the vicinity, by which means the edge of the eyelid is first removed for some distance from the eye, and afterwards turned completely outward, together with the whole of the affected eyelid.

The morbid swelling of the lining of the eyelids, which causes the first species of ectropium (putting out of present consideration a similar affection incidental to old age), arises mostly from a congenital laxity of this membrane, afterwards increased by obstinate chronic ophthalmies, particularly of a scrophulous nature, in relaxed, unhealthy subjects; or else the disease originates from the small-pox affecting the eyes.

While the disease is confined to the lower eyelid, as it most commonly is, the lining of this part may be observed rising in the form of a semilunar fold, of a pale red colour, like the fungous granulations of wounds, and intervening between the eye and eyelid, which latter it in some measure everts. When the swelling is afterwards occasioned by the lining of both the eyelids, the disease assumes an annular shape, in the centre of which the eyeball seems sunk, while the circumference of the ring presses, and everts the edges of the two eyelids so as to cause both great uneasiness and deformity. In each of the above cases, on pressing the skin of the eyelids with the point of the finger, it becomes manifest, that they are very capable of being elongated, and would readily yield, so as entirely to cover the eyeball, were they not prevented by the intervening swelling of their membranous lining.

Besides the very considerable deformity, which the disease produces, it occasions a continual discharge of tears over the cheek, and, what is worse, a dryness of the eyeball, frequent exasperated attacks of chronic ophthalmy, incapacity to bear the light, and, lastly, opacity and ulceration of the cornea.

The second species of ectropium, or that arising from a contraction of the integuments of the eyelids, or neighbouring parts, is not unfrequently a consequence of puckered scars, produced by the confluent small-pox; deep burns; or the excision of cancerous, or encysted tumours, without saving a sufficient quantity of skin; or, lastly, the disorder is the effect of malignant carbuncles, or any kind of wound attended with much loss of substance. Each of these causes is quite enough to bring on such a contraction of the skin of the eyelids, as to draw these parts towards the arches of the orbits, so as to remove them from the eyeball, and turn their edges outward. No sooner has this circumstance happened, than it is followed by another one equally unpleasant, namely, a swelling of the internal membrane of the affected eyelids, which afterwards has a great share in completing the eversion. The lining of the eyelids, though trivially everted, being continually exposed to the air, and irritation of extraneous substances, soon swells, and rises up, like a fungus. One side of this fungus-like tumour covers a part of the eyeball; the other pushes the eyelid so considerably outward, that its edge is not unfrequently in contact with the margin of the orbit. The complaints, induced by this second species of ectropium, are the same as those brought on by the first; it being noticed, however, that in both cases, whenever the disease is very inveterate, the fungous swelling of the inside of the eyelids, becomes hard, coriaceous, and, as it were, callous.

Although in both species of ectropium, the lining of the eyelids seems equally swollen, yet the surgeon can easily distinguish to which of the two species the disease belongs. For, in the first, the skin of the eyelids, and adjoining parts, is not deformed with scars, and by pressing the everted eyelid with the point of the finger, the part would with ease cover the eye, were it not for the intervening fungous swelling. But, in the second species of ectropium, besides the obvious cicatrix and contraction of the skin of the eyelids, or adjacent parts, when an effort is made to cover the eye with the everted eyelid, by pressing upon the latter part with the point of the finger, it does not give way, so as completely to cover the globe, or only yields, as it ought to do, for a certain extent; or it does not move in the least from its unnatural position, by reason of the integuments of the eyelids having been so extensively destroyed, that their margin has become adherent to the arch of the orbit.

From a comparison of the two species of ectropium, it clearly appears that the cure of this disease cannot be accomplished with equal perfection in both its forms, and that the second species is even in some cases, absolutely incurable. For, as in the first species of ectropium, the disease only depends upon a morbid intumescence of the internal membrane of the eyelids, and the treatment merely consists in removing the redundant part, art possesses many efficacious means of accomplishing what is desired. But, in the second species of ectropium, the chief cause of which arises from the loss of a portion of the skin of the eyelids, or adjacent parts, which loss no artifice can restore; surgery is not capable of effecting a perfect cure of the malady. The treatment is confined to remedying, as much as possible, such complaints as result from this kind of eversion, and this can be done in a more or less satisfactory manner, according as the loss of skin on the eyelid is little or great. Cases, in which so much skin is deficient, that the edge of the eyelid is adherent to the margin of the orbit, are to be abandoned as incurable. *Si nimium palpebræ deest*, says Celsus, *nulla id restituere curatio potest;* (*lib. 7. cap. 7.*) Hence, in treating the second species of ectropium, the degree of success attending the cure, may always be estimated, by remarking to what point the eyelid admits of being replaced, on being gently pushed, with the end of the finger, towards the globe of the eye, both before and after the employment of such means as are calculated to effect an elongation of the skin of the eyelid; for, it is to this point, and no further, that art can reduce the everted part, and permanently keep it so replaced. With respect to the treatment of the first species of ectropium; when the disease is recent, the fungous swelling of the lining of the eyelid not considerable, and, consequently, the edge of the eyelid not much turned out, and in young subjects (for in old ones the eyelids are so flaccid, that the disease is irremediable) it may be cured by destroying the fungous surface of the internal membrane of the eyelid, with the argentum nitratum, which is to be done as follows:—The surgeon must evert the whole of the affected eyelid with his left hand, and with his right wipe it dry with a piece of rag. Then he is to rub the caustic forcibly over the whole surface of the fungous swelling, so as to form an eschar. And, that the patient may suffer as little as possible, an assistant is instantly to apply a little oil to the burnt part, immediately the caustic is removed, by which means the argentum nitratum will be kept from dissolving in the tears, and spreading over the eye. Should, however, any part of the caustic be dissolved, and give the patient pain, the surgeon, or attendants, must immediately wash the irritating substance away, by repeatedly bathing the eye with new milk. The cauterization is to be repeated for several days in succession, until the argentum nitratum has produced a sufficient destruction of the internal membrane of the eyelid, and of its fungous surface, particularly near the tarsus. Afterwards, bathing the eye with plain water, or barley-water, and mel. rosæ, will prove sufficient for healing the sore on the inside of the eyelid. The result of such treatment will be, that, in proportion as the wound within the eyelid heals, the eversion will gradually diminish, and the edge of the eyelid at last return into its natural position.

This plan of cure can only be successfully put in practice, in cases in which the ectropium is slight and recent. To remedy the considerable and

inveterate form of the first species of the disease, in an expeditious and effectual way, the quickest and safest plan is to cut away the whole of the fungous swelling, closely to the muscular substance, on the inside of the eyelid.

The patient being therefore seated, with his head a little inclined backward, the surgeon, with the index and middle finger of his left hand, is firmly to keep the eyelid everted, and holding a small pair of curved scissars, with convex edges, in his right, he is completely to cut off the whole fungosity of the internal membrane of the eyelid, as near as possible to its base. The same operation is then to be repeated on the other eyelid, should that be affected with the same disorder. If the excrescence should be of such a shape, that it cannot be exactly included within the scissars, it must be raised as much as possible, with forceps, or a double-pointed hook, and dissected off at its base, by means of a small bistoury with a convex edge. The bleeding, which seems, at the beginning of the operation, as if it would be copious, stops of itself, or as soon as the eye is bathed with cold water. The surgeon is then to apply the dressings, which are to consist of two small compresses, one put on the upper, the other on the lower arch of the orbit, and over these the uniting bandage, in the form of the monoculus, or so applied as to compress and replace the edges of the everted eyelids, in order to make them cover the eye. On the first removal of the dressings, which should take place about twenty four or thirty hours after the operation, the surgeon will find the whole, or almost the whole, of the eyelid, in its natural position. The treatment should afterwards consist in washing the ulcer on the inside of the eyelid with simple water, twice a day, or else with aqua malvæ, or barley-water, and mel. rosæ, until it is completely well. If, towards the end of the cure, the wound should assume a fungous appearance, or the edge of the eyelid seem to be too distant from the eyeball, the wound on the inside of the eyelid must be rubbed several times with the argentum nitratum, for the purpose of destroying a little more of the membranous lining, so that, when the cicatrization follows, a greater contraction of it may take place, and the edge of the eyelid be drawn still nearer the eye. However, proper steps must also be pursued, in order to resist the principal cause on which the ectropium depends, particularly, chronic ophthalmy, the relaxed and various state of the conjunctiva, &c. (See *Ophthalmy.*)

In the second species of ectropium, or that produced by an accidental contraction of the skin of the eyelids, or neighbouring parts, the curative indication does in no respect differ from what it is in the foregoing instance. If a contraction of the integuments has proved capable of everting the eyelid, the excision of a piece of the internal membrane of the part, and the cicatrix which will follow, must also be capable, for the same reason, of bringing back the eyelid into its natural position. But, since nothing can restore the lost skin, the shortened state of the whole eyelid, in whatever degree it exists, must always continue, even after any operation the most skilfully executed. Hence, the treatment of the second species of ectropium will never succeed so perfectly as that of the first, and the replaced eyelid will always remain shorter, than natural, in proportion to the quantity of integuments lost. It is true, that, in many cases, eversion seems greater than it actually is, in regard to the small quantity of skin lost or destroyed; for, when the disease has once begun, though the contraction of the skin may be trivial, in consequence of the little quantity of it deficient, still the swelling of the lining of the eyelid, which never fails to increase, at last brings on a complete eversion of the part. In these cases, the cure may be accomplished with such success, as is surprising to the inexperienced; for, after the fungous swelling of the internal membrane of the eyelid has been cut off, and the edge of the part approximated to the eyeball, the shortening of the eyelid, remaining after the operation, is so trivial, that it may be considered as nothing, in comparison with the deformity and inconvenience occasioned by the ectropium. Whenever, therefore, the retraction of the skin of the everted eyelid, and the consequent shortness of it, are such, as not to prevent its rising again and covering the eye, if not entirely, at least moderately, the surgeon should cut away the internal membrane of the everted eyelid, as already explained, so as to produce a loss of substance on the inside

of the everted eyelid. This may be done, as most convenient, either with the convex-edged curved scissars, or small convex-edged bistoury. In inveterate cases of ectropium, in which the tumid lining of the eyelids has become hard and callous, it is best to apply to the everted eyelid, for a few days before the operation, a soft bread and milk poultice, in order to render the part flexible, and more easily separated, than it could be in its former rigid state.

It is a most certain truth, that making a division of the cicatrices, which have given rise to the shortening and eversion of the eyelid, does not procure any permanent elongation of this part, and consequently it is of no avail in the cure of the present disease. We see the same circumstance occur after deep and extensive burns of the skin of the palm of the hand and fingers: whatever pains may have been taken, during the treatment, to keep the hand and fingers extended, no sooner is the cicatrization thus completed, than the fingers become irremediably bent. The same thing happens after extensive burns of the skin of the face and neck. Fabricius ab Aquapendente, who well knew the inutility of making a semilunar cut in the skin of the eyelids, for the purpose of remedying their shortening and eversion, proposes, as the best expedient, to stretch them with adhesive plasters, applied to them and the eyebrow, and tied closely together. Whatever advantage may result from this practice, the same degree of benefit may be derived from using, for a few days, a bread and milk poultice, afterwards oily embrocations, and, lastly, the uniting bandage, so put on as to stretch the shortened eyelid, in an opposite direction to that produced by the cicatrix. This practice should always be carefully tried, before resorting to the operation.

The patient being seated, if an adult, or placed on a table with his head a little elevated, and held by proper assistants, if a child, the surgeon, with a small convexed bistoury, is to make an incision of sufficient depth into the internal membrane of the eyelid, along the tarsus, carefully avoiding the situation of the puncta lachrymalia. Then he should raise, with a pair of forceps, the flap of the divided fungous membrane, and continue to detach it, with the bistoury, from the subjacent parts, all over the inner surface of the eyelid, as far as where the membrane quits this part, to be reflected over the front of the eye, under the name of *conjunctiva*. The separation being thus far accomplished, the membrane is to be raised still more with the forceps, and cut off with one, or two strokes of the scissars, at the lowest part of the eyelid. The compresses and bandage, to keep the eyelid replaced, are to be applied, as above directed. On changing the dressings, a day, or two, after the operation, the eyelid will be found, in a great measure, replaced, and the disfigurement, which it caused, greatly amended. The operation is rarely followed by bad symptoms, such as vomiting, violent pain, and inflammation. However, should they occur, the vomiting may be relieved by means of an opiate clyster, and, as for the pain and inflammation, attended with great tumefaction of the eyelid operated upon, these complaints may be cured by applying a poultice, or bags filled with emollient herbs, at the same time employing internal antiphlogistics, until the inflammation and swelling have subsided, and suppuration has commenced on the inside of the eyelid, on which the operation has been done. After this, the treatment is to consist in washing the part, twice a day, with barley-water and mel. rosæ, and, lastly, in touching the wound a few times with the argentum nitratum, in order to keep the granulations within certain limits, and to form a permanent cicatrix, proper for maintaining the eyelid replaced. (*Scarpa sulle Malattie degli Occhi.*)

ECZEMA, (from εκζεω, to boil out.) A hot painful eruption, or pustule. Mr. Pearson calls the erythéma mercuriale, *eczéma mercuriale*. (See *Mercury.*)

EFFRACTURA, (from *effringo*, to break down.) A species of fracture, in which the bone is much depressed by the blow.

EFFUSION, (from *effundo*, to pour out.) *Effusio.* In surgery, means the escape of any fluid out of the vessel, or viscus, naturally containing it, and its lodgment in another cavity, in the cellular substance, or in the substance of parts. Thus, when the chest is wounded, blood is sometimes effused from the vessels into the cavity of the pleura; in cases of false aneurism, the blood gets out of the artery into the interstices of the cellular substance;

in cases of fistulæ in perineo, the urine gets from the bladder and urethra into the cellular membrane of the perineum and scrotum; and, when great violence is applied to the skull, blood is often effused even in the very substance of the brain.

Effusion also sometimes signifies the natural secretion of fluids from the vessels: thus surgeons frequently speak of the coagulable lymph being effused on different surfaces. (See *Extravasation.*)

ELEVATOR. *Elevatorium.* An instrument for raising depressed portions of the skull.

ELUXATIO, (from *eluxo*, to put out of joint.) A dislocation.

ELYTROCELE, (from ελυτρον, the vagina, and κηλη, a tumour.) A hernia in the vagina.

EMBREGMA, (from εμβρεχω, to make wet.) An embrocation.

EMBROCATION, (from εμβρεχω, to make wet.) *Embrocatio.* Strictly a fluid application made to any part of the body. Many use the term, however, synonymously with liniment. The following embrocations are noticed in the *Pharmacopœia Chirurgica.*

EMBROCATIO ALUMINIS. ℞. Aluminis ʒij. Aceti spiritûs vinosi tenuioris, sing. ℔ss. For chilblains, and diseased joints.

EMBROCATIO AMMONIÆ. ℞. Embrocat. ammon. Acet. cum sapone ℥ij. Aq. ammon. pur. ʒij. M. For sprains and bruises.

EMBROCATIO AMMONIÆ ACETATÆ CAMPHORATÆ. ℞. Solut. saponis cum camphorâ. Aq. ammon. acet. sing. ℥j. Aq. ammon. pur. ℥ss. M. For sprains and bruises. It is also frequently applied to disperse chilblains, which have not suppurated. Said to be the same as Steers's opodeldoc.

EMBROCATIO AMMONIÆ ACETATÆ. ℞. Aq. ammon. acet. Solut. sapon. sing. ℥j. M. For bruises with inflammation.

EMBROCATIO CANTHARIDIS CUM CAMPHORA. ℞. Tinct. cantharidis. Spirit. camph. sing. ℥j. M. This may be used in any case, in which the object is to stimulate the skin. The absorption of cantharides, however, may bring on a strangury.

EMBRYOTOMIA, from εμβρυον, a fœtus, and τεμνω, to cut. The operation of cutting into the womb, in order to extract the fœtus. (See *Cæsarean Operation.*)

EMOLLIENTIS, (from *emollio*, to soften.) *Emollientia.* Such applications, as have the property of softening and relaxing parts.

EMPHYSEMA, (from εμφυσαω, to inflate.) A swelling produced by air being diffused in the cellular substance.

The common cause of this affection is a fractured rib, by which the vesicles of the lungs being wounded, the air escapes through them into the cavity of the thorax. But, as the rib on being fractured, and pushed inwards, wounds the pleura, which lines the ribs and intercostal muscles, part of the air most commonly gets through the pleura, and those lacerated muscles into the cellular membrane, which is on the outside of the chest, and thence it is diffused through the same membrane over the whole body, so as to inflate it sometimes to an extraordinary degree. This inflation of the cellular membrane has been commonly looked upon, as the most dangerous part of the disease; how justly, will appear in the sequel. (*Hewson, Med. Obs. and Inquiries. Vol.* 3.)

Emphysema is most frequent after a fractured rib, because there is, in this instance, a wide laceration of the lungs, and no exit for the air; it is less frequent in large wounds with a knife, or broad sword, because the air has an open and unimpeded issue; it is again more frequent in deep stabs with bayonets, or small swords; and it is peculiarly frequent in gun-shot wounds, because the orifice in the skin inflames, and swells, while the wound is wider within. (*John Bell on Wounds of the Breast.*)

The symptoms, attending emphysema, are generally of the following kind. The patient at first complains of a considerable tightness of the chest, with pain, chiefly in the situation of the injury, and great difficulty of breathing. This obstruction of respiration gradually increases, and becomes more and more insupportable. The patient soon finds himself unable to lie down in bed, and cannot breathe, unless when his body is in an upright posture, or he is sitting a little inclined forward. The countenance becomes red and swollen. The pulse, at first, weak and contracted, becomes afterwards irregular. The extremities grow cold, and, if the patient continue unrelieved, he soon dies, to every appearance suffocated.

The emphysematous swelling, where-

soever situated, is easily distinguished from œdema, or anasarca, by the crepitation which occurs on handling it, or a noise, like that which takes place on compressing a dry bladder half filled with air. (*Encyclopédie Méthodique; Partie Chirurgicale.*)

The wound of the pleura and intercostals may sometimes be too small to suffer the air to get readily into the cellular membrane, and to inflate it, but may confine a part of it in the cavity of the thorax, so as to compress the lungs, prevent their expansion, and cause the same symptoms of tightness of the chest, quick breathing, and sense of suffocation, which water does in the hydrops pectoris, or matter in the empysema. (*Hewson.*)

To understand, why the air passes at all out of the wound of the lungs, we must advert to the manner, in which inspiration and expiration are naturally carried on. It is well known, that in the perfect state, the surface of the lungs always lies in close contact with the membrane lining the chest, both in inspiration and expiration. The lungs themselves are only passive organs, and are quite incapable, by any action of their own, to expand and contract, so as to maintain their external surface constantly in contact with the inside of the thorax, which is continually undergoing an alternate change of dimensions. Every muscle, that has any concern in enlarging and diminishing the capacity of the chest, must contribute to the effect of adapting the volume of the lungs to the cavity, in which they are contained, as long as there is no communication between the cavity of the pleura, and the external air. In inspiration, the thorax is enlarged in every direction, the lungs are expanded in the same way, and the air entering through the wind-pipe into the air-cells of these organs, prevents the occurrence of a vacuum.

But, in cases of wounds, when there is a free communication between the atmosphere and inside of the chest, on this cavity being expanded, the air naturally enters it, at the same time, and for the same reasons, that the air enters the lungs through the trachea, and the lung itself remains proportionally collapsed. When the thorax is next contracted, in expiration, the air is compressed out of the lung, and also, out of the bag of the pleura, through the external wound, if there be a direct one. In the latter circumstance, the emphysematous swelling is never very extensive.

But, in the case of a fractured rib, attended with a breach in the pleura costalis, pleura pulmonalis, and some of the air-cells of the lungs, there is no direct communication between the cavity of the chest and the external air; in other words, there is no outward wound in the parietes of the thorax. There is, however, a preternatural opening formed between the air-cells of the lungs and the cavity of the chest, and also another one between the latter space, and the general cellular substance of the body, through the breach in the pleura costalis. The consequence is, that, when the chest is expanded in inspiration, air rushes from the wound in the surface of the lungs, and insinuates itself between them and the pleura costalis. The lungs collapse in proportion, and the place, which they naturally occupied, when distended, is now occupied by the air. When in expiration, the dimensions of the chest are every where diminished, the air, now lodged in the bag of the pleura, cannot get back into the aperture in the collapsed lung, because this is already full of air, and is equally compressed on every side, by that which is confined in the thorax. Were there no breach in the pleura costalis, this air could not now become diffused; the muscles of inspiration would next enlarge the chest, remove the pressure from the surface of the wounded lung, more air would be sucked out of it, as it were, into the space between the pleura costalis and pleura pulmonalis, and this process would go on, till the lungs of the wounded side were completely collapsed. But, in the case of a fractured rib, or of a narrow stab, in which there is also a breach in the pleura costalis, without any free vent outward, for the air, which gets out of the lung into the cavity of the pleura, as soon as the expiratory powers lessen the capacity of the chest, this air, not being able to get back through the breach in the collapsed lung, passes through the laceration, or wound, in the pleura costalis, into the common cellular substance.

It is through the communicating cells of this structure, that the air becomes diffused most extensively over the whole body, in proportion as the expiratory muscles continue in their

turn to lessen the capacity of the chest, and pump the air, as it were, through the breach in the pleura costalis, immediately after it had been sucked, as it were, out of the wound in the lung, in inspiration. (See *John Bell on Wounds of the Breast. Halliday on Emphysema.* 1807.)

To prove, that the confinement of air in the chest, is the cause of the dangerous symptoms attending emphysema, Mr. Hewson adverts to the histories of some most remarkable cases, published by M. Littre, M. Mery, Dr. Hunter, and Mr. Cheston. (See *Mem. de l'Acad. Royale des Sciences, for* 1713. *Med. Observations and Inquiries, Vol.* 2. *and Pathological Inquiries.*)

In M. Littre's case, the patient, who had been wounded in the side with a sword, could not breathe, without making the most violent efforts, especially, during the latter part of his disease: he died on the fifth day.

In M. Mery's case, a man had the fourth and fifth true ribs broken by a coach passing over his chest, his respiration was much impeded from the first, and became more and more difficult, till he died, which was on the fourth day after the accident.

In Dr. Hunter's case, the patient had received a considerable hurt on his side by a fall from his horse. He had a difficulty of breathing, which increased in proportion as the skin became elevated and tense; it was laborious as well as frequent. His inspiration was short, and almost instantaneous, and ended with a catch in the throat, which was produced by the shutting of the glottis; after this he strained to expire for a moment without any noise, then suddenly opening the glottis, he forced out his breath with a sort of groan, and in a hurry, and then quickly inspired again; so that his endeavours seemed to be to keep his lungs always full; inspiration succeeding expiration as fast as possible. He said, his difficulty of breathing was owing to an oppression or tightness across his breast, near the pit of the stomach. He had a little cough, which exasperated his pain, and he brought up blood and phlegm from his lungs. He was relieved by scarifications, and recovered.

In Mr. Cheston's case, the man had received a blow on the chest. He had a constant cough, bringing up, after many ineffectual efforts, a frothy discharge, lightly tinctured with blood; he seemed to be in the greatest agonies, and under a constant appearance of suffocation. His pulse was irregular, and sometimes scarcely to be felt, his face livid, and, when he was sensible, which was only now and then, he complained of a pain in his head. On passing a bandage round his chest, with a proper compress to prevent the discharge of air into the cellular membrane, and to confine the motion of the thorax, the patient cried out, that he could not suffer it. A strong compression by the hand alone affected him in the same way. Notwithstanding bleeding, repeated scarifications, and other means, his sense of suffocation, and difficulty of breathing increased. On the fourth day, the air no longer got into the cellular membrane, when on a sudden inclining his head backward as it were, for the admission of more air, than usual, his breathing became more difficult and interrupted, he turned wholly insensible, and soon afterwards died.

M. Littre, M. Mery, and Mr. Cheston, opened their patients after death.

M. Littre, besides a wound of the lungs and fractured rib, found a considerable quantity of blood in the cavity of the thorax, and was sensible of some putrid air escaping, on his first puncturing the intercostals and pleura. The wounded lobe was hard and black, and the other two of the same side were inflamed.

In M. Mery's patient, no blood was extravasated, nor was there any thing preternatural, except the fractured ribs, the wound of the pleura, and that of the lungs.

Mr. Cheston found a fracture of the tenth and eleventh ribs, and a wound of the lungs. The lungs, below the wound, were livid, and more compact, than usual; but every thing else was natural, no extravasation, no inflammation, no internal emphysema.

Mr. Hewson made experiments on animals to shew, that air in their chests produced great difficulty of breathing, such as occurs in cases of emphysema, and in one case, which he examined after death, air was actually discharged on puncturing the thorax.

The object of Mr. Hewson's paper is to recommend making an opening into the chest, for the purpose of giving vent to the air confined in that cavity, just as is done for the discharge

of pus, in cases of empyema, and water, in those of hydrops pectoris.

In wounds of the lungs, says this author, whether occasioned by fractured ribs, or other causes, when symptoms of tightness and suffocation come on, so far should we be from dreading the emphysematous swelling of the cellular membrane, that we should rather consider it, as a favourable symptom, shewing that the air is not likely to be confined in the thorax; and so far should we be from compressing the wound to prevent the inflation, or emphysema, that we should rather dilate it (if not large enough already,) or perform the paracentesis thoracis. We may judge of the necessity of this operation from the violence of the symptoms, such as the oppressed breathing, &c. For when these are not considerable, and the air gets out of the chest with sufficient freedom, the operation then becomes unnecessary.

The best place for performing the operation, says Mr. Hewson, if the disease is on the right side, will be on the fore-part of the chest, between the fifth and sixth ribs; for, there the integuments are thin, and, in the case of air, no depending drain is required. But, if the disease is on the left side, it will be more adviseable to make the opening between the seventh and eighth, or eighth and ninth ribs, that we may be sure of avoiding the pericardium. As large penetrating wounds are inconvenient on account of the air entering by the aperture in such a quantity, *as to prevent the expansion of the lungs*, a small wound will be eligible, and especially as air does not require a large one for its escape. Mr. Hewson recommends dissecting cautiously with a knife, in preference to the coarse and hazardous method of thrusting in a trocar.

There is one error, prevailing in Mr. Hewson's paper, for which he has been justly criticized by Mr. John Bell; viz. the idea, that it is possible and proper to make the collapsed lung expand by making an opening into the chest, in cases of emphysema. Bromfield and B. Bell have both imbibed the same erroneous opinions, and proposed plans for exhausting the air and expanding the lung. It is very certain, that it is impracticable to make the collapsed viscus expand, until the breach in it is closed, and this closure is greatly promoted by the quiet state, in which the collapsed lung remains; a state, also, the most favourable for the stoppage of any bleeding from the pulmonary vessels.

The true object then of making an opening into the thorax, when the symptoms of suffocation are very violent in cases of emphysema, is not to obtain an expansion of the lung on the affected side, not to take the pressure of the air from it; but, to remove the pressure caused on the opposite lung by the distention of the mediastinum, and, at the same time, to diminish the pressure of the air on the diaphragm. The lung on the affected side must continue collapsed, and it is most advantageous, that it should do so. The opposite lung is that, which for a time must of itself carry on respiration, and it is known to be fully adequate to this function, provided the quantity of air, on the other side of the chest, do not produce too much pressure on the mediastinum, and diaphragm.

Mr. John Bell concludes his remarks on this subject, with advising the following practice. 1st. Upon observing the crackling tumour beginning to form itself over a fractured rib, you should make small punctures with the point of a lancet, as in bleeding; and if the point be struck deep enough, the air will rush out audibly. But, as this air was in the thorax, before it came into the cellular substance, it is plain, that the thorax is still full, and that the lung of that side is already collapsed and useless, and must continue so. The purpose, therefore, of making these scarifications, and, especially, of making them so near the fractured part, is not to relieve the lungs, but, merely, to prevent the air spreading more widely beneath the skin.

2nd. If, before you arrive, the air shall have spread to very remote parts of the body, as to the scrotum, and down the thighs, it will be easier to make small punctures in those parts, to let out the air directly, than to press it along the whole body, till you bring it up to the punctures made on the chest, over the wounded part.

3rd. If, notwithstanding free punctures, and pressing out the air in this way, you should find by the oppression, that either air, or blood, is accumulating within the cavity of the thorax, so as to oppress not the wounded lung only, which was of course collapsed and useless from the first, but so as to

oppress also the diaphragm, and through the diaphragm to affect also the sound lung; then a freer incision must be made, through the skin and muscles, and a small one delicately into the thorax to let out the confined air, or blood. (*John Bell.*)

After a few days, the wound, in the collapsed lung, becomes closed by the adhesive inflammation around it, so that the air no longer gets out of it into the cavity of the chest, and any extensive opening may be healed. What air is already there is ultimately absorbed, and the lung, expanding in proportion, resumes its original functions. Emphysema has been known to arise from the bursting of a vomica, and ulceration of the surface of the lungs; but, the air, which escapes, in this instance, cannot find its way into the cavity of the thorax, because the inflammation, which precedes the abscess and ulceration of the air-cells, closes those which are adjacent, and produces an adhesion of the edges of the vomica, or ulcer, to the inner surface of the chest, so as entirely to separate the two cavities. We are not acquainted with any instance of the symptoms, imputed to the confinement of air in the chest, originating from suppuration and ulceration of the surface of the lungs; but, Palfyn, Dr. Hunter, and the author of the article *emphysema*, in the French Encyclopædia, have seen cases, in which emphysema has arisen from abscesses of the lungs, attended with adhesion to the pleura, and ulcerations in the situation of such adhesion. In such instances, the pus having made its way through the pleura and intercostal muscles, the air escapes also through the same track, so as to get into the cellular membrane on the ontside of the chest.

A violent effort of respiration has, sometimes, produced a certain degree of emphysema, which first makes its appearance about the clavicles, and afterwards spreads over the neck and adjacent parts. The efforts of labour have been known to occasion a similar symptom; but, no bad consequences have followed. (*Medical Communications, p.* 176.)

M. Louis has described an emphysema of this sort, which, on account of its cause, and the indication, which it furnishes to the practitioner, is highly important. This famous surgeon had occasion to remark it in a young girl, who died suffocated, from a bean falling into her wind-pipe, and he considers it, as a pathognomonic symptom of such an accident, concerning the existence of which it is so essential not to commit any mistake. (See *Bronchotomy.*) This emphysema made its appearance on both sides of the neck, above the clavicles, and came on suddenly, on the third day after the accident. The inspection of the body proved, that the lungs and mediastinum were also in an emphysematous state. The retention of the air, confined by the foreign body, produced, says M. Louis, at each attempt to expire, and, especially, when the violent fits of coughing occurred, a strong propulsion of this fluid towards the surface of the lung, into the spongy substance of this viscus. Thence, the air passed into the cellular texture, which unites the surface of the lung to the pleura pulmonalis; and, by communications from cells to cells, it caused a prodigious swelling of the cellular substance, between the two layers of the mediastinum. The emphysema, increasing, at length made its appearance above the clavicles. This tumefaction of the lung, and surrounding parts, in consequence of air getting into their spongy, and cellular texture, is an evident cause of suffocation, and, the swelling seems so natural an effect of the presence of a foreign body in the trachea, that one can hardly fail to think it an essential symptom, though no author has made mention of it. (*Mémoires de l'Acad. de Chirurgie, Tom.* 4.)

An emphysematous swelling of the head, neck, and chest, has also been noticed in typhoid fevers. Dr. Huxham relates an instance, of this sort, in a sailor of a scorbutic habit. (*Medical Observations, and Inquiries, Vol.* 3, *Art.* 4.)

Surgeons often observe a partial emphysema, in cases of gangrene.

The reader may consult, with advantage, *l'Encyclopédie Méthodique; Partie Chirurgicale. Hewson's Paper in Med. Obs. and Inq. Vol.* 3. *Mem. de l'Acad. Royale des Sciences for* 1713. *Dr. Hunter in Med. Obs. and Inq. Vol.* 2. *Cheston in Pathological Inquiries. A Case in Abernethy's Works. John Bell on Wounds of the Breast. Halliday on Emphysema*, 1807.

EMPLASTRUM, (from εμπλασσω, to spread upon.) A plaster.

The following are some of the most useful plasters, employed in surgery.

EMPLASTRUM AMMONIACI CUM ACETO. ℞. Ammoniaci ℥ij. Aceti Distillati ℥iij. Ammoniacum in aceto liquefactum evapora in vase ferreo ad emplastri crassitudinem.

EMPLASTRUM AMMONIACI SCILLITICUM. ℞. Gumm. ammoniaci ℥j. Aceti Scillitici, q. s. ut fiant emplastrum, quo pars affecta tegatur.

Mr. Ford has found this plaster useful in some scrophulous affections. It may be rendered more stimulating by sprinkling it with squills. *Ford on the Hip-joint, p.* 59.) It has been recommended by Swediaur; *London Medical Journal, Vol.* 1, *p.* 198.)

The first plaster partakes of the same stimulating property, though in a milder degree.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO. Discutient.

EMPLASTRUM AMMONIACI CUM CICUTA. ℞. Gum. ammon. ℥iij. Succi cicutæ spissatæ ℥ij. Aq. litharg. acet. ℥j.

Dissolve the ammoniacum in a little vinegar of squills, then add the other ingredients, and boil them all slowly to the consistence of a plaster. This is discutient.

EMPLASTRUM AMMONIÆ. ℞. Sapon. ʒij. Emplastr. litharg. ℥ss. Ammon. mur. ℥j.

The two first articles are to be melted together, and when nearly cold, the muriated ammonia, finely powdered, is to be added. Its use is to stimulate the skin, and excite the action of the absorbents. Hence, it disperses many chronic swellings and indurations.

EMPLASTRUM CANTHARIDIS. (See *Blister.*)

EMPLASTRUM LITHARGYRI. Diacholon.

EMPLASTRUM LITHARGYRI COMPOSITUM. Properties Discutient.

EMPLASTRUM LITHARGYRI CUM HYDRARGYRO. Properties discutient.

EMPLASTRUM LITHARGYRI CUM RESINA. The Adhesive or Sticking-plaster.

EMPLASTRUM SAPONIS. The plaster commonly used for fractures. It is also frequently applied to bruised parts, and to many indurations of a chronic nature.

EMPROSTHOTONOS, (from εμπροσθεν, before or forwards, and τεινω, to extend.) A spasmodic, or tetanic, affection, in which the body is bent forwards.

EMPYEMA, (from εν, within, and πυον, pus.) A collection of matter in the cavity of the thorax.

There is reason for believing, that matter is contained in the cavity of the chest, when, after a pleurisy, or inflammation in the thorax, the patient has a difficulty of breathing, particularly, upon lying on the side, opposite the affected one; and when an œdematous swelling is externally perceptible. I have seen a patient in St. Bartholomew's Hospital, who had so large a quantity of matter in the left bag of the pleura, that it completely displaced the heart, which pulsated against the inside of the chest, at a considerable distance to the right of the sternum. This man's life might probably have been saved, had paracentesis thoracis been performed in time. Some suspected an aneurism from the throbbing on the right of the sternum; and the case was fully understood after death, when the body was opened. A little attention to the symptoms, however, might have convinced any man of moderate understanding, that it was an empyema, and that making an opening, for the discharge of the matter, afforded the only rational chance of preserving life. There had been pain and inflammation in the chest, followed by shiverings; there was very great difficulty of breathing; the heart, which previously used to beat in the usual place, no longer did so; but, now, pulsated on the right side of the thorax.

With regard to the mode of making an opening into the chest; see *Paracentesis Thoracis.*

ENCANTHIS, from εν and κανθος, the angle of the eye.)

The encanthis, at its commencement, is nothing more, says Scarpa, than a small, soft, red, and sometimes rather livid, excrescence, which grows from the caruncula lachrymalis, and, at the same time, from the neighbouring semilunar fold of the conjunctiva. The inveterate encanthis is ordinarily of a very considerable magnitude; its roots extend beyond the caruncula lachrymalis, and semilunar fold, to the membranous lining of one, or both eyelids. The patient experiences very serious inconvenience from its origin, and interposition between the commissure of the eyelids, which it necessarily keeps asunder, on the side towards the nose.

The encanthis keeps up a chronic ophthalmy, impedes the action of the eyelids, and prevents in particular the complete closure of the eye. Besides, partly by compressing, and partly by displacing the orifices of the puncta lachrymalia, it obstructs the free passage of the tears into the nose.

The excrescence, on its first appearance, (continues this eminent writer,) is commonly granulated, like a mulberry, or is of a ragged, and fringed structure. Afterwards, when it has acquired a certain size, one part of it represents a granulated tumour, while the rest appears like a smooth, whitish, or ash-coloured substance, streaked with varicose vessels, sometimes advancing as far over the conjunctiva, covering the side of the eye next to the nose, as where the cornea and sclerotica unite. In this advanced state, the encanthis constantly interests the caruncula lachrymalis, the semilunar fold, and the membranous lining of one, or both eyelids. In addition to the roots, which in such circumstances connect the excrescence with the caruncula lachrymalis, the semilunar fold, and the conjunctiva of the globe of the eye, the encanthis emits an appendage, or prominent, firm elongation, along the inside of the upper, or lower eyelid, in the direction of its edge. The middle, or body, of the encanthis divides near the cornea, as it were, like a swallow's tail, to form two appendages, or elongations, one of which extends along the inner surface of the upper eyelid by the margin of which it is covered, while the other shoots, in a direction from the internal towards the external angle, along the inside of the lower eyelid, which also conceals it beneath its edge.

The body of the encanthis, or that middle portion of the whole excrescence, which reaches, from the caruncula lachrymalis and semilunar fold, inclusively, over the conjunctiva almost to the junction of the sclerotica with the cornea, sometimes forms a prominence, as large as as mall nut, or chestnut. At other times, it is of considerable size, but depressed, and broken down, as it were, at its centre. Still, however, the body of the encanthis preserves that granulated appearance, which prevailed at first; while one, or both the appendages, on the inside of the eyelid, appear rather like a lippomatous, than a granulated substance.

On turning out the inside of the eyelids, these appendages, or elongations of the encanthis, form a prominence projecting forward. When both eyelids are equally affected, and turned inside out, the lippomatous appendages conjointly represent, as it were, a ring, the back of which rests on the globe of the eye.

Fabr. Hildanus was acquainted with this disease, which he treated with success, and named, *ficus scirrhosus ad majorem oculi canthum.* (*Cent.* 1. *Obs.* 2)

However, in the case related by Hildanus, the encanthis seems only to have had one appendage, situated on the inner surface of the upper eyelid, below its edge.

Sometimes, as is noticed on the subject of the pterygium, the encanthis assumes a cancerous malignancy. This character is evinced by the dull red, and, as it were, leaden colour of the excrescence; by its exceeding hardness, and the lancinating pains, which occur in it, and extend to the forehead, the whole eyeball, and the temple, especially, when the tumour has been slightly touched. It is, also, evinced by the propensity of the excrescence to bleed, by the partial ulcerations on its surface, which emit a fungous substance, and a thin, and exceedingly acrid discharge. This malignant species, or rather this degenerate state of the encanthis, only admits of palliative treatment; unless, indeed, an effort be made to extirpate it entirely, together with the whole of what is contained in the orbit, and, even then, the event is very dubious.

The benign encanthis, how large soever it may be, is always curable by extirpation. Those instances, which are small, incipient, and granulated, like a mulberry, or of a fringed structure, which originate either from the caruncula lachrymalis, or the semilunar fold of the conjunctiva, or from both these parts together, and even in part from the internal commissure of the eyelids, may be raised by means of a pair of forceps, and cut off from the whole of their origin, closely to their base, with the curved scissars with convex edges. In the performance of this operation, it is unnecessary to introduce a needle and thread through this little excrescence, as some are wont to do, for the purpose of raising it, and destroying more accurately all

its origins, and adhesions. The same object is fulfilled by means of forceps, without inconveniencing the patient with a puncture of this kind, and drawing a thread through the part, in order to make a noose. However, in cutting out an encanthis of this small size, care should be taken not to remove, together with that portion of the excrescence which originates from the caruncula lachrymalis, any more of this latter body, than what is absolutely necessary for the precise eradication of the disease, in order that no irremediable weeping may be occasioned.

When the little excrescence has been detached from all its roots, says Scarpa, the eye must be washed several times with cold water to cleanse it from the blood, and then it is to be covered with a piece of fine linen, and a retentive bandage. On the 5th, 6th, or 7th day, the inflammation arising from the operation entirely ceases, and the suppuration from the wound is accompanied with the mucous appearance already described. The little wounds are then to be touched with a piece of alum, scraped to a point like a crayon, and the vitriolic collyrium, containing the mucilage of quince-seeds, is to be injected into the eye in question several times a day. If these means should not bring about the wished-for cicatrization; but, on the contrary, the small wounds situated on the caruncula, and internal commissure of the eyelids, should become stationary, and covered with proud-flesh, the argentum nitratum ought to be applied to them. The conjunctiva, however, should be avoided as much as possible, especially, if at all wounded. When the fungous granulations have been destroyed, the cure may be perfected by the collyrium already mentioned, or rather by introducing, thrice a day, between the eyeball and internal angle of the eyelids, the powder of tutty, and the armenian bole. Bidloo extols very much powdered chalk, either alone, or in conjunction with burnt alum. (*Exercit. Anat. Chir. Decad.* 2.)

Excision is equally applicable to the inveterate encanthis, which is of considerable size, and broken down at its body, or which forms a prominence, as large as a nut, or chestnut, with two lippomatous appendages extending along the inner surface of one, or both eyelids. The application of a ligature to such an execrescence ought never to be regarded as a method of cure; for, the large, inveterate encanthis never has a sufficiently narrow neck to admit of being tied. On the contrary, when the tumour is voluminous, its roots, invariably, extend to the caruncula lachrymalis, the semilunar fold, and the conjunctiva covering the eyeball, oftentimes, nearly as far as the cornea. In this state, also, the encanthis has one, or two lippomatous appendages, which reach along the membranous lining of one, or both eyelids. Hence, though the ligature were to produce a separation of the body of the encanthis, one, or both the lippomatous appenpages would still remain to be extirpated. This second operation could only be accomplished by recision. In this disease, there is no foundation for the fear of hemorrhage, to which the advocates for the ligature attach so much importance; for, cases are recorded of considerable, inveterate encanthes being removed, without the least untoward occurrence from loss of blood. To these, Scarpa observes, he could add a great number of his own, so that no doubt can now be entertained on this point.

Pellier relates a case, in which an encanthis was follwed by a dangerous hemorrhage, though it had been cut out by an expert oculist. He enters, however, into no detail concerning the nature of the complaint, nor the way, in which the operation was performed; circumstances from which one might deduce the reason of an unusual accident. Indeed, the same author adds, "I have often performed this operation for such excrescences, and have never met with a similar occurrence." *Recueil d'Observ. sur les Maladies de l'Œil. Part* 2. *Obs.* 118.

In the above mentioned case of a large, inveterate encanthis, with only one elongation on the inside of the upper eyelid, as soon as Fabricius Hildanus had taken hold of the body of the tumour with a hook, and drawn it towards him, he turned out the inside of the eyelid, so that the lippomatous appendage was made to project through its whole extent. Then he dissected this production away by means of a small bistoury, and, continuing the incision, he entirely detached the body of the encanthis from the conjunctiva covering the eyeball, from the semilunar fold, and from the caruncula lachrymalis. The operation was followed

by the most complete success, and ought to serve as a model, and guide, to all surgeons, who have occasion to treat this disease.

When the encanthis is large, and inveterate, with two lippomatous elongations, one on the inside of the upper eyelid, and the other on that of the lower end, we are to proceed in the following manner. The patient being seated, an assistant is to turn out the inside of the upper eyelid, so as to make one of the appendages of the encanthis project outward. By means of a small bistoury, a deep incision is next to be made into the elongation, in the direction of the margin of the eyelid; and then having taken hold of, and drawn it forwards with a pair of forceps, we are to separate it, throughout its whole length, from the inside of the upper eyelid, proceeding from the external, towards the internal angle of the eye, as far as the body, or middle, of the encanthis. We are then to do the same to the lippomatous appendage on the inside of the lower eyelid. Afterwards the body of the encanthis is to be elevated, if possible, with a pair of forceps; but when this instrument will not answer the purpose, a double hook must be employed. This middle portion is now to be detached, partly by the bistoury, and partly by the curved scissars from the subjacent conjunctiva, on the globe of the eye, from the semilunar fold, and from the caruncula lachrymalis; dividing the substance of this last part more, or less deeply, according to the depth and hardness of the large, inveterate encanthis. Here it is proper to state distinctly, that when we have to deal with an old, large tumour of this nature, that is deeply rooted in the caruncula lachrymalis, it is not regularly in our power to preserve a sufficient quantity of the substance of this part, to prevent the tears from dropping over the cheek, after the wound is healed.

The eye is to be repeatedly washed with cold water.

The rest of the treatment, consequent to the extirpation of a large encanthis, is almost the same, as what was explained in speaking of the small incipient one. Bathing the eye very frequently in the lotion of mallows, and employing anodyne, detergent collyria, are the best local means, until the mucous appearance, preceding suppuration, has taken place on the surface of the wound. Then we may have recourse to mild astringent ointments and collyria. The mildest topical applications are generally the best, both in the first stage of suppuration, as well as afterwards, particularly, when, together with the encanthis, we have removed a considerable piece of the conjunctiva, which covered the eyeball towards the nose, and was intimately connected with the body of the excrescence.

The following case, related by Marchetti, will throw additional light on the contents of this chapter. *Curavi quemdam canonicum Polonum laborantem meliceride magnitudinis jujubæ, quæ à caruncula anguli majoris oculi ad totam pupillam porrigebatur. A multis tentata curatio medicamentis, decoctis scilicet, collyriis, et aliis hujusmodi; omnia tamen octo mensium spatio incassùm adhibita. Cùm verò me consuluisset, ipsum tumorem evellendum censui; quod cùm reformidaret, spe tamen salutis operationem admisit, quam statim molitus sum, corpore priùs expurgato accuratissimè, ab aliis medicis. Paravi itaque hamulum, quo ipsam meliceridem perforavi, et manu apprehendi, alterâ verò forcipe eamdem cum folliculo sectione separavi tum à caruncula, tum à tunicâ adnatâ, et ipsâ pupillâ; atque ita totum tumorem eduxi sine ullâ offensâ ipsius oculi; à quibus statim applicui gossypium imbutum aquâ rosaceâ cum ovi albumine agitatâ, et portiunculâ croci, patiente tres dies hoc modo fasciâ vincto; adhibito postmodum collyrio cum aquâ rosarum, et pulvere tutiæ præparatæ; quibus spatio octo dierum omnino convaluit æger; increpante licèt meam præceptore meo ab Aquapendente audaciam; cùm tamen brevi spatio temporis id præstiterim, quod alii medici non potuerunt perficere; idque præsentibus præclarissimo Joanne Dominico Salâ cum multis studiosis.* (*Obs. Med. Chir. Sylloge, obs.* 21.)

The preceding account is taken from *Scarpa sulle Malattie degli Occhi.* I know of no better work, to which I can refer the reader. They who understand German, however, may peruse Richter's remarks on the subject, in his *Anfangsgr. der Wundarzn.* He is doubtless one of the best writers on the diseases of the eye in general.

ENCEPHALOCELE, (from εγκεφαλον, the brain, ond κηλη, a tumour.) A hernia of the brain. (See *Hernia Cerebri.*)

ENCYSTED TUMOURS. (See *Tumours Encysted.*)

ENEMA, (from ενιημι, to inject.) A glyster.

The following are some of the most useful glysters, employed in the practice of surgery.

Cathartic.

℞. Decocti Hordei ℔j.
Salis Muriatici ℥j.—Misce.

℞. Decocti Avenæ ℔j.
Olei Olivæ ℥ij.
Magnesiæ vitriolatæ ℥j.—Misce.*

Anodyne.

℞. Mucilaginis Amyli, Aquæ distillatæ sing. ℥ij. Tincturæ Opii guttas XL.—Misce.

℞. Olei Olivæ, ℥iv. Tincturæ Opii guttas XL.—Misce.

The two latter glysters are particularly useful in cases in which there is great irritation about the rectum, bladder, or urethra. They have great effect in diminishing spasmodic affections of this canal and the neck of the bladder.

Tobacco,

Employed in cases of strangulated Hernia.

℞. Nicotianæ ʒj. Aq. ferventis ℔j. The plant is to be macerated ten minutes, and the liquor then strained for use. One half should be first injected, and soon afterwards the other, unless the glyster should operate with dangerous violence, as it sometimes does in particular constitutions.

ENTEROCELE, (from ενλιεχα, the bowels, and κηλη, a tumour.) A species of hernia, in which the contents of the tumour are intestine.

ENTERO-EPIPLOCELE, (from ενλιεχα, the bowels, επιπλοον, the omentum, and κηλη, a tumour.) A species of hernia, in which the contents of the swelling are composed both of intestine and omentum.

ENTERO-HYDROCELE, (from ενλιεχα, the bowels, and υδροκηλη, a dropsy of the scrotum.) This must mean a common scrotal rupture, with a good deal of water in the hernial sac: or else a *congenital hernia*, (in which the bowels descend into the tunica vaginalis testis,) attended with a collection of fluid in the cavity of this membrane.

ENTEROMPHALOS, (from ενλιεχα, the intestines, and ομφαλος, the navel.) A hernia at the navel, formed by a protrusion of intestine.

ENTERORAPHE, (from ενλιεχα, the intestines, and ραφη, a suture.) A suture of the intestines.

ENTEROSCHEOCELE, (from ενλιεχα, the intestines, and οσχεοκηλη, a hernia in the scrotum.) Such a case, in which the protruded parts are intestine.

ENTROPIUM, (from εν and τρεπω, to turn.) An inversion of the eyelids. (See *Trichiasis.*)

EPIPHORA, (from επιφερω, to carry with force.) By this term is meant an accumulation of tears on the anterior part of the eye; in consequence of which, the person afflicted is not only under the necessity of frequently wiping them away, but vision is injured by the morbid refraction, which they produce in the rays of light that enter the pupil. The disease may arise from a more copious secretion of tears than the puncta lachrymalia can absorb, or, as is most common, from an obstruction in the lachrymal canal, in consequence of which the tears are prevented from passing freely from the eye into the nose. *Ware on the Epiphora, or Watery Eye.* (See *Fistula Lachrymalis.*)

EPIPLOCELE, (from επιπλοον, the omentum, and κηλη, a tumour.) A hernia, formed by a protrusion of a piece of the omentum. (See *Hernia.*)

EPIPLOOMPHALON, (from επιπλοον, the omentum, and ομφαλος, the navel.) An omental hernia, protruding at the navel.

EPIPLOSCHEOCELE, (from επιπλοον, the omentum, οσχεον, the scrotum, and κηλη, a tumour.) An epiplocele, or omental hernia in the scrotum.

EPISTHOTONOS, (from επισθω, forwards, and τεινω, to extend.) A spasm, by which the body is drawn forwards.

EPULIS, (from επι, upon, and κλα, the gums.) A small tubercle on the gums. It is said sometimes to become cancerous. The best plan of cure is to extirpate it with a knife.

[* A glyster equally efficacious and always at hand may be prepared by mixing together, a table spoonful of olive oil, two, of molasses, and one of common marine salt, with a pint of warm water.]

EPULOTICS, (from επουλοω, to cicatrize.) *Epulotica.* Applications conducive to the healing of wounds.

ERETHISMUS, (from ερεθιζω, to irritate.) Any thing which causes irritation. Mr. Pearson has described a state of the constitution, produced by mercury acting on it as a poison. He calls it the *mercurial erethismus*, and mentions, that it is characterized by great depression of strength, anxiety about the præcordia, irregular action of the heart, frequent sighing, trembling, a small, quick, sometimes intermitting pulse, occasional vomiting, a pale contracted countenance, a sense of coldness; but the tongue is seldom furred, nor are the vital and natural functions much disturbed. In this state, any sudden exertion will sometimes prove fatal. Mr. Pearson advises, with a view of preventing the dangerous tendency of this affection, the immediate discontinuance of the use of mercury; and exposing the patient to a dry cool air. The incipient erethismus may often be averted by the camphor mixture with large doses of the volatile alkali, if mercury be also left off. Sarsaparilla is also beneficial, when the stomach will bear it. (*Pearson on Lues Venerea, page* 156, *&c. Edit.* 2.)

EROSION, (from *erodo*, to gnaw off) *Erosio.* This word is very often used by surgical authors in the same sense as ulceration; viz. the formation of a breach, or chasm, in the substance of parts, by the action of the absorbents.

ERYSIPELAS, (from ερυω, to draw, and πελας, adjoining.) St. Anthony's fire; so called, from its tendency to draw the neighbouring parts into the same state, or, in other words, from its propensity to spread.

Erysipelas may be defined to be an inflammatory, cutaneous, and trivially elevated swelling, the other characters of which will be presently explained.

In this definition, we have adopted the opinion of medical and surgical writers, who have generally agreed to arrange erysipelas in the class of inflammatory complaints. However, though the affection may have such relations with the latter disorders, as will not allow it to be considered as a positively separate species of disease, yet, if its symptoms be investigated with care, it will be found, that these relations are sufficiently remote to make erysipelas and phlegmon be regarded as two very distinct kinds of inflammation. It has been thought, that the principal difference, existing between the two affections, consisted in the situation which was peculiar to each; erysipelas commonly affecting the surface of the skin, which is very irritable, while phlegmon is situated more deeply in the very substance of parts. It will presently be seen, that this explanation is not sufficient to account for the very different symptoms, which belong to the two affections.

As the symptoms of erysipelas are very much the same, in whatever parts of the body the disorder makes its appearance, we shall begin with describing its various phenomena and its progress, when the face is affected; and we shall afterwards explain the particular circumstances, which belong to the complaint in other cases.

The attack often takes place in a sudden manner, either with or without fever; but it is also frequently preceded by shiverings, complaints about the region of the heart, and other symptoms very similar to those which indicate the approach of an intermittent fever. The heat is often accompanied with a little delirium, and almost always with drowsiness of a more or less evident kind. A swelling afterwards makes its appearance, attacking the forehead, the cheeks, the nose, or eyelids. This swelling is elastic and smooth; but it is not distinctly circumscribed, and it gradually spreads over such parts of the face as were not at first affected. The skin of the part affected becomes of a bright red colour, occasionally having a tendency to a livid hue, in other instances having a mixture of yellow. These colours disappear when pressure is made on the part affected, but very soon reappear when such pressure is discontinued. The patient experiences a burning heat, and a disagreeable pricking in the part, rather than any acute pain: sometimes he complains of a very troublesome itching. The surface of the tumour is shining, and, as it were, semi-transparent: but without hardness, tension, or any sensation of throbbing. The eyelids are often so swollen that the patient cannot see, and the whole countenance is exceedingly disfigured. Small vesicles arise over a more or less extensive part of the erysipelatous tumour, and they are filled with a transparent serous fluid, and bear a great resemblance to those

which are occasioned by boiling water. When such vesicles burst, the fluid which is discharged, sometimes excoriates the neighbouring parts. Very frequently, there is even a slight ulceration at the base of these vesicles, which ulceration, in the worst sort of cases, assumes a gangrenous appearance, and falls rapidly into a state of complete mortification. When the disease takes a favourable course, the fever, which till now has continued, begins to abate; the vesicles dry up; and, at the end of an interval of eight or twelve days, the cuticle peels off. The degree of danger, attendant on erysipelas, depends on the delirium and other symptoms indicating an affection of the brain.

The seat of erysipelas seems to be under the cuticle, in the rete mucosum: but it is not confined to this part, as the cellular membrane is always affected even in a considerable degree. The affection of this membrane, however, is very different from what happens in phlegmonous inflammation. In a genuine case of erysipelas, healthy pus is very rarely found enclosed in a circumscribed cavity; and when there is any secretion of purulent matter, a feel is communicated, on compressing the part, almost like that which a sponge would give. In such cases the cellular substance has suffered considerably, and the part is frequently attacked by gangrene.

It is not easy to determine the causes which give rise to this complaint. There are a great many which, in conjunction with concomitant circumstances, manifestly contribute, in many cases, to the production of the disorder. Such are in particular:

1. Violent passions, such as anger, acute grief, &c.

2. Exposure to the heat of the sun, or that of the fire, too long continued.

3. The impression of cold damp air.

4. The action of various vegetable, mineral, and animal poisons.

5. Wounds, contusions, fractures, &c.

There is no doubt, that erysipelas is, for the most part, intimately dependent on the state of the constitution. Persons in the habit of drunkenness, and other kinds of intemperance, and who, in a state of intoxication, meet with local injuries, often have erysipelatous inflammation in consequence of them. Other subjects, who lead more regular lives, experience, when they meet with similar injuries, healthy phlegmonous inflammation.

The opinion of Hippocrates and Galen, with respect to the origin of this disorder from a congestion of the bile, is universally known to all initiated in the profession of surgery. This old doctrine has been, in some measure, revived by Tissot, and many other believers in the humoral pathology, who attribute the cause of erysipelas to an acrid humour, commonly a bilious one, diffused through the mass of the blood. But, much as I despise the absurdity of this theory, observation obliges me to confess, that the complaint seems frequently to be connected with a wrong state of the chylopoietic viscera, and, probably, with a morbid state of the bilious secretion in particular. A sudden suppression of perspiration, by exposure to cold and damp, or other more obscure causes, is set down by every writer on this subject, as frequently having a great share in exciting, and keeping up erysipelatous affections.

A further proof, that erysipelas is mostly dependent on constitutional causes, is that the affection most frequently happens in autumn or in any season, when hot weather is succeeded by cold and wet.

After what has been said, the characters, which distinguish erysipelas from phlegmon, may be taken notice of.

1. The inflammatory swelling, which takes place in the former, is not so elevated as in the latter, and is never plainly circumscribed.

2. In most cases, the surface of the skin seems as if it were burnt.

3. The redness, though of a bright description, disappears on pressure.

4. The sense of throbbing, and darting pain, attendant on phlegmon, is not observable.

5. The inflamed part is free from tension, and appears as it were affected with œdema, or rather with emphysema; only one can perceive no crepitation.

As we have already remarked, however, it must not be inferred from these differences, that erysipelas is to be considered as a disease essentially distinct from those, which are called inflammatory, as it has some characters in which it manifestly approaches them. Like phlegmonous inflamma-

tions, it may end in suppuration, though of a less perfect sort, than that in which phlegmon ends, and rarely contained in a circumscribed cavity. The pulse, in this disease, as well as in others of the same class, is generally full, and frequently hard, and when the patients are bled, their blood has the same appearance, and is covered with the same kind of inflammatory crust, as blood taken away in other kinds of inflammation.

It is proper, however, to notice, that practitioners are not universally agreed with respect to the nature of the pulse in erysipelas: it is, according to some, particularly Mr. Pearson, soft, frequent, and often irregular. But, if due attention be paid, this difference will be found to depend on particular circumstances. In the impure air of hospitals, and in all places, where the air is impregnated with carbonic acid gas, and other noxious gases, we find, that various affections decidedly inflammatory, especially those which are attendant on wounds, affect the body, and the sanguiferous system in particular, in a very different manner from what is observed when the patients are living in a more salubrious air. All inflammations assume a character more or less unfavourable, in consequence of the influence of bad air. This is particularly striking in cases of erysipelas. In such instances, living in an impure atmosphere has a singular effect in augmenting the sense of weakness and dejection, which patients always experience in a certain degree, and, in these cases, it may even go so far as to produce a total alteration of the state of the pulse. But, if attention be paid to the disease in a situation where the atmosphere is not impregnated with putrid effluvia, it will be found to put on a very different shape. The symptoms of dejection, of nervous irritation, and of the brain being affected, are much less conspicuous; and the state of the pulse, especially in patients who have not been previously debilitated by other diseases, bears a great resemblance to that which takes place in an inflammation of the chest.

We have also to remark, that, besides bad air, many other circumstances, which do not even belong to the nature of erysipelas, may have a share in producing an alteration of its symptoms. Thus, while inflammations of another kind, such as pleurisy and acute rheumatism, particularly affect robust persons, in whom the vital principle exists with a great deal of energy, erysipelas is prone to attack persons who are aged, or of delicate and depraved constitutions. The latter is also seen making its appearance as a symptom, in weakened parts, which have in a certain degree been deprived of their tone, as is the case with œdematous parts. It is not surprising, that, in these different cases, in which the tone of the system has already suffered, the state of the pulse, in persons affected with erysipelas, should seem different from what it is in individuals, who are more healthy and robust.

These observations on the nature of erysipelas lead us to remark, that this disease is not simple and uniform in its progress and symptoms, and that the mode of treatment ought to vary according to the particular form which the disorder may put on. The complaint has been distinguished into three species, viz. the *acute erysipelas*, the *œdematous erysipelas*, and the *malignant* or *gangrenous erysipelas*. These three species, which are strictly only different degrees of one same disease, or varieties produced by the particular circumstances, in which the patient is placed, may be either symptomatic, or idiopathic.

The *acute erysipelas* is mostly met with in persons of a sanguineous and choleric temperament; it makes its attack suddenly, and is very apt to affect the face. The pulse is always frequent, and most commonly full and hard. All the other general symptoms of inflammation are observable. These subside a little when the erysipelas has completely formed, though they often increase during the first periods of the swelling. The heat in the part affected is very great: the skin is of a brighter red colour than it is in the other kinds of erysipelas; vesicles form on the surface of the swelling, but they are less numerous, and more distinct, than those originating in the other species of this complaint. In the acute erysipelas, the inflammation is seldom followed by suppuration, except just at the edges of the eyelids, and the disease speedily terminates, sometimes in three or four days. The part affected changes its colour, and becomes yellowish; and the cuticle seperates in small scales. The whole scalp is often affected with a painful sensibility, which

even continues a long while after the disease is entirely at an end.

The acute erysipelas is often idiopathic. It is sometimes observed to attack the same person periodically, at certain times of the year. It is also very frequently a consequence of wounds, &c.

The attack of the *œdematous erysipelas* is neither so sudden, nor so violent, as that of the preceding kind. The swelling increases more gradually; it spreads to a greater extent; the heat is less ardent; the inflammatory symptoms are less evident; the pulse is not so hard, and the strength is more depressed. The symptoms of the brain being affected are more alarming. The colour of the skin is, in this case, much deeper, and intermingled with yellow and brown; the vesicles are small and numerous; and when the part affected has been exposed a few days to the air, it becomes covered with a brown dark-coloured scab, which somewhat resembles the one which occurs in the confluent small-pox.

This sort of erysipelas is far more uncommon than the foregoing one, and is much more dangerous. The patients often are in a state of delirium, or rather of lethargy, on the seventh, ninth, or eleventh day, or sometimes a little later. It is chiefly in hospitals that the disorder occurs, often appearing there to be epidemic, though it cannot be said to be ever contagious. It is particularly prone to attack persons weakened by age or intemperance, children, and dropsical subjects. When the œdematous erysipelas makes its appearance, as a symptom of some other affection, it is not nearly so dangerous as when idiopathic. It is always, however, to be considered as a serious malady, whatever may be its occasional cause. It is more apt, than the acute erysipelas, to shift its situation from the surface of the body to the internal parts. It is also seen affecting one leg, and then the other, several times in the course of one indisposition. When the brain becomes affected in this manner, delirium, and other most alarming symptoms, are immediately excited.

The *gangrenous erysipelas* bears a considerable resemblance to the preceding kind, in regard to the symptoms, with which it makes its attack; but it is much more rapid in its progress. The swelling soon becomes covered with phlyctenæ, the basis of which is livid; and symptoms of gangrene, attended with a state of the pulse, similar to that which takes place in malignant fevers, are not long before they make their appearance. This species of erysipelas is very liable to occur on the face, shoulders, and chest. The danger, which attends it, is proportioned to the more or less vigorous state of the system; the case is often fatal, particularly when the disease attacks persons who have been already debilitated by other causes. When it terminates favourably, small cavities and sinuses are often found in the cellular substance, which contain pus of a bad quality. In this sort of case, one or more ulcers form externally, through which considerable sloughs of the cellular membrane are discharged.

When erysipelas in the legs terminates favourably, it generally leaves those parts more or less affected with an œdematous swelling, which it is often very difficult to cure.

The observations, which we have just been making, on the different kinds of erysipelas, shew, that the treatment of the disease cannot be the same in all cases. Hence, we shall describe, separately, the mode of treatment proper for each particular case.

The first indication in the treatment of the acute erysipelas, is to lessen the inflammation by bleeding, which is to be repeated, more or less, according to symptoms. Such other means are also to be adopted, as tend to diminish the force of the circulation. In short, the antiphlogistic plan, in the full sense of the expression, is proper.

In general, it is unnecessary to repeat bleeding, in any case of erysipelas, so frequently as is done in other inflammatory cases. We ought to be guided, however, in this respect, by the state of the pulse, and other symptoms, never forgetting the patient's age, the degree of strength before the disease, and the situation of the disorder itself. *Cæteris paribus*, the patient will bear bleeding better in the country, and in an open, pure air, than in a large city, and especially in an hospital.

The circulation, in the vessels on the surface of the body, should also be promoted by diluting beverages, proper doses of nitre, the saline mixture, and, above all, by administering small doses of the antimonial powder, or tartar emetic. The belly should be kept

open by glysters, and mild laxatives, and, when the patient is very much inconvenienced by the irritation and excessive heat of the part affected, small doses of opium may occasionally be given.

A gentle emetic very often has an exceedingly good effect in calming the fever, and expediting the cure of the erysipelas, especially after bleeding has been practised. But emetics are not to be continued, when they have a purgative effect.

In this complaint, as in every other one, in which the head is affected, the patient should be made to keep his head, as much as possible, in an elevated position.

In the œdematous erysipelas, perhaps, bleeding is never admissible. The loss of even a very small quantity of blood may have the most fatal consequences. One should also be exceedingly sparing of other evacuations. A determination to the skin should in particular be kept up by antimonials, and irritation and pain soothed by administering the *spiritus ætheris vitriolici compositus*, æther, camphor, opium, &c.

When the disorder seems to shift its situation to any internal part, and, particularly, to the brain, blisters should, without the least delay, be applied between the shoulders, to the head or legs.

In order to prevent the complaint from terminating in mortification, the patient's strength should be supported by tonic remedies, such as wine and bark.

With regard to the treatment of the gangrenous erysipelas, nothing more need to be said than what is contained in the article on mortification.

Various topical applications have been recommended in cases of erysipelas, and the unfounded fear of repelling the local affection, lest grievous constitutional derangement should arise, has created the most absurd prejudices against the most efficacious remedies. All medicines, derived from the classes of medicines called narcotics, repellents, and astringents, are condemned as topical applications, on the assertion, that they have a tendency to produce gangrene. Spirituous ones are reprobated as having the effect of increasing the inflammation, and all emollient, aqueous, and oily ones are condemned, as tending to protract the disease and make the swelling spread. Those practitioners, who entertain these opinions, extol farinaceous powders, such as starch, flour, &c. as the most proper and least objectionable of all topical applications. These are recommended to be repeatedly sprinkled on the inflamed parts.

For my own part, I have always been in the habit of applying Goulard's lotion to erysipelatous cases arising from wounds, and other kinds of local irritation, and I have always had every reason to think such applications as beneficial in these affections as in phlegmon.

Mr. Pearson prefers mild warm cataplasms, composed of the powders of aniseed, fennel, camomile flowers, &c. mixed with a fourth part, or an equal quantity of milk. Linseed powder may sometimes prove a convenient addition.

Consult *l'Encyclopédie Méthodique, partie Chirurgicale; Pearson's Principles of Surgery; and Les Œuvres Chirurgicales de Desault, par Bichat.*

ERYTHEMA, (from ἐρυθρὸς, red.) A redness of any part. For the erythema mercuriale, see *Mercury.*

ESCHAR, (from ἐσχαρόω, to form a scab, or crust.) *Eschara.* This term is applied to a dry crust, formed by a portion of the solids deprived of life. When any living part has been burnt by the actual, or potential, cautery, all that has been submitted to the action of this application, loses its sensibility and vital principle, becomes hard, rough on the surface, and of a black, or gray, colour, forming what is properly named an *eschar.* This, in short, is only a slough, produced by caustics, or actual fire.

ESCHAROTICS, (from ἐσχαρόω, to form a crust over.) *Escharotica.* Applications which form an eschar, or deaden the surface on which they are put. By escharotics, however, surgeons commonly understand the milder kind of caustics, such as the *hydrargyrus nitratus ruber, ærugo æris,* &c.

EXÆRESIS, (from ἐξαιρέω, to remove.) One of the divisions of surgery adopted by the old surgeons; the term implies the removal of parts.

EXCISION, (from *excindo,* to cut off.) *Excisio.* The cutting off any part.

EXCORIATION, (from *excorio,* to take off the skin.) *Excoriatio.* A separation of the cuticle; a soreness, merely affecting the surface of the skin.

EXCRESCENCE, (from *excresco*, to grow from.) *Excrescentia.* A tumour, growing out of, or from any part, and not included in its substance.

EXFOLIATION, (from *exfolio*, to cast the leaf.) *Exfoliatio.* The separation of a dead piece of bone from the living is termed, *exfoliation.*

One part of a bone is never separated from another by the rotting of the dead part, for that which comes away is as sound as it ever was. Exfoliation takes place soonest in bones, wherein are the fewest cells, and whose texture is the closest. Before any part of a bone can be thrown off, by exfoliation, it must be dead. But, even then, till the process of exfoliation begins, the bone adheres as strongly as ever, and would remain for years, before it could be separated by putrefaction alone. Bones are composed of two substances, viz. a true animal matter, and an earthy one, which are only intermixed with each other. A dead bone acts on the system, in the same manner, as any other extraneous body. It stimulates the adjacent living parts; in consequence of which, such a process is begun, as must terminate in its being thrown off. The effects of this stimulus are, first, that the living adjacent bone becomes more vascular; a circumstance, which always takes place, when a part has more to do, than is just sufficient for the support of life. Secondly, that the earth of the living part, where it is in contact with the dead bone, is absorbed; hence, the bone becomes softer, and adheres by its animal matter only. Thirdly, that the living animal part is at last absorbed along the surface of contact: this part of the process commences long before the last is finished. Both of them begin, first at the surface, though, in their course, they do not every where take place in an equal degree at the same time. Fourthly, in proportion to the waste, made by the last part of the process, a fungus arises from the living surface, and fills up the intermediate space, so that there is no vacuum. These different stages together constitute ulceration. When any part of a bone is once loose, it will be pushed to the surface in the same manner, as most other inanimate bodies would be, and this stage is partly mechanical, and partly a continuation of ulceration. A proof of the third stage, above mentioned, may be derived from cases, in which people die, while exfoliation is going on. A small groove, or worm-eaten canal, can then be discovered, which becomes gradually deeper, and follows the irregularities of the living and dead surfaces. After the application of the trepan, a circular piece of bone is frequently thrown off, which is always less than the space from which it came. This, however, would never be the case, were there not a loss of substance. (*John Hunter.*)

It was anciently believed, that whenever a bone was denuded, the exposed surface must necessarily exfoliate, and, this being taken for granted, the old surgeons used to set about bringing on an exfoliation as quickly as possible. For this purpose, the actual cautery was usually applied to the part of the bone, which was uncovered, and, as under such treatment, a portion of the bone was of course killed, and then exfoliated, the prejudiced practitioner believed, that he had only accelerated a process, which must of necessity have followed in a slow and tedious manner.

Mr. Hunter very truly remarks, that neither caustics, nor the actual cautery, hasten exfoliation; they only produce death in a part of the bone, which is the first step towards exfoliation. If caustics ever hasten exfoliation, when the bone is already dead, it must be by producing inflammation in the adjacent living bone; this brings about a change in it, and makes it exert a power, which it was incapable of before.

Exfoliation is not a necessary consequence of a bone being laid bare, and deprived of its periosteum. If the bone be in other respects uninjured, healthy, and enjoying a vigorous circulation of blood through its texture, granulations will be generated on the surface of such bone, which will cover and firmly adhere to it, without the smallest exfoliation being thrown off; especially, in young subjects. But, if caustic, stimulating, or drying applications be made use of, the circulation in the surface of the bone will necessarily be disturbed and destroyed, and that part of the surface, through which the circulation ceases to be carried on, will be separated, and cast off, by the process of exfoliation.

If any application to an exfoliating portion of bone be at all efficacious, it must be one, which will stop the mortification in the affected bone, and promote the absorption of those particles of bone, which form the connexion be-

tween that which is living and that which is actually dead. And as the bone dies from the same causes, as the soft parts mortify, we should at least follow the same principles in practice, which we do in the latter instance, and, though from the inferior vascularity and vital powers of the bones, we cannot expect surgery to have so much control over their affections, as over those of the soft parts, yet, every good will be obtained, which it is possible to acquire. Attention to such principles will at least teach us to avoid making the death of part of a bone more extensive, than it would be, if the cautery, caustics, and strong astringents, were not employed.

The best mode of attempting to prevent an exfoliation from occurring at all on a bone, that has been exposed by a wound, is, to cover the part again, as soon as possible, with the flesh, which has been detached. This, as we shall notice in the article, *Head, Injuries of*, may generally be practised with advantage, when the scalp has been detached from the cranium, provided the flap is still connected with the rest of the integument.

When the exposed bone cannot be covered, it should be dressed with the mildest and simplest applications, with plain lint, or lint spread with the unguentum spermatis ceti.

The dead pieces of bone, when very tedious in exfoliating, when wedged in the substance of the surrounding living bone, and when so situated as to admit of being safely sawn, or cut away, may be removed in this manner, as is described in the articles *Caries* and *Necrosis*. In such operation, Mr. Hey's saws are eminently advantageous.

In speaking of necrosis, we shall have occasion to notice the efficacy, which Mr. Crowther has found blisters possess in quickening the cure of necrosis, when kept open by the savin cerate, as recommended in his work on the white-swelling.

EXFOLIATIVUM, (from *exfolio*, to shed the leaf.) A raspatory, or instrument for scraping exfoliating portions of bone.

EXOMPHALOS, (from εξ, out of, and ομφαλος, the navel.) A hernia, protruding at the navel.

EXOPHTHALMIA, (from εξ, out, and οφθαλμος, the eye.) An unnatural protrusion of the eye.

EXOSTOSIS, (from εξ, out, and οστεον, a bone.) A bony excrescence, or tumour, growing out of some part of a bone.

If bones resemble the soft parts of the body in their structure, they must resemble them in their diseases, and a swelling may take place in bones, as well as other parts; but, there is a particular kind of tumour, which forms on their surface, and which is denominated an *exostosis*.

The generality of writers, even the most modern, have admitted many diseases among exostoses, which ought to be considered in a very distinct light; I need only instance the spina ventosa.

There seem to me to be only three species of exostosis, exclusive of venereal nodes. The first is the true exostosis, or osseous tumour growing from the very substance of a bone. The second consists chiefly in a thickening, and induration of the periosteum. And the third kind of exostosis might be termed *fungous*. An instance of such a disease growing from the cavity of the antrum, is related by Mr. Abernethy, in the Medical and Chirurgical Transactions, and quoted in another part of the present Dictionary. (See *Antrum*.)

The bony swelling, in some cases, acquires such a hardness, that no remains of a fibrous structure can be distinguished, and it absolutely resembles ivory; in other cases, it is spongy; and, lastly, it may be composed of osseous and fleshy parts together.

The bones, most frequently affected with exostosis, are those of the cranium, the lower jaw, sternum, humerus, radius, ulna, bones of the carpus, the femur, and tibia. There is, however, no bone of the body, which may not become the seat of this disease. It is not uncommon to find the bones of the cranium affected with exostosis in their whole extent. The ossa parietalia sometimes become an inch thick. (*Boyer.*)

The exostosis, however, mostly rises from the surface of the bone, in the form of a hard round tumour, and venereal exostoses, or nodes, are observed to arise chiefly on compact bones, and such of these, as are only superficially covered with soft parts, as for instance, the bones of the cranium, and the front surface of the tibia.

The causes of exostoses do not seem to be at all understood. Most writers impute the disease to internal causes, such as scrophula and lues venerea. That the latter affection is the cause of nodes, which are certainly a species of exostosis, no one will deny; but, that scrophula is ever concerned in producing any of the other kinds of exostosis must not be admitted, at least, before some evidence is adduced in support of the doctrine.

The ease, with which bony tumours form in some persons, is certainly a very remarkable fact, and tends to render it probable, that constitutional causes have considerable influence. I remember, that Mr. Abernethy mentions, in his lectures, his having seen a boy, who came out of Cornwall, who was so excessively afflicted with an apparent predisposition to exostoses, or an exuberant deposition of bony matter, that a very trifling blow would occasion a bony swelling on any bone of his body. His ligamentum nuchæ was ossified, and prevented the motion of his neck; the margins of his axillæ were also ossified, so that he was, as it were, completely pinioned. Besides all this, the subject in question had numerous other exostoses on various parts of his body. Mr. Abernethy gave, in this case, the muriatic and acetic acids, with a view of dissolving the lime in the lad's system, which this gentleman thought might be too abundant, and not duly carried off in proportion to its secretion. The boy was also forbidden to eat food, containing any kind of lime.

An exostosis is always hard, but its size is various, and it may be indolent, or painful. By these signs, and its firm adhesion to the bone, it may be always distinguished from other tumours. Some exostoses cannot be ascertained before death. Such was the case in which the parietal bone was found, after death, to be three times thicker, than natural. Such also was the example, related in the memoirs of the Academy at Dijon, in which a person died from an exostosis on the internal side of the os pubis, which tumour prevented the discharge of the urine, or the introduction of a catheter, by its pressure on the neck of the bladder. (*Boyer.*)

Should an exostosis take place in the orbit, the eye would of course protrude preternaturally from this cavity, constituting a case of exophthalmy Facts of this kind are to be met with on record.

Our ignorance of the pathology of exostoses, particularly, its causes accounts for the imperfection of our treatment of it. With the exception of the venereal exostosis, or node, there is no species of this affection, for which, it can be said, that we have any one medicine of the least efficacy.

Boyer, and other writers on the diseases of the bones, seem to regard some exostoses, as a perfectly inorganic mass of lime, and, consequently, they entertain no idea, that the absorbent vessels can possibly take away the particles of the tumour, just as the secerning arteries have laid them down. Such writers, however, were well aware, that nodes were capable of being diminished, and this could only be effected by the action of the absorbent system.

Whether any exostoses might be lessened by keeping open a blister, over such tumours, for a considerable time, is a point, perhaps, worthy of further investigation. It is certain, that such applications tend to diminish venereal nodes, after they have been lessened as much as they can be by mercury; and we also know, that blisters, kept open, promote the absorption of the dead bones in cases of necrosis.

When exostoses merely occasion a deformity, and no pain, nor inconvenience, from the pressure, which they occasion on the neighbouring parts, it is certainly most advisable not to undertake any operation for their removal; for, as Boyer has truly observed, in by far the greater number of instances, the local affection is much less to be dreaded, than the means used for removing it.

Caustics and the cautery have occasionally been applied to exostoses; but, they always do mischief. Boyer mentions an unfortunate woman, who had a caustic applied to an exostosis of the inside of the tibia; but which, instead of removing the tumour, caused a necrosis, of which she was not well two years afterwards.

When exostoses are productive of much pain and injure the health, and their situation admits of their being safely removed, with the aid of suitable saws, or even with that of a gouge and mallet; the operation may be undertaken. Many tumours of this kind,

however, have bases so very extensive, and deep, that, when situated on the limbs, amputation becomes preferable to any attempt made to saw or cut away the exostoses, so as to preserve the members, on which they are situated.

In removing an exostosis, its base must be as freely exposed by the knife, as circumstances will allow, and to this part a small fine saw may be applied. It appears to me that in cutting away some exostoses, the flexible saw, described by Dr. Jeffray, of Glasgow, (see *Amputation*,) might be found useful. Mr. Hey's saws are now so well known to the profession, that I scarcely need recommend them to be remembered in the present cases.

EXTIRPATION, (from *extirpo*, to eradicate.) *Extirpatio*. The complete removal, or destruction of any part, either by cutting-instruments, or the action of caustics.

EXTRACTION, (from *extraho*, to draw out.) *Extractio*. The taking extraneous substances out of the body. Thus bullets and splinters are said to be *extracted* from wounds; stones from the uretha, or bladder.

Surgeons also sometimes apply the term, *extraction*, to the removal of tumours out of cavities, as for instance, to the taking of cartilaginous tumours out of the joints; they seldom speak of extracting any diseased original part of the body; though, they do so in one example, viz. the cataract.

EXTRACTION OF THE CATARACT. See *Cataract*.

EXTRAVASATION, (from *extra*, without, and *vas*, a vessel.) *Extravasatio*. A term, applied by surgeons to fluids, which are out of their proper vessels, or receptacles. Thus, when blood is effused on the surface, or in the ventricles of the brain, it is said, that there is an *extravasation*. See *Head, Injuries of*. When blood is poured from the vessels into the cavity of the peritoneum, in wounds of the abdomen, surgeons call this accident an *extravasation*. The urine is also said to be *extravasated*, when, in consequence of a wound, or of sloughing, or ulceration, it makes its way into the cellular substance, or among the abdominal viscera. When the bile spreads among the convolutions of the bowels, in wounds of the gall-bladder, this is a species of extravasation.

EYE CANCER, *and Extirpation of*. Cancer of the eye may make its attack on both sexes, and at any period of life. It seems, however, that the disease is more frequent in childhood. Experience has shewn, that, at the Hôtel Dieu more than one third of the patients, on whom Desault operated, were under twelve years of age. The complaint sometimes comes on after an obstinate ophthalmy; sometimes after a blow on the eye, after wounds, a staphyloma, and, often, after fungous excrescences, which form on the surface, or in the interior of the eye. The disease is said to have been caused by the imprudent employment of topical irritating applications; very frequently the causes are constitutional ones.

The following symptoms commonly indicate its attack, and accompany its progress. Head-achs, and an unusual heat in the organ, are the forerunners of the disease. An uneasy itching affects the eye and adjacent parts. The organ frequently weeps a great deal, and from being from the first irritably sensible of the impression of light, it soon becomes unable to bear it without pain, unless, indeed, some previous disease should have rendered the organ incapable of transmitting the rays of light to the retina. To the itching succeeds, at the end of a certain time, a pricking sensation, which is followed by a pain, that is not very acute at first, but, afterwards, becomes extremely poignant and lancinating. The eye enlarges, and assumes not the red colour of ophthalmy, but a dull hue, ending in a livid, yellowish, or blackish one. Sight becomes obstructed and destroyed; the pains grow more acute, and the size of the organ increases, not as in hydrophthalmy, according to its natural dimensions, but, by an unequal enlargement of its surface, which becomes rough and irregular. As the magnitude of the part increases, so does the hardness. The cornea, after turning whitish, reddish, and livid, ulcerates and bursts, and fungous growths project from the opening, discharging a purulent fetid sanies.

The disease continuing, a manifest disproportion is seen between the eye and the orbit. As in hydrophthalmy, the organ projects out beyond the margin of this cavity, and forms a hideous prominence on the face. The portion of the conjunctiva, naturally reflected over the inside of each eyelid, becomes separated, in consequence of being dragged by the eye, to the front of

which it applies itself, forming a reddish kind of band over it.

The suppuration puts on a more formidable aspect. The fungi increase, and become livid and dark-coloured. Hemorrhages follow, more or less frequently, and copiously. The pains, now more incessant, continually torment the patient, and, if art does not now interfere, the eyelids next swell, inflame, and become scirrhous. The lower one, over which the sanies flows, is excoriated; fungi arise from it; and the disease is propagated to the cheek, and nose, so as to present, perhaps, one of the most terrible pictures, which external diseases can form. The os planum of the os ethmoides is rendered carious, as well as the os unguis; the pituitary membrane is affected; the pains increase, and become general; and the cancerous diathesis afterwards makes its appearance.

The progress of the disease does not regularly follow the above course. It varies, according as a blow, a disease, or a cancerous disposition, has been the cause. It is enough to state here, however, that the patient is always brought to the grave by a terrible death, if the disease be not extirpated. As surgery possesses no means of curing this affliction, the only plan is to remove the part affected, and, practitioners, more timid in this, than other cases of cancer, never ventured to undertake the extirpation of the eye, till several ages, after they had done that of other cancerous parts.

The ancients are silent on this operation, and it is to the German surgery, that we are indebted for the first proposals of the kind. It was, for the first time, practised in the sixteenth century, with a very coarsely constructed instrument, shaped like a spoon, with cutting edges, and, by means of which, the eye was separated from the surrounding parts, and taken out of the orbit. But, this instrument, invented by Bartisch, was too large to reach to the deep contracted part of the orbit, so that either a part of the disease was left behind, or the thin delicate bones of the orbit were fractured, when the instrument was introduced too far. Fabricius Hildanus learned these inconveniences from experience, and, to avoid them, devised a sort of probe-pointed bistoury; a better instrument, but not free from objections, and forgotten for near a century afterwards; surgeons continuing to use sometimes the above spoon, sometimes various kinds of hooks. Muys, Bartholine, &c. afford examples of operations so performed. Bidloo, more judicious, than his predecessors, made use of scissars, and a pointed bistoury. His mode of operating, though not very methodical, was crowned with several successes, a circumstance in its favour, as M. Louis has observed.

A lancet seemed to Lavauguyon sufficient for extirpating the eye, and he is the first French surgeon, who has spoken of this operation. All the surgeons of that country considered the operation, as useless, cruel, and dangerous, until St. Ives mentioned, that he had done it with success, without, however, describing the plan, which he followed. There are engraved, in the *Institut. Chirurg.* two tumours of the kind now under consideration, which the author removed with the bistoury, alone, which he thinks quite sufficient, and preferable to the means employed by Bartisch, Hildanus, and Muys. Several English surgeons, have used a sort of curved knife, an engraving of which is given in B. Bell's system; but, in dissecting the tumour, this instrument it not so convenient, as a straight bistoury.

Thus far the plans of operating, advised by authors, were not guided by any fixed rules. M. Louis endeavoured to lay down such rules, and his method has, for a long while, been mostly adopted in France. It consists in dividing the attachments of the eye to the eyelids; then those of the small oblique muscle; next, those of the great oblique muscle; then those of the levator palpebræ superioris, varying according to their insertions, the manner of holding the knife. The eyeball is afterwards detached, and the four straight muscles, and optic nerve, divided with a pair of curved scissars.

This way of operating, founded upon anatomical principles, seems at first glimpse to offer a method, in which, as M. Louis remarks, each stroke of the instrument is guided by the knowledge of the parts. But, it is to be noticed, that these parts, being altered by disease, most commonly do not present the same structure and relations, which they do in the natural state; and that the flattened, lacerated, destroyed muscles, on their being confused with the eye itself, cannot serve, as in lithotomy,

for the foundation of any precepts relative to the operation. Besides, why use both the knife and scissars? The latter instrument is obviously useless, though M. Louis seems to think the operation cannot be done without them. The inclination of the outer side of the orbit will always allow a bistoury to be carried to the bottom of this cavity, so as to divide from above downwards, the optic nerve, and muscular attachments, which are to be drawn forward so as to render them tense.

Guided by the above principles, Desault, after having practised and taught the method of M. Louis, returned to Heister's advice, who wishes only a bistoury to be employed. To have an exact idea of the mode of operating, which is always easy and simple with this one instrument, we must suppose the carcinoma to be in three different states. 1. When the tumour hardly projects out of the orbit, so that the eyelids are free. 2. When it is much larger, projects considerably forward, and pushes in this direction the healthy eyelids, which are in contact with it, together with a portion of the conjunctiva, which invests them, and is now detached from them. 3. When, in a much more advanced period, the eyelids participate in the cancerous state. In the first case, the eyelids must be separated from the eye, by cutting through the conjunctiva, where it turns to be reflected over the globe of the eye. In the second instance, the eyelids and conjunctiva, which are in contact with the diseased eye, must be dissected from it. In the third, these parts must be cut away, together with the eye. (*Œuvres Chirurgicales de Desault; par Bichat. Tom. II.*)

After the above observations, it only seems necessary to annex a few brief directions for operating, as laid down in my *First Lines of the Practice of Surgery*.

When the eyeball is exceedingly enlarged, it is necessary to divide the eyelids at the external angle, in order to facilitate the operation. The surgeon can operate most conveniently when he employs a common dissecting knife, and when his patient is lying down with his face exposed to a good light. That operator must be endued with very little dexterity, who finds it necessary to introduce hooks and ligatures through the eye, with a view of drawing it outward, while he is dividing the surrounding parts. No man of common adroitness can require any other means for this purpose, than his own fingers, or a pair of forceps. When the eyelids are diseased, they must be removed; but, when prudence sanctions their being preserved, this is an immense advantage. No particular directions, how to accomplish the operation, seem requisite. The eye must not be drawn out too forcibly, before the optic nerve is divided, and care must be taken not to penetrate any of the foramina, or thin parts of the orbit, with the point of the knife, for fear of injuring the brain. Great care should also be taken to leave no diseased parts behind, in the orbit. The hemorrhage may always be securely stopped by filling the orbit with scraped lint. It is constantly adviseable, to remove the lachrymal gland, as this part seems to be particularly apt to be the source of such inveterate fungous diseases, as too often follow the operation.

The antiphlogistic treatment is proper, for a few days afterwards. Sometimes, fungous granulations continually form in the orbit, notwithstanding they are repeatedly destroyed, and the patient is at last exhausted. Sometimes, the disease in the orbit extends even to the brain, and produces fatal consequences. When malignant fungous excrescences grow from the cornea alone, it is clearly unnecessary to extirpate the whole eyeball.

EYE, DROPSY OF. See *Hydrophthalmy*.

F

FASCIA, (from *fascis* a bundle, because, by means of a band, materials are collected into bundles.) A bandage, fillet, or roller. See *Bandage.*

FEVERS, SURGICAL. Under this head we comprehend two species of fever, viz. the *inflammatory*, and the *hectic*, which are particularly interesting to surgeons, because frequently attendant on surgical disorders.

We have mentioned, in treating of inflammation, that a febrile disturbance of the constitution is attendant on every considerable inflammation. In the present article, we shall endeavour to give some account of the particulars of this disorder.

The fever, about to be described, is known and distinguished by several names; some calling it *inflammatory*; some *symptomatic*; and others *sympathetic*. It is sometimes idiopathic; that is to say, it occasionally originates at the same time with the local inflammation, and from the same causes. *(Burns.)* In other instances, and, indeed, we may say, in all ordinary surgical cases, it is symptomatic; or, in other words, it is produced, not directly by the causes, which originally produced the inflammation, but in consequence of the sympathy of the whole constitution for the disturbed state of a part.

The idiopathic inflammatory fever is said to be always preceded by chilliness. The symptomatic inflammatory fever, sometimes takes place so quickly, in consequence of the violence of the exciting cause, or of the local inflammation, that no preceding coldness is observable. If, however, the local inflammation be more slowly induced, and consequently, operate more gradually on the system, then the coldness is evidently perceived. The symptomatic fever, induced by scalding, or burning a part, is quickly produced, and we have very little time to attend to the period of formation. On the other hand, the symptomatic fever, induced by wounds, is excited more slowly, and the period of formation is longer. This fever is not produced, when the inflammation only affects parts in a slight degree; but, it constantly makes its appearance, if the local inflammation be considerable, or if it affect very sensible parts. *(Burns.)*

The degree, in which this fever is excited, does not altogether depend upon the absolute quantity, or violence of the inflammation; but, in a great measure, upon the degree of the local inflammatory action, compared with the natural power and action of the part affected. Parts, in which the action is naturally low, are extremely painful when inflamed, and the system sympathizes greatly with them. Hence, the constitution is very much affected, when tendons, bones, or ligaments, are the parts inflamed. Severe inflammation of a large joint, every one knows, is apt to excite the most alarming, and even fatal derangement of the system. When very sensible parts are inflamed; for instance, the eye; the symptomatic fever is generally more considerable, than it would be, were it to arise from an equal quantity and degree of inflammation in a less sensible organ.

In common parts, as muscle, cellular membrane, skin, &c. the symptoms will be acute; the pulse strong and full, and the more so, if the inflammation be near the heart; but, perhaps, not so quick, as when the part is far from it. The stomach will sympathize less, and the blood will be pushed farther into the small vessels. *(Hunter.)*

If the inflammation be in a tendinous, ligamentous, or bony parts, the symptoms will be less acute, the stomach will sympathize more, the pulse will not be so full, but, perhaps, quicker: there will be more irritability, and the blood will not be so much pushed into the small vessels, and, therefore, it will forsake the skin. *(Hunter.)*

It seems to be a material circumstance, whether the inflammation is in the upper, or lower extremity; that is, far from, or near to the heart; for the symptoms are more violent, the constitution more affected, and the power of resolution less, when the

part inflamed is far from the source of the circulation, than when near it, even when the parts are similar, both in texture and use. (*Hunter.*)

If the heart, or lungs, are inflamed, either immediately, or affected, secondarily, by sympathy, the disease has more violent effects upon the constitution, than the same quantity of inflammation would have, if the part affected were not a vital one, or one with which the vital parts did not sympathize. If the part be such as the vital ones readily sympathize with, then the sympathetic action of the latter will affect the constitution, as in an inflammation of the testicle. (*Hunter.*) In such cases, the pulse is much quicker and smaller, and the blood is more sizy, than if the inflammation were in a common part, such as muscle, cellular membrane, and skin. (*Hunter.*)

When the stomach is inflamed, the patient feels an oppression and dejection through all the stages of the inflammation; the pulse is generally low and quick, and the pain obtuse, strong, and oppressing; such as the patient can hardly bear. If the intestines are much affected, the same symptoms take place, especially if the inflammation be in the upper part of the canal; but, if only the colon be affected, the patient is more roused, and the pulse is fuller, than when the stomach only is inflamed. When the uterus is inflamed, the pulse is extremely quick and low. When the inflammation is either in the intestines, testicle, or uterus, the stomach generally sympathizes. In inflammation of the brain, the pulse varies more, than in the same affection of any other part; and, perhaps, we must, in this instance, form a judgment of the complaint, more from other symptoms, than the pulse. (*Hunter.*)

When the inflammation is situated in a part, not very essential to life, and occasions the general affection of the system, called inflammatory fever, the pulse is fuller and stronger, than common, and the blood is pushed further into the extreme arteries, than when the inflammation is in a vital part. The patient, after many occasional rigors, is at first rather roused. The pulse is, as above described, when the constitution is strong and not irritable; but, if this be extremely irritable and weak, as in many women, who lead sedentary lives, the pulse may be quick, hard, and small, at the commencement of the inflammation, just as if vital parts were concerned. The blood may also be sizy; but it will be loose and flat on the surface. (*Hunter.*)

We may set down the ordinary symptoms of the inflammatory fever, occurring in consequence of local inflammation in common parts, and in a healthy habit, as follows; The pulse is frequent, full, and strong: all the secretions are diminished; the patient is vigilant and restless; the perspiration is obstructed, and the skin is hot and dry; the urine is high-coloured, and small in quantity; the mouth is parched, and the tongue furred; there is an oppressive thirst experienced; disturbance of the nervous system; loss of appetite and sleep; and in some cases, delirium.

OF WHAT IS TO BE DONE FOR THE RELIEF OF THE INFLAMMATORY FEVER.

Upon this part of the subject very little is to be said; for, as the febrile disturbance of the system is produced, and entirely kept up, in almost every instance, by the local inflammation, it must be evident, that the means employed for diminishing the exciting cause, are also the best for abating the constitutional effects. Hence, it very seldom happens, that any particular measures are adopted expressly for the fever itself; as this affection is sure to subside in proportion as the local inflammation is lessened, or resolved. But, when the febrile disturbance is considerable, and the inflammation itself is also considerable, the agitated state of the system may have in its turn a share in keeping up, and even increasing, the local affection, and should be quieted as much as possible. However, in these very instances, we should, in all probability, be led to a more rigorous adoption of the antiphlogistic plan of treatment, from an abstract consideration of the state of the local inflammation itself, without any reference to that of the constitution. Indeed, the increased action of the heart and arteries, and the suppression of the secretions, require the employment of antiphlogistic means, and antimonials, the very same things, which are indicated for the resolution of the local inflammation itself. Bleeding, purging, cold drinks, low diet, the exhibition of the antimonium tarta-

rizatum, James's powder, or the common antimonial powder; and bathing the feet and body in warm water, are measures, which have the greatest efficacy in tranquillizing the constitutional disturbance implied by the term, inflammatory fever. But, I think it right to repeat, that it is hardly ever necessary to have recourse to such an evacuation as general bleeding, merely on account of the fever; as this is only an effect, which invariably subsides, in proportion as the local cause is diminished.

HECTIC FEVER.

The sympathetic, or symptomatic fever, already described, is an *immediate* affection of the constitution, in consequence of some local disorder: the hectic fever is a *remote* one. When the hectic fever is a consequence of local disease, it has commonly been preceded by inflammation and suppuration; but, there is an inability to accomplish granulation and cicatrization: and the cure of course, cannot be accomplished. The constitution may now be said to be oppressed with a local disease, or irritation, of which it cannot relieve itself.

A distinction should be made, between a hectic fever, arising entirely from a local complaint in a good constitution, which is only disturbed by too great an irritation, and a hectic fever, arising principally from the badness of the constitution; which does not dispose the parts to heal. In the first species, it is only necessary to remove the part, (if removeable,) and then all will do well; but, in the second, nothing is gained by a removal of the part, unless the wound, made in the operation, is much less, and more easily put into a local method of cure; by reason of which, the constitution sinks less, under this state and the operation together, than under the former one. Here the nicest discrimination is requisite, *(Hunter.)*

The hectic fever comes on at very different periods after the inflammation, and commencement of suppuration, owing to a variety of circumstances. Some constitutions, having less powers of resistance, than others, must more easily fall into this state.

The hectic fever takes its rise from a variety of causes, but, which have been divided into two species, with regard to diseased parts; viz. parts called vital, and others not of this nature. Many of the causes of hectic fever, arising from diseases of the vital parts, would not produce this constitutional affection, if they were in any other part of the body; such, for instance, is the formation of tumours, either in, or so as to press upon, a vital part, or one, whose functions are immediately connected with life. Scirrhi in the stomach, and mesenteric glands; diseased lungs, liver, &c. produce hectic fever very soon.

When hectic fever arises from a disease of a part, that is not vital, it commences sooner, or later, according as it is in the power of the part to heal, or continue the disease. If the part be far from the source of the circulation, the fever will come on sooner, with the same quantity of disease. When the disease is in parts, which are not vital, and excites hectic fever, it is generally in situations, where so much mischief happens as to affect the constitution, and where the powers of healing are little. This is the case with diseases of most joints. We must also include parts, which have a tendency to such specific diseases, as are not readily cured in any situation.

Although hectic fever commonly arises from some incurable local disease of a vital part, or of an extensive disease of a common part, yet it is possible for it to be an original disease in the constitution, without any local cause whatever, that we know of.

Hectic is a slow mode of dissolution: the general symptoms are those of a low, or slow fever, attended with weakness. But, there is rather weak action, than real weakness; for, upon the removal of the hectic cause, the action of strength is immediately produced, and every natural function is reestablished, however much it was impaired before.

The particular symptoms are debility; a small, quick, and sharp pulse; the blood forsakes the skin; loss of appetite; frequently, a rejection of all aliment from the stomach; wasting; a great readiness to be thrown into sweats; spontaneous perspirations, when the patient is in bed; the urine is pale-coloured, and very copious; and there is often a constitutional purging.

Hectic fever has been imputed to the absorption of pus into the circulation;

but, this cause has been much exaggerated, as concerned in occasioning many of the bad symptoms, which frequently attack persons, who have sores. The hectic fever almost constantly attends suppuration, when in particular parts, such as vital ones. It also attends many inflammations, before actual suppuration takes place, as in cases of white swelling of the large joints. The same quantity and species of inflammation and suppuration in any of the fleshy parts, especially such as are near the source of the circulation, have in general no such effect. Hence, in the first instances, the fever is only an effect on the system, produced by a local complaint, that has a peculiar property.

The constitution sympathizes more readily with diseases of vital parts, than with those of any other parts; their diseases are also in general more difficult to cure, than the same affections of parts, which are not vital. All diseases of bones, ligaments, and tendons, affect the constitution more readily, than those of muscles, skin, cellular membrane, &c.

When the disease is in vital parts, and is such as not to kill, by its first constitutional effects, the system then becomes teazed with a complaint, which is disturbing the *necessary actions of health*. In the large joints, a disease continues to harass the constitution, by attacking parts, which have no power, or rather, no disposition to produce a salutary inflammation and suppuration. Thus, the system is also irritated by the existence of an incurable disease. Such is the theory of the cause of hectic fever.

If the absorption of matter always produced the symptoms, above described, how could any patient, who has a large sore, possibly escape becoming hectic; for, there is no reason to suppose, that one sore can absorb more readily than another. If absorbed matter occasioned such violent effects, as have been commonly ascribed to it, why does not venereal matter do the same? We often know, that absorption is going on, by the progress of buboes. A large one, just on the point of bursting, has been known to be absorbed, in consequence of a few days' sea-sickness. The person continued at sea for four and twenty days afterwards; yet, no hectic symptoms followed, only the specific constitutional effects, which are of a very different description.

Matter is sometimes formed on the inside of the veins, when their cavities are inflamed, and this matter cannot fail to get into the circulation; yet, hectic symptoms do not arise. Also, very large collections of matter, which have been produced without visible inflammation, as many abscesses of the scrophulous kind, are wholly absorbed, in a very short time, but no bad symptoms are the consequence. *(Hunter.)*

Hence, we may conclude, that the absorption of pus has no share in occasioning hectic fever. Many other arguments might be adduced to shew the absurdity of the doctrine; but, we can here only refer the reader to what Mr. Hunter has said farther on the subject, in his work on inflammation.

It is much more probable, that the hectic fever arises from the effect, which the irritation of a vital organ, or other parts, such as joints, have on the constitution, when either incurable in themselves, or are so for a time to the constitution. *(Hunter.)*

TREATMENT OF HECTIC FEVER.

We have no method of curing the consequences above related. All relief must depend on the cure of the cause, (viz. the local complaint,) or on its removal.

Tonic medicines have been recommended on account of the evident existence of great debility. Antiseptics have also been given, in consequence of the idea that, when pus is absorbed, it makes the blood disposed to putrify. For these reasons, bark and wine have been exhibited.

Bark will, in most cases, only assist in supporting the constitution. Until the cause is removed, however, there seems no prospect of curing a disorder of the constitution. It is true, tonic medicines may make the system less susceptible of the disease, and also contribute to diminish the cause itself, by disposing the local complaints to heal. When, however, the hectic fever arises from a specific disease, such as the venereal, though bark may enable the constitution to bear the local affection better, than it otherwise could do, yet, this medicine can never remove the syphylitic mischief. *(Hunter.)*

No medicine, not even bark itself, has any direct power of communicating strength to the human constitution. All that can be done, in the treatment of hectic fever, when it is thought inexpedient, or impracticable, to remove the morbid part, is to combat particular symptoms, and to promote digestion. It is by bringing about the latter object, that bark is useful in these cases. The infusum cinchonæ being more apt to agree with the stomach, than the decoction, or powder, should generally be preferred. Nourishing food, easy of digestion, should be frequently taken, in small quantities at a time. Nothing is more prejudicial to a weak constitution, than overloading the stomach. Wine may also be given, but not too freely, and, not at all, if it should create heartburn, as it sometimes does in hectic patients. Madeira is less apt to have this disagreeable effect, than port. In these cases, it is often found useful to administer gentle cordial aromatic draughts. But, of all medicines, opium is perhaps the most valuable to those, who are afflicted with hectic fever; it alleviates pain, procures sleep, and checks the diarrhœa, which so frequently attends such cases.

When the local complaint, connected with the fever, is totally incurable, it must, if possible, be removed by a manual operation. Thus, when a diseased joint keeps up hectic fever, and seems to present no hopes of cure, amputation must be performed. But, when the local disease holds out the chance of being cured, provided the state of the constitution were improved, the surgeon is, in this circumstance, to endeavour to support the patient's strength. Great discretion, however, must be exercised, in deciding how long it is safe to oppose the influence of an obstinate local disease over the system, by the power of medicine. Although patients, in an abject state of weakness, have oftentimes been restored to health by a removal of the morbid part, yet many have been suffered to sink so low, that no future treatment could save them from the grave. Clemency in the practice of surgery, does not consist so much in delaying strong and vigorous measures, as in boldly deciding to put them in execution, as soon as they are indicated.

When the hectic fever arises from local diseases in parts, which the constitution can bear the removal of, the morbid part should be taken away, if it cannot be cured, consistently with the advice already given. When the disease arises from some incurable disease, in an extremity, all the above mentioned symptoms cease, almost immediately after the limb has been taken off. A hectic pulse, at one hundred and twenty, has been known to sink to ninety in a few hours after the removal of the hectic cause. Persons have been known to sleep soundly the first night afterwards, who had not slept tolerably for weeks before. Cold sweats have stopped immediately, as well as those, called colliquative. A purging has immediately ceased, and the urine begun to drop its sediment. (*Hunter.*)

FIBULA, (*quasi figilula*, from *figo* to fasten.) So named from its resemblance to a Roman clasp. The small bone of the leg. See *Fractures* and *Dislocations.*

FICATIO, or FICUS, (a fig.) A tubercle about the anus, or pudenda, resembling a fig.

FISSURE, (from *findo*, to cleave asunder.) *Fissura.* A very fine crack in a bone, has this term often applied to it. See *Fracture.*

FISTULA, in surgery, strictly means a sore, which has a narrow orifice, runs very deeply, is callous, and has no disposition to heal. The name is evidently taken from the similitude, which the long cavity of such an ulcer has to that of a pipe, or reed. A fistula commonly leads to the situation of some disease keeping up suppuration; and from which place the matter cannot readily escape. No technical term has been more misapplied, than this has; and no misinterpretation of a word has had worse influence in practice, than that of the present one. Many simple, healthy abscesses, with small openings, have too often been called *fistulous;* and, being considered as in a callous state, the treatment pursued has in reality at last rendered them so, and been the only reason of their not having healed.

FISTULA IN ANO. See *Anus.*

FISTULA LACHRYMALIS. A disease, arising from an obstruction in the ductus nasalis, and preventing the tears and mucus of the lachrymal parts of the eye from descending into the nose.

No one can have a proper conception of this disorder, without adverting to the anatomy, and functions, of the parts

concerned. Hence, I shall first insert the interesting relation of these subjects, as delivered by Mr. Pott.

"That the motions of the eyelids may be performed with the utmost ease, that the tunica cornea may be kept constantly clean, bright, and fit for the transmission of the rays of light, and that dust, and other hurtful particles, may be immediately washed away, the surface of the eye is continually moistened by a fine limpid fluid.

"This fluid is derived principally from a large gland, situated under the upper edge of the orbit, near the outer corner of the eye, which gland is of the conglomerate kind, and lies in a small depression of the os frontis; its excretory ducts, or those by which it discharges the secreted fluid, piercing the tunica conjunctiva, just above the cartilaginous borders of the upper eyelids.

"While the caruncule was thought to be the secretory organ of the tears, this gland bore the title of glandula innominata; but now, that its use and office are known, it is called glandula lachrymalis.

"By irritation from any sharp or poignant particles, a large quantity of this fluid is immediately secreted, and by the motion of the eyelids is as immediately derived over the surface of the eye, by which means such particles are washed and wiped off. Sometimes also the passions of the mind produce an immediate increase of lymph, which is then strictly and properly called tears; a constant secretion of too large a quantity causes a disease, called epiphora; and a deficiency of it makes the motions of the lid difficult and painful.

"Although the fluid secreted by the lachrymal gland is considerable in quantity, yet, when it is not suddenly produced by irritation from without, or passion within, it is so constantly and gradually carried off, as to create neither trouble, uneasiness, nor blemish.

"The edge, or border of each eyelid, is formed by a thin cartilage, the figure and consistence of which keep the lids properly expanded; these cartilages are covered by a fine membrane, and are called cilia; their internal edges do, upon every motion, sweep over every point of the surface of the cornea; this motion, though almost imperceptible, unless attended to, is very frequently performed; and as the secretion of the fluid is also constant, the eye is by this means kept always moist, clean, and bright.

"At the extremity of each of these cartilaginous borders of the eyelids, on the side next the nose, is a small papilla, or eminence; and in the middle of each of these is a small hole, or perforation, which being made in the cartilage, is not liable to collapse while the parts are in a sound state, but remains always open; they are called the puncta lachrymalia; and their office is to receive the lachrymal fluid, as it runs off the cornea along the edges of the eyelids, thereby preventing it from trickling down the cheek; and that there may be no impediment to the constant execution of this office, during the time of sleep, as well as that of being awake, the internal edges of the cilia do not come into immediate contact with each other in that point where these orifices are.

"From each of these puncta lachrymalia proceeds a small membranous tube; which tubes soon enter into, or form a pouch or bag, situated near the inner angle of the eye, just below the union of the two lids, under the musculus orbicularis palpebrarum; the bag is called the sacculus lachrymalis, and its office is to receive all the lymph brought by the puncta and ducts; the upper part of this sacculus lies in an excavation, formed partly by the nasal process of the os maxillare superius, and partly by the os unguis; the lower part of it is confined in a long channel, and forms a tube, or duct, which descending obliquely backward, communicates with the cavity of the nose, behind the os spongiosum superius, by an opening whose size is somewhat different in different subjects.

"This passage is called the ductus ad nares or the ductus nasalis, and through it whatever is received by the sacculus from the puncta does, in a healthy and sound state of these parts, pass into the nose.

"The membrane which lines this sacculus and duct, is in its structure much like to the membrana pituitaria narium, from the surface of which a clear viscid mucus is secreted, and by which the sacculus and passages are constantly moistened and kept pervious.

"While the parts are in a healthy, sound state, the fluid secreted by the

lachrymal gland passes off through the puncta, sacculus, and duct, into the nose, without any trouble: but when they are in a diseased state, the case is otherwise. This membrane, like all other vascular parts, is liable to inflammation, by which means it often happens, that it is so thickened as to obstruct the nasal duct, and thereby much impede, or totally hinder the passage of any thing through it; in consequence of which obstruction, the sacculus is filled by its natural mucus, and the derivation of the serum from the lachrymal gland through it being thus prevented, it runs off from the eyelid down the cheek; this obstruction continuing, and the mucus still lodging, the sacculus is dilated, and produces that tumour in the inner corner of the eye, and that discharge, upon pressure, which characterize the first state of the disease in question, and, in conjunction with several other attending symptoms, prove its seat to be in the lachrymal sac, and nasal duct.

"Although the seat of this disease is the same in almost every subject, yet its appearance is very different in different persons, and under different circumstances. These variations depend principally on—

1. The degree of obstruction in the nasal duct.
2. The state of the cellular membrane covering the sac.
3. The state of the sacculus itself.
4. That of the bone underneath.
5. The general state and habit of the patient.*

"Sometimes a serous kind of defluxion, by which the lining of the sac and duct are so thickened as to obstruct, or prevent the passage of the fluid through them into the nose, makes the whole complaint; and the cellular membrane on the outside not being diseased, there is no appearance of inflammation. In this case the duct is stopped, and the sacculus dilated, but without any alteration in the colour of the skin; a fulness appears in the corner of the eye next to the nose; and upon the application of a finger to this tumour, a clear viscid mucus is discharged through the puncta lachrymalia; the patient feels no pain, nor finds any inconvenience, except what is produced by the discharge of this mucus, and by the trickling of the lymph down the cheek.

"In some cases the mucus is not perfectly and always clear, but is sometimes cloudy, and looks as if it had a mixture of milk or cream in it; at first waking, some of it is generally found in the corner of the eye; and the eyelashes, being smeared over with it during sleep, most commonly adhere together in the morning.

"This is the most simple state of the disease, what the French have called the hernia, or hydrops sacculi lachrymalis: it is frequently met with in children who have been rickety, or are subject to glandular obstructions; and in this state it sometimes remains for some years, subject to little alterations, as the health or habit shall happen to vary, the sacculus being sometimes more, sometimes less full, and troublesome; the mucus which is pressed out, is sometimes more, sometimes less cloudy, and now and then it is attended with a slight ophthalmy, or an inflammation of the eyelids, but which, by common care is easily removed.

"If the sacculus is not much dilated, the discharge small, and produced only by pressure, the chief inconveniences are the weeping eye, and the gumming together of the lids, after sleeping; but these, by being attended to, may be kept from being very troublesome; and, if the disease makes no farther progress, may be so regulated as to render any more painful process totally unnecessary.

"If the dilatation is considerable, the swelling is more visible, and the quantity of mucus is larger; it is also in this state more frequently mixt and cloudy, and more troublesome, from the more frequent necessity of emptying the bag; but if the patient be adult, it may, even in the more dilated state of it, be kept from being very inconvenient.

"If an inflammation comes on, the tumour is thereby considerably increased, the discharge is larger, as well during sleep as upon pressure; the skin covering it loses its natural whiteness and softness, becomes hard, and ac-

* As the state and circumstances of this disease are really various, and differ very essentially from each other, the general custom of calling them all by the one name of fistula lachrymalis is absurd.

quires an inflamed redness; and with the mucus a mixture of something, which in colour resembles matter, is discharged, especially if the pressure be made with any force, or continued for any time: this circumstance, added to the painful sensation, and inflamed appearance of the parts, has been productive of a supposition, that in this state there is either an ulcer or an abscess within the sacculus or duct."

Mr. Pott next attempts to prove, that the contents of the sac are only of a mucous, not a purulent, quality.

On quitting this discussion, Mr. Pott remarks, "The inflammation of the cellular membrane covering the sac, is a circumstance which makes a considerable difference, both in the appearance of the disease, and in its requisite treatment; in some cases it is confined merely to the surface of the tumour in the corner of the eye; in others it spreads still farther, affecting the eyelids, cheek, and side of the nose.

"When the parts are in this state, the mucus within the bag has generally the appearance of being matter, that is, it wears a deep yellow, and is of a more thin consistence; if the puncta lachrymalia are naturally large and open, and the inflammation confined to the surface of the sac, its contents will pass off pretty freely, and the skin will remain entire; this is what the ancients called the simple, or imperfect, anchylops.

"But when the skin covering the lachrymal bag has been for some time inflamed, or subject to frequently returning inflammations, it most commonly happens, that the puncta lachrymalia are affected by it, and the fluid not having an opportunity of passing off through them, distends the inflamed skin, so that at last it becomes sloughy, and bursts externally. This is that state of the disease which is called perfect aigylops, or ægylops; the discharge which used to be made through the puncta lachrymalia, while the skin was entire, is now made through the new opening; and, by excoriating the eyelids and cheek, increases the inflammation, and gives the disease a much more disagreeable appearance. In some, the matter bursts through a small hole, and after it has discharged itself, the tumour subsides, the neighbouring parts become cool, and though the skin covering the surface of the sacculus is sloughy and foul, yet there is no reason to believe that the sac itself is much diseased below; in others, the breach is large, the skin remains hard and inflamed, and from the appearance of the sore, there is reason to suppose the whole inside of the bag to be in a diseased state; and in some cases, which have been much neglected or irritated by ill treatment, the cavity of the sacculus seems to be filled with a loose ill-natured fungus, which gleets largely, and produces inflammation and excoriation of all the parts about.

"There is also another circumstance which sometimes is found to attend this disorder, viz. a carious state of the bones. This was by our forefathers supposed to be a frequent one, and was the principal reason for their so free use of the caustic, cautery, and scalpra, in the treatment of it; but since the disease has been more minutely examined into, this circumstance has been found to be a very rare one. When the fistula lachrymalis is a symptom of the lues venerea, as it sometimes is, the bones are indeed often carious; but then, the fistula is not the original complaint, but produced secondarily, and is a consequence of the diseased state of the os ethmoides, and ossa spongiosa of the nose, and is not curable by any local means or applications, but depends entirely on the cure of the disease of which it is a symptom.

"I have also seen an abscess after the small-pox, which, by falling on the lachrymal bag, has made it all slough away, and leave the bones bare; which circumstance I have also seen attend the free use of strong escharotics applied to destroy what is called the cyst; but without the accession of some other disorder producing it, or the most absurd method of treating the complaint, I believe that a caries of the bones will very seldom be met with. Indeed, the combination of other diseases, either of the general habit, or affecting the same, or the neighbouring parts, does often make a very material difference, both in the appearance of the disorder, in the prognostic, and the proper method of treating it, which therefore should always be inquired into: for instance, the patient is sometimes subject to an habitual ophthalmy, or lippitudo, which will

add to the deformity, and give a good deal of additional trouble during the cure; an ozœna, or some other disease of the membrane, and cells of the ethmoid bone, or a polypose excrescence within the nose, are now and then combined with it; the habit is sometimes, as I have before observed, infected with the lues venerea, of which this disease may be a symptom; strumous glandular obstructions are its too frequent companions; and, what is worst of all, it is sometimes cancerous."

TREATMENT OF THE FIRST STAGE OF THE FISTULA LACHRYMALIS.

Mr. Pott continues: "From what has been said, I think it will appear that this disease, in its primary and most simple state, consists in a detention or lodgment of mucus in the sacculus lachrymalis, in consequence of an obstruction of the natural passage from that bag into the nose; that by means of this lodgment the sacculus is distended, irritated, and sometimes inflamed; that the fluid which passes from the lachrymal gland over the eye to the puncta lachrymalia, being prevented by the fulness of the sac from getting into it, runs down the cheek; and therefore that the characteristic marks of the disorder, when recent, are a small tumour in the corner of the eye, an involuntary flux of the serum down that side of the face, and a discharge of mucus through the puncta lachrymalia upon pressure.

"This lodgment, being originally produced by the stoppage of the natural duct, it follows, that the first curative intention is, the removal of that obstruction; which is sometimes practicable, but more often not; the degree of obstruction, its date, the state of the adjacent parts, and some other circumstances, rendering it more or less so in different subjects.

"That the inexperienced practitioner may be guarded against giving a hasty prognostic, or making attempts, which, however fatiguing to the patient, must in the end prove fruitless; and that he may be enabled to understand the disease more perfectly, I shall take the liberty to divide it into four general heads, or states, under which all its lesser distinctions may be comprehended.

"The first consists in a simple dilatation of the sacculus, and obstruction of the nasal duct, discharging upon pressure a mucus either quite clear, or a little cloudy; the skin covering the bag being entire and perfectly free from inflammation.

"In the second, the tumour is somewhat larger; the skin which covers it is in an inflamed state, but entire; and the discharge made through the puncta lachrymalia is of a pale yellow, or purulent colour.

"In the third, the skin covering the sacculus is become sloughy and burst, by which means the swelling is in some measure lessened; but the mucus, which, while the skin was entire, used to be pressed out through the puncta lachrymalia, now discharges itself through the new aperture; the ductus ad nares, both in this and the preceding state, are not otherwise diseased, than by the thickening of its lining.

"In the fourth, the passage from the sacculus lachrymalis into the nose is totally obliterated, the inside of the former being either ulcerated, or filled up with a fungus, and attended sometimes with a caries of the bone underneath."

Our limits oblige us to pass over what Mr. Pott next states, concerning the practice of the ancients.

"In the first and most simple state of the disease, viz. that of mere obstruction, without inflammation, much pains have been taken to restore the parts to their natural state and use, without making any wound or division at all; the introduction of a probe, the injection of a fluid, and a constant compression made on the outside of the sacculus in the corner of the eye, are the principal means by which this has been attempted.

"Some few years ago, M. Anel made a probe of so small a size as to be capable of passing from the eyelid into the nose, being introduced at one of the puncta lachrymalia, and passing through the sacculus and duct; with which probe, he proposed to break through any small obstruction, which might be found in its passage.

"He also invented a syringe whose pipe is small enough to enter one of the puncta, and by that means to furnish an opportunity of injecting a liquor into the sacculus and duct; and with these two instruments he pretended to be able to cure the disease,

whenever it consisted in obstruction merely, and the discharge was not much discoloured. The first of these, viz. the passage of a small probe through the puncta, has a plausible appearance, but will, upon trial, be found very unequal to the task assigned; the very small size of it, its necessary flexibility, and the very little resistance it is capable of making, are manifest deficiencies in the instrument; the quick sensation in the lining of the sac and duct, and its diseased state, are great objections on the side of the parts, supposing that it was capable of answering any valuable end, which it most certainly is not.

"That the passing a fine probe from one of the puncta lachrymalia into the nose is very practicable, I know from experience; but I also know from the same experience, that the pain it gives, and the inflammation it often excites, are much greater, than any benefit, which does or can arise from it.

"It is said that the principal use of this probe is to clear the little ducts leading from the puncta into the sacculus, and the obstruction of those ducts is often mentioned as a part of this disease; by which one would be led to suppose that it was a circumstance which frequently occurred, whereas it is seldom if ever met with, and when it does happen, can never produce the disease in question; the principal characteristic of which is, a discharge into the inner corner of the eye upon pressure made in the angle; this discharge is made from the sacculus, through the puncta, and proves that the latter are open; the passing a probe therefore through these seems to be perfectly unnecessary, since a stoppage of them would never give rise to that disease, which consists in an obstruction to the passage of any thing from the sac into the nose, and not from the eye into the sac.

"The syringe, if used judiciously while the disease is recent, the sac very little dilated, and the mucus perfectly clear, will sometimes be found serviceable; I have used it where, I think, it has been much so; I have by means of it injected a fluid through the the sacculus into the nose, and in two or three instances have effected cures by it; but I have also often used it ineffectually; it gives no pain, and a few trials render the use of it very little troublesome."

The screw, invented by Fabricius ab Aquapendente, for compressing the lachrymal sac, being now never used, we need not follow Mr. Pott in shewing its inapplicableness.

Mr. Pott continues; "Besides these means of attempting a cure without incision, the gentlemen of the French Academy have favoured us with some others, such as the introduction of a probe into the lower part of the nasal duct within the nose, the injection of a fluid by the same orifice, the passing a seton from the punctum lachrymale superius through the sacculus and duct, and out at the nostril, there to remain till the cure is completed; and, for those purposes, they have invented, and given figures of a number of probes, syringes, and many other instruments, which, they say, have been very successfully used; far be it from me to say that they have not, or to prevent any body from trying those, or any other means, by which mankind may be cured of diseases with the least possible fatigue and pain; but from the experiments which I have made of most of these processes, I must beg leave to suspend my assent to their general utility, or even to their frequent practicability.

"Repeated trials upon dead subjects will undoubtedly enable a man to pass the probe, or perhaps now and then the seton, but he will also find it often absolutely impracticable; and, in the few instances, in which he may chance to succeed, as to this attempt, what will in general be the consequence? not what the writers on these subjects have taught him to believe, a cure, but a sense of pain, and degree of inflammation, which the patient, before such attempts were made, was free from; an exasperation of the disease, and a loss of much time, as I have more than once experienced. To which consideration may be added, that infants and young children are very often afflicted with this disorder, and that such processes as these are absolutely impracticable upon them, &c.

"Anel's syringe I have used successfully, and think it may now and then be very well worth trying, in recent cases more especially, as it may always be used without giving any pain, or running the risk of raising an inflammation; but I must also beg leave to observe, that if the bag is not much dilated, the mucus clear, the skin and

cellular membrane uninflamed, and the parts about soft and easy, if the patient will take care not to suffer too great an accumulation, will, by the frequent use of a vitriotic collyrium, keep the eyelids clean and cool, and carefully avoid such things as irritate the membrana narium, or occasion a sudden flux of lymph from the lachrymal gland, the disease may for many years, nay often for life, be kept from being very troublesome, or inconvenient, without any surgery at all." *(Pott.)*

In 1780, Sir William Blizard proposed, instead of injecting water, to introduce quicksilver through a small pipe communicating with a long tube full of this fluid. The specific gravity of the quicksilver, when the sac was distended with it, he believed would have more power, than water propelled through a syringe, to remove the lachrymal obstruction.

Mr. Ware, after trying Sir William Blizard's plan, gave the preference to Anel's syringe, with which he generally injects warm water, through the lower punctum lachrymale, into the lachrymal sac, and puts a finger over the superior punctum to prevent the fluid from escaping through it. With this finger, the lachrymal sac should also be occasionally compressed, in order to assist the determination of the water downward into the nose. Mr. Ware has sometimes used the injection thrice a day, though, in general, much less frequently; and, he says, the success he has experienced is considerable. (See *Ware on the Epiphora.)*

"I in general begin the treatment by injecting some warm water through the inferior punctum lachrymale, and I repeat the operation four or five days in succession. If, in this space of time, none of the water pass through the duct into the nose, and if the watering of the eye continue as troublesome as it was before the injection was employed, I usually open the angular vein, or direct a leech to be applied near the lachrymal sac; adding here a caution, that the leech be not suffered to fix on either of the eyelids, lest it produce an extravasation of blood in the adjacent cells. About the same time that blood is taken away in the neighbourhood of the eye, I usually vary the injection, and try the effects either of a weak vitriolic, or anodyne, lotion. In some instances, also, when I have found it impossible, after several attempts, to inject any part of the liquid through the duct, I have introduced a golden probe, about the size of a bristle, through the superior punctum lachrymale, and, attending to the direction of the duct, have insinuated its extremity through the obstruction, and conveyed it fully into the nose; immediately after which I have found, that a liquid, injected through the inferior punctum, has passed without any difficulty; and, by repeating these operations, for a few successive days, I have at length established the freedom of the passage, and completed the cure. In other instances, I have recommended a strongly stimulative sternutatory to be snuffed up the nose, about an hour before the time of the patient's going to rest, which, by exciting a large discharge from the schneiderian membrane, has sometimes also greatly contributed to open the the obstruction in the nasal duct.

"Cases occur very rarely which may not be relieved by some of the means above related." *(Ware's Additional Remarks on the Epiphora.)*

When the discharge has been fetid, Mr. Ware has sometimes found, that a vitriolic lotion, injected into the sac, has quickly corrected the quality of the matter.

Scarpa, in his *Osservazioni sulle principali Malattie degli Occhi*, maintains, that the chief part of the yellow viscid matter, which accumulates in the lachrymal sac, is secreted by the lining of the eyelids, and by the little glands of Meibomius; and that the altered quality of this secretion has a principal share in the cause of the disease. He states, that the truth of this fact may at once be ascertained by everting the eyelids; and especially the lower one of the affected side; and by comparing them with those of the opposite eye. The former will always exhibit an unnatural redness of the internal membrane, which has a villous appearance, all along the extent of the tarsus, while their edges are swollen; and numerous varicose vessels are distinguishable on its surface. The follicles of Meibomius, are also turgid and prominent.

Hence, Scarpa advises making such applications to the inside of the eyelids, as have a tendency to improve the quality of the secretion from them, at the same time, that attempts are made to remove the obstruction in the ductus nasalis. Mr. Ware, indeed, had previously noticed, that such treatment may occasionally be proper.

"When an epiphora is occasioned by an acrimonious discharge from the sebaceous glands on the edges of the eyelids, it must be evident, that injections into the sac will be very insufficient to accomplish a cure, because the sac is not the seat of the disorder. The remedies that are employed must be directed, on the contrary, to the ciliary glands themselves, in order to correct the morbid secretion that is made by them; and for this purpose, I do not know any application that is so likely to prove effectual as the unguentum hydrargyri nitrati, of the new London Dispensatory, which should be used here in the same manner, in which it is applied in common cases of the psor-ophthalmy. It will be proper to cleanse the eyelids every morning, from the gum that collects on their edges during the night, with some soft unctuous application; and I usually advise to apply to them, two or three times, in the course of the day, a lotion composed of three grains of white vitriol, in two ounces of rose, or elder-flower, water."

Mr. Ware very judiciously censures the plan of applying collyria to the eye by means of linen, wet in them; and he recommends eye-glasses for the purpose, or insinuating the fluid, between the eye and eyelids, with a camel-hair pencil, thoroughly wet in the application. (*Additional Remarks on the Epiphora.*)

Scarpa also extols washing the eye, three or four times a day, with a vitriolic collyrium; and, besides praising the ointment recommended by Mr. Ware, he recommends Janin's ophthalmic ointment, to be smeared over the margins and lining of the eyelids, every morning and evening.

℞. *Adipis Suillæ. Tutiæ præp. Bol. Armen. sing.* ℥ij. *Calcis Hydrarg. alb.* ℥j. *Misce.* To be used at first lowered with a larger proportion of lard, than is here ordered.

TREATMENT OF THE SECOND AND THIRD STAGES OF THE FISTULA LACHRYMALIS.

When the disease, says Mr. Pott, is got beyond the simple state just described, that is, when the parts round about are much, or constantly inflamed, or the skin, covering the tumour, is burst, there is something more to be done, if a cure is intended. In this state, an opening in the upper part of the sacculus lachrymalis becomes in general absolutely necessary; and, as a wound, made by a knife, leaves a much less disagreeable scar, than that which necessarily follows the bursting of the skin, one being a mere simple division, the other a loss of substance, it will always be found best to anticipate the accident of bursting, by making an opening, as soon as the integuments are in such a state as to threaten it.

If the sacculus is already burst, the opening, if necessary, is to be enlarged with a knife, or dilated. The incision made, the sacculus should be moderately distended with dry lint, or prepared sponge; by which means, an opportunity will be gained, in two or three days, of knowing the state of the inside of the sac, and of the ductus nasalis; if the former is neither sloughy, nor otherwise diseased, and the obstruction in the latter but slight, sometimes after a free discharge has been made, for some days, and the inaflammation, occasioned by the first operation, is gone off, the sac contracts itself, a superficial dressing, with moderate pressure, heals the sore, the lachrymal fluid resumes its wonted course, and the disease disappears. (*Pott.*)

When this simple method fails, the point to be aimed at, says Mr. Pott, is to render the nasal duct pervious; and, for this purpose, the passage from the sac to the nose, must be gradually distended, by passing either a probe, or a piece of cat-gut, or a bougie, gently into it, as far as it will go, and repeating it occasionally, until it is got quite through. (*Pott.*)

Such was the practice commonly pursued, till M. Pellier, and Mr. Wathen, recommended introducing a metallic tube down the ductus nasalis, and leaving it for a time in that situation, with a view of preventing the duct, after it had been made pervious, from closing again. It seems unnecessary to enter into a detail of their methods, which have now universally given place to a most simple mode of practice, devised by Mr. Ware, and explained by him in the following terms:

"Whenever a patient applies to me for relief, on account of an obstruction in the lachrymal passage, I always think it right to attempt to clear the canal from any inspissated mucus that

may be lodged in it, by injecting some warm water through the inferior punctum lachrymale; joining with it, when necessary, a trial of the other remedies that have been proposed in the two papers on the epiphora, which were laid before the public in the years 1792 and 1795. But if, after the use of these for about a week or ten days, there be not some perceptible advance towards a cure, or, if, from the long continuance of the obstruction, there be reason to fear that it is too firmly fixed to yield to this easy mode of treatment, I do not hesitate to propose the operation which is now to be described. The only persons, with respect to whom I entertain any doubts as to the propriety of this opinion, are infants. In such subjects, I always think it advisable to postpone the operation, unless the symptoms be particularly urgent, until they are eight or nine years old.

"If the disease has not occasioned an aperture in the lachrymal sac, or if this aperture be not situated in a right line with the longitudinal direction of the nasal duct, a puncture should be made into the sac, at a small distance from the internal juncture of the palpebræ, and nearly in a line drawn horizontally from this juncture towards the nose, with a very narrow spear-pointed lancet. The blunt end of a silver probe, of a size rather smaller, than the probes, that are commonly used by surgeons, should then be introduced through the wound, and gently, but steadily, be pushed on in the direction of the nasal duct, with a force sufficient to overcome the obstruction in this canal, and until there is reason to believe that it has freely entered into the cavity of the nose. The position of the probe, when thus introduced, will be nearly perpendicular; its side will touch the upper edge of the orbit; and the space between its bulbous end in the nose and the wound in the skin will usually be found, in a full-grown person, to be about an inch and a quarter, or an inch and three eighths. The probe is then to be withdrawn, and a silver style of a size nearly similar to that of the probe, but rather smaller, about an inch and three-eighths in length, with a flat head like that of a nail, but placed obliquely, that it may sit close on the skin, is to be introduced through the duct, in place of the probe, and to be left constantly in it. For the first day or two after the style has been introduced, it is sometimes advisable to wash the eye with a weak saturnine lotion, in order to obviate any tendency to inflammation which may have been excited by the operation; but this in general is so slight, that I have rarely had occasion to use any application to remove it. The style should be withdrawn once every day for about a week, and afterwards every second or third day. Some warm water should each time be injected through the duct into the nose, and the instrument be afterwards replaced in the same manner as before. I formerly used to cover the head of the style with a piece of diachylon plaster spread on black silk; but have of late obviated the necessity for applying any plaster by blackening the head of the style with sealing-wax."

Mr. Ware did not on first trying this method expect any relief, till the style was left off. However, he was agreeably disappointed, to find, that the watering of the eye ceased, as soon as the style was introduced, and the sight became proportionably more useful and strong.

The wound, which Mr. Ware makes in the sac, when there is no suitable ulcerated aperture, is only just large enough to admit the end of the probe, or style; and this soon becomes a fistulous orifice, through which the style may be passed without the least pain. In short, in about a week, or ten days, the treatment becomes so easy, that the patient, or any friend, is fully competent to do what is necessary. It merely consists in withdrawing the style, two, or three times a week, occasionally injecting some warm water, and then replacing the instrument as before.

Some, finding no inconvenience from the style, and being afraid to leave it off, wear it for years; many others disuse it in about a month, or six weeks, and continue quite well. The ulcerations, sometimes existing over the lachrymal sac, commonly heal, as soon as the tears can pass down into the nose; but Mr. Ware mentions two instances, in which such sores did not heal, until a weak solution of the hydrargyrus muriatus, and bark, were administered. (See *Ware on the Fistula Lachrymalis.*)

TREATMENT OF THE FOURTH STAGE OF THE FISTULA LACHRYMALIS.

The last state is that, in which the natural passage, from the sacculus to the nose, is so diseased as to be quite obliterated; or in which the bones are sometimes found to be carious.

The methods, hitherto described, have all been calculated to preserve the natural passage; they are sometimes successful; but, when they are not, there is no chirurgical means left, but to attempt the formation of an artificial one in its stead. The upper and hinder part of the sacculus lachrymalis is firmly attached to the os unguis, a small, and very thin bone, just within the orbit of the eye; which bone is so situated, that if it be by any means broken through, or removed, the two cavities of the nose and of the orbit, communicate with each other; consequently, the os unguis forms the partition between the hinder part of the lachrymal bag, and the upper part of the cavity of the nose; and it is by making a breach in this partition, that we attempt the formation of an artificial passage for the lachrymal fluid. (*Pott.*)

The cautery has now been long disused for making an aperture in the os unguis; and there are different instruments recommended for the purpose, such as a large, strong probe, a kind of gimblet, a curved trocar, &c. [among these should be mentioned Mr. Hunter's circular punch,] each of which, says the above elegant writer, if dexterously and properly applied, will do the business very well; the one necessary caution is, so to apply whatever instrument is used, that it may pierce through that part of the bone which lies immediately behind the sacculus lachrymalis, and not to push too far up into the nose, for fear of injuring the os spongiosum behind, while it breaks its way. Mr. Pott adds, that he himself has always used a curved trocar, the point of which should be turned obliquely downward, from the angle of the eye, towards the inside of the nose. The accomplishment of the breach will be known by the discharge of blood from the nostril, and of air from the wound, upon blowing the nose. Care must be taken to apply the instrument to the part of the bone, anterior to the perpendicular ridge, which divides it.

As soon as the perforation is made, a tent of lint should be introduced, of such size as to fill the aperture, and so long as to pass through it into the cavity of the nose: this should be permitted to remain in two, three, or four days, till the suppuration of the parts renders its extraction easy; and, after that, a fresh one should be passed every day, until the clean granulating appearance of the sore makes it probable, that the edges of the divided membrane are in the same state. The business now is to prevent the incarnation from closing the orifice; for which purpose, the end of the tent may be moistened with spir. vitriol. ten. or a piece of lunar caustic, so included in a quill, as to leave little more than the extremity naked, may at each dressing, or every other, or every third day, be introduced; by which the granulations will be repressed, and the opening maintained: and when this has been done for some little time, a piece of bougie of proper size, or a leaden cannula, may be introduced instead of the tent; and leaving off all other dressing, the sore may be suffered to contract as much as the bougie will permit; which should be of such length, that one extremity of it may lie level with the skin in the corner of the eye, and the other be within the nose.

The longer time the patient can be prevailed upon to wear the bougie, the more likely will be the continuance of the opening; and, when it is withdrawn, the external orifice should be covered only by a superficial pledget, or plaster, and suffered to heal under moderate pressure. (*Pott.*)

After the perforating instrument is withdrawn, Mr. Ware recommends a nail-headed style, about an inch long, to be introduced through the aperture, in the same way in which it is introduced through the nasal duct, in cases, in which the obstruction is not so great as to prevent its passing in this direction; and it may remain here with as much safety, as in this last mentioned instance, for as long a time as its continuance may be thought necessary to establish the freedom of the communication.

Mr. Ware is undoubtedly deserving of much honour for the improvement of this part of surgery; the following short passage of his own work fully shews in what his merits consist. "It may, perhaps, be thought, that the operation, which I have taken the liberty to recommend, has a close resemblance

to that which was proposed by the late Mr. Pott. It will be found to differ from it, however, in many essential respects. Mr. Pott, for instance, as well as Mr. Warner and Mr. Bell, advises the operator to make a large opening into the lachrymal sac. On the contrary, I have proposed to make a small one. These gentlemen, again, afterwards recommend different kinds of dressings; some of which are difficult to be applied, and painful in their action. The dressing, which I have proposed, is confined simply and solely to a silver nail-headed style. Their operation is performed, and their dressings employed, in order to form a communication, through which the tears may afterward pass into the nose; and until their passage is formed, and the necessity for further dressings ceases, they do not encourage any hope, that the disorder will be removed. Experience, however, teaches me, that as soon as the style is introduced, the disorder immediately ceases; and the tears pass at once into the nose, either through the natural nasal duct, or through the perforation that is made by the operation in the thin part of the os unguis." (*Ware on the Fistula Lachrymalis*)

I scarcely need add, that the works, containing the most valuable information, relative to the present subject, are *Pott's observations relative to the disorder of the corner of the eye, commonly called the Fistula Lachrymalis; Mémoires de l'Acad. Royale de Chirurgie; Ware on the Epiphora and Fistula Lachrymalis; Scarpa sulle principali Malattie degli Occhi.* They who understand German may also refer with advantage to *Richter's Anfangsgrunde der Wundarzneykunst;* an author, who has treated of all the diseases of the eyes in a superior manner.

FISTULÆ IN PERINÆO. When the methods recommended for the removal of strictures (See *Urethra, Strictures of*) have not been attempted, or not succeeded, nature endeavours to relieve herself by making a new passage for the urine, which, although it often prevents immediate death, yet, if not remedied, is productive of much inconvenience and misery to the patient through life. The mode by which nature endeavours to procure relief, is by ulceration on the inside of that part of the urethra which is enlarged, and within the stricture. The ulceration commonly begins near, or close to the stricture, although the stricture may be at a considerable distance from the bladder. The stricture is often included in the ulceration, by which means it is removed; but, unluckily, this does not always happen. The ulceration is always on the side of the urethra, next to the external surface.

The internal membrane and substance of the urethra having ulcerated, the urine readily gets into the loose cellular membrane of the scrotum and penis, and diffuses itself all over those parts; and as this fluid is very irritating to them, they inflame and swell. The presence of the urine prevents the adhesive inflammation from taking place; it becomes the cause of suppuration wherever it is diffused, and the irritation is often so great that it produces mortification, first in all the cellular membrane, and afterwards in several parts of the skin; all of which, if the patient live, slough away, making a free communication between the urethra and external surface, and producing *fistulæ in perinæo.*

However, when the ulceration takes place further back than the portion of the urethra, between the glans penis and membranous part of this canal, the abscess is generally more circumscribed.

The urine sometimes insinuates itself into the corpus spongiosum urethræ, and is immediately diffused through the whole, even to the glans penis, so as to produce a mortification of all those parts.

Although the ulceration of the urethra may be in the perinæum, yet the urine generally passes easily forwards into the scrotum, which contains the loosest cellular substance in the body; and there is always a hardness, extending along the perinæum to the swelled scrotum, in the track of the pus.

Ulceration can only be prevented by destroying the stricture; but, when the urine is diffused in the cellular membrane, the removal of the stricture will generally be too late to prevent all the mischief, although it will be necessary for the complete cure. Therefore, an attempt should be made to pass a bougie, for perhaps the stricture may have been destroyed by the ulceration, so as to allow this instrument to be introduced. When this is the case, bougies must be almost constantly used, to

procure as free a passage forwards, in the right way, as possible. When the bougie cannot pass, the application of caustic would in many cases be too slow in its operation, and, in others, cannot be tried, by reason of the situation of the stricture.

While we are attempting to cure the stricture, antiphlogistic measures, particularly bleeding, are to be adopted. The parts should be exposed to the steam of hot water; the warm bath made use of; opium and turpentine medicines given by the mouth, and in glysters; with a view of diminishing any spasmodic affection. But, all these proceedings are often insufficient, and, therefore, an immediate effort must be made, both to unload the bladder, and prevent the further effusion of urine, by making an opening into the urethra, somewhere beyond the stricture, but, the nearer to it, the better.

Introduce a director, or some such instrument into the urethra, as far as the stricture, and make the end of it as prominent as possible, so as to be felt; which, indeed, is often impossible. If it can be felt, it must be cut upon, and the incision carried on a little farther, towards the bladder, or anus, so as to open the urethra beyond the stricture. This will both allow the urine to escape,and destroy the stricture. If the instrument cannot be felt, at first, by the finger, we must cut down towards it; and, on afterwards feeling it, proceed as above.

When the stricture is opposite the scrotum, as the opening cannot be made in this situation, it must be made in the perinæum, in which case, there can be no direction given by an instrument, as one cannot pass sufficiently far, and the only guide is our anatomical knowledge. The opening being made, proceed as directed in the cure of a false passage. (See *Urethra, False Passage in.* In whichsoever way the operation is done, a bougie, or a catheter, which is better, must afterwards be introduced, and the wound healed over it.

When the inflammation, from the extravasation of urine, is attended with suppuration and mortification, the parts must be freely scarified, in order to give vent both to the urine and pus. When there is sloughing, the incisions should be made in the mortified parts.

Sometimes, when the urethra is ulcerated, and the cellular membrane of the penis and prepuce is so much distended, as to produce a phymosis, it is impossible to find the orifice of the urethra.

Frequently the new passages for the urine do not heal, on account of the stricture not being removed; and even when this has been cured, they often will not heal, but become truly fistulous, and produce fresh inflammations and suppurations, which often burst by distinct openings. Such new abscesses and openings often form, in consequence of the former ones having become too small, before the obstruction in the urethra is removed.

Such diseases sometimes bring on intermittent disorders, which do not yield to bark; but do not recur, when the fistulæ, and disease of the urethra, have been cured.

In order to cure fistulæ in perinæo, unattended with the above described urgent symptoms, the urethra must be rendered as free as possible, and, this alone is often enough; for, the urine finding a ready passage forwards, is not forced into the internal mouth of the fistulæ, so that these heal up. The cure of the strictures, however, is not always sufficient, and the following operation becomes indispensable.

The sinuses are to be laid open in the same manner as other sinuses, which have no disposition to heal. In doing this, as little as possible of the sound part of the urethra must be opened. Hence, the surgeon must direct himself to the inner orifice of the fistulæ, by means of a staff, introduced (if possible) into the bladder, and a probe passed into one of the fistulous passages. The probe should be first bent, that it may more readily follow the turns of the fistula. When it can be made to meet the staff, so much the better, for, then the operator can just cut only what is necessary.

When the fistula is so straight, as to admit of a director being introduced, this instrument is the best. When neither the probe, nor the director, can be made to pass as far as the staff, we must open the sinuses as far as the first instrument goes, and then search for the continuation of the passage, for the purpose of laying it open.

Having divided the fistulæ, as far as their termination, in the urethra, a ca-

theter should be introduced, and worn at first, almost constantly. This is better than a bougie, which must be frequently withdrawn to allow the patient to make water, and it often could not be introduced again without getting entangled in the wounds.

Whatever instrument is used for keeping the passage clear and open, while the sores are healing, whether the sores are the consequence of the causes of the fistula, or the above operation, there is, in many cases, a limited time for its employment. At first, it often assists the cure; but, in the end, it may obstruct the healing, by acting at the bottom of the wound as an extraneous body. Hence when the sores become stationary, let the catheter be withdrawn, and introduced only occasionally.

Even after the sores are well, the bougie may afterwards be used, in order to determine whether the passage is free from disease.

When fistulæ in perinæo have been laid open, the wounds are to be at first dressed down to the bottom as much as possible, which will prevent the reunion of the parts first dressed, and make the granulations shoot from the bottom so as to consolidate the whole by one bond of union. (See *Treatise on the Venereal Disease, by John Hunter.*)

FLUCTUATION, (from *fluctuo*, to float.) *Fluctuatio.* That motion and agitation, which is evident upon the pressure of a part containing any fluid.

FOMENTATION. *Fomentatio, Fomentum, Fotus.* By a fomentation, surgeons commonly mean the application of flannel, or some other substance, wet with warm water, or some medicinal decoction, to any part of the body. Fomentations are chiefly of use in surgery in relieving pain, and inflammation, and in promoting suppuration when this is desirable. Some particular decoctions, however, are used for fomentations, with a view of affecting, by means of their medicinal qualities, scrophulous, cancerous, and other sores of a specific nature. We shall just mention a few of the most useful fomentations in common use.

FOMENTUM AMMONIÆ MURIATÆ. ℞. *Fomenti Communis* ℔ij. *Ammon. Mur.* ℥j. *Spirit. Camph.* ℥ij.

Just before using the hot decoction, add to it the ammonia muriata, and spirit. Said to be of service to some indolent ulcers; and, perhaps, it might be of use in promoting the absorption of some tumours, and suppuration in others.

FOMENTUM CICUTÆ. ℞. *Fol. Cicut. recent.* ℔j. *vel Fol. Cicut. exsiccat.* ℥iij. *Aq. Comm.* ℔iij. *Coque usque reman.* ℔ij, *et cola.*

This fomentation is considered, as a very proper one for many scrophulous, cancerous, and phagedenic ulcers.

FOMENTUM CHAMÆMELI. ℞. *Lini contusi* ℥j. *Chamæmeli* ℥ij. *Aq. Distillat.* ℔vj. *Paulisper coque, et cola.*

This is a common fomentation for ordinary purposes.

FOMENTUM GALLÆ ℞. *Gallæ Contusæ* ℥ss. *Aq. Ferventis* ℔ij. *Macera per horam, et cola.* Used for the prolapsus ani. It is sometimes also employed, as a cold application, in cases of hemorrhoids.

FOMENTUM PAPAVERIS ALBI. ℞ *Papav. Alb. Exsiccati* ℥iv. *Aq. Pur.* ℔vj. Bruise the poppies, put them in the water, and boil the liquor, till only a quart remains, which is to be strained. This fomentation is a very excellent one, for very painful inflammations of the eyes, and for numerous ulcers, and other diseases, attended with intolerable pain.

FONTANELLA, (dim. of *fons*, a fountain.) An issue, so named from its continually running.

FONTICULUS. The same.

FORCEPS. A surgical instrument, being a pair of pincers, of various sizes and forms, according to the purposes for which it is designed. Thus the common forceps, for removing the dressings from sores and wounds, and for taking away any loose exfoliating pieces of bone, differ from the forceps intended to be used in lithotomy; and these latter are very different from the forceps used for taking up the mouths of the large arteries, in order that they may be tied.

FRACTURE, (from *frango*, to break.) *Fractura.* Is a solution of continuity of one, or of several bones, produced in general by external force, but, occasionally, by the powerful action of muscles, as is often exemplified in the broken patella. The long bones are particularly subject to be broken, and, mostly, at their middle part. They may, however, be fractured near their extremities. Sometimes, the same bone is broken in different places, which case is termed a *comminuted* fracture.

Though, when the middle part of a bone is fractured, the ends of the fracture are more apt to be displaced, on account of the contiguous surfaces being less extensive, yet, this kind of fracture is the least dangerous, because the violence, which has caused the accident, has seldom been applied to the broken part, and consequently, the adjacent soft parts are uninjured. The middle of a bone also is broken by less force, than any other part of it, and the fracture being distant from any joint, no stiffness, nor anchylosis, is likely to result from the injury.

Fractures are also distinguished into *transverse* and *oblique*. Duverney has admitted another class, viz. *longitudinal* ones; but, J. L. Petit has denied the possibility of this case, and Boyer adopts the opinion of the latter, rejecting, as impossible, the longitudinal fracture, unless that name be given to longitudinal splinters of comminuted fractures.

The most important division of fractures, is into *simple* and *compound*. By a *simple* fracture, surgeons mean a breach in the continuity of one, or more bones, without any external wound, communicating internally with the fracture, and caused by the protrusion of the ends of the broken bone, or bones. By a *compound* fracture, they signify, the same sort of injury of a bone, or bones, attended with a laceration of the integuments, which laceration is produced by the protrusion of one, or both ends, of the fracture.

The dangerous nature of compound fractures will be fully understood, when we presently treat separately of this subject.

The causes of fractures are divided into *predisposing* and *remote*.

In the first class are comprehended, the situation and functions of the bones, the age of the patients, and their diseases. Superficial bones are more easily fractured, than those, which are covered by a considerable quantity of soft parts. The functions of some bones render them more liable to be fractured, than others; thus the radius, which supports the hand, is more liable to be fractured, than the ulna. The clavicle, which serves to keep the shoulder in its proper position, and support on its arched extremity all the motions of the upper extremity, is hence very subject to be broken. The gradual increase of the quantity of the phosphate of lime, in the structure of the bones, makes them brittle, in proportion as we advance in years, and, in old age, the proportion of the inorganized to the organized part is so great, that the bones are fractured by the slightest causes. In childhood, the fibrous and organized part bears a greater proportion to the earth, and the bones being, consequently, more elastic and flexible, are not so easily broken, as in old age. Louis and Saviard mention cases, in which, women affected with old ulcerated cancers, have fractured their bones in merely executing the natural, and ordinary motions of the body, as merely changing their position in bed.

The remote cause of fractures is external force, variously applied, in falls, blows, &c. In particular instances, the bones are broken by the violent action of the muscles attached to them; this is almost always the case with the fractured patella. I remember a very strong man, whom Mr. Ramsden attended at Pentonville, who broke his os brachii, in making a powerful blow, although he missed his aim, and struck nothing at all.

Some of the symptoms of fractures are very equivocal. The pain, and inability to move the limb, commonly enumerated, may arise from a mere bruise, a dislocation, or other cause. The crepitus, the change in the form of the limb, and the shortening of it, are circumstances, communicating the most certain information; and the crepitus, in particular, is the principal symptom to be depended upon. The signs of fractures, however, are so exceedingly various, according to the bones, which are the subject of injury, that, it cannot be said, that there is any one, which is invariably attendant on such cases, and characteristically confined to them. The writers of systems of surgery have usually noticed loss of motion in the injured limb, deformity, swelling, tension, pain, &c. as forming the general diagnosis of fractures. However, it is easily comprehensible by any one, acquainted with anatomy, that numerous fractures cannot prevent the motion of the part, nor occasion outward deformity; and every surgeon must know, that, though, at first, there may be pain in the situation of a fracture, no swelling and tension take place, till after a certain period.

When, therefore, a limb is broken, and the event is not manifest from the distortion of the part, it is proper to trace, with the fingers, the outlines of the suspected bone: if it be the tibia, let the surgeon examine with his fingers, whether there is any inequality along the anterior surface, and along the sharp front edge of that bone. If it be the clavicle, let him trace the superficial course of the bone, in the same attentive manner. Wherever any unusual pain occurs, or any unnatural irregularity appears, then let him try, if a grating, or crepitus, cannot be felt on endeavouring to make one end of the fracture rub against the other. When the os brachii, or the os femoris, is the subject of inquiry, a crepitus is felt almost as soon as the limb is touched, and, in the case of the broken thigh, there is a considerable shortening of the extremity, unless sometimes when the fracture is of the transverse kind. But, when there are two bones, as in the leg and the fore-arm, and only one is broken, the other continues to prevent the limb from being shortened, and thrown out of its natural shape, so that a crepitus can only be felt by a very careful examination with the fingers.

I am aware, that considerable harm, and great unnecessary pain, have been occasioned in the practice of surgery, by an over officious care to feel the grating of fractured bones, and, whenever the case is sufficiently evident to the eyes, I cannot refrain from censuring those practitioners, who indulge their own ill-judged habits, at the expense of torture to the unfortunate patient. A fracture is an injury, that is necessarily attended with a great deal of pain, and followed by more, or less swelling, and inflammation; and to increase these evils by roughly, or unnecessarily handling the part, is both ignorantly cruel, and, if I may use the expression, unsurgical.

In some kinds of fractures, the broken bone is so surrounded with thick fleshy parts, that it is very difficult to feel a crepitus, or ascertain the existence of the injury. Some fractures of the neck of the thigh-bone, unattended with much retraction of the limb, are instances illustrative of this observation.

The prognosis of fractures varies, according to the bone injured, what part of it is broken, the direction of the breach of continuity, and what other mischief complicates the case. Fractures of bones, which have many strong muscles inserted into them, are more difficult of cure, than those of other bones, which have not so many powers attached to them, and capable of disturbing the ends of their fractures.

The fracture of the middle part of a long bone, is less dangerous, than a similar injury near a joint, with which the bone is articulated, for reasons mentioned above.

Oblique fractures are more troublesome, and difficult of cure, than transverse ones, because an oblique surface does not resist the retraction of the lower portion of the broken bone, and, consequently, it is very difficult to keep the ends of the fracture applied to each other, in a proper manner.

Fractures complicated with a violent contusion of the soft parts, or with a wound, rendering them compound ones, are much more dangerous, than other ones free from such accidents. Fractures of the leg are generally more serious, than similar injuries of the upper extremity.

A fracture may be rendered a very dangerous case, by being attended with a wound of a large artery.

In a debilitated old man, a fracture is less likely to end well, than in a healthy child, or strong young subject. The scurvy is said to retard the formation of callus; but, it is not true, that pregnancy prevents the union of fractures. There are certain indescribable constitutions, in which bones, more particularly, however, the os brachii, will not unite again after being broken. These temperaments are also very various; at least, I infer so from two subjects, to whom I paid particular attention. One was a strong, robust man, whose chief peculiarity seemed to be his indifference to pain: he had the ends of the broken os brachii cut down to, turned out, and sawn off, by Mr. Long, in St. Bartholomew's hospital, and the limb afterwards put in splints, and taken the greatest care of; but no union followed. The other case was a broken tibia and fibula, which remained disunited for about four months; but, afterwards, grew together. The latter subject was a complete instance of hypochondriasis. I have since seen a woman, under Sir James Earle, in the above institution, whose os brachii did

not unite in the least, though it had been broken several months. Every attempt to move the bone occasioned excruciating torture. The woman died of some illness in the hospital, and, on dissecting the arm, the cause of the fracture not having united was found to arise from the upper, sharp, pointed extremity of the lower portion of the broken bone having been forcibly drawn up by the muscles, and penetrated the substance of the biceps, in which it still remained. I am indebted to Mr. Henry Earle for the account of the appearance on dissection; and I do not know, that this kind of impediment to the union of a fracture has been noticed by any writer. I shall only remark on this part of the subject, that cutting down to the fracture and scraping, or sawing off, the ends of the bone, is an operation, to which we are not much encouraged by the results of cases, on which the experiment has been made. Besides the failure of the operation, which was most completely executed by Mr. Long, before numerous spectators, I understand, that Mr. Cline, and other surgeons, have tried the same proceeding, with no better success.

The process, by which broken bones grow together again, is nearly of the same nature, as that, by which the soft parts are united in wounds. The only difference is, that in uniting a fracture, the vessels after a time deposit the phosphate of lime. The vessels ramifying on the ends of the fracture, first effuse coagulating lymph. This gradually becomes vascular, and in proportion as the vessels acquire the power of secreting earthy matter, it is by degrees converted into new bone, termed *callus*, which, from being at first soft and flexible, at length becomes firm and unyielding, like the original bone, and fit for constituting the future bond of union, between the two extremities of the fracture. In order that the first connecting substance may speedily become organized, and fitted for the formation of callus, nothing is so favourable as perfect quietude. Hence, the chief surgical indication, in the treatment of fractures, after the bones are replaced, is to keep them perfectly motionless: nature completes the rest. (See *Callus*.)

TREATMENT OF FRACTURES IN GENERAL.

The general doctrine, relative to fractures, is contained under the following heads, as part of the treatment of them.

Extension.
Counter-Extension.
Coaptation, or Setting.
Application of Medicaments.
Deligation, or Bandage.
Position.
Prevention, or Relief of Accidents.

In the subsequent part of the present article, little more remains for us to do, than to follow Mr. Pott in his judicious observations on this part of practice.

It is very material to understand, how the ends of a fracture become displaced, because the greatest object in the treatment is to prevent such derangement. The separating of the ends of the fracture is not, however, an invariable occurrence; for fractures frequently take place, and yet no deformity is produced. When the tibia alone is fractured at its upper part, the shape of the limb is unaltered, because the diameter of the bone there is so great, and the surfaces of the fracture in contact so extensive, that they cannot be easily separated, and the unbroken fibula also aids in keeping the ends of the fracture from being displaced. A fracture of the upper thick part of the ulna alone is seldom deranged. In cases, however, in which both bones of the leg, or forearm, are broken, the ends of the fracture are commonly more or less displaced, and the limb consequently deformed.

The causes, and the varieties, of the derangement, attendant on fractures, form a most interesting subject.

In transverse fractures, the ends of the broken part cannot be deranged in the longitudinal direction, before they have been so much displaced, in the direction of the diameter of the bone, that no points of the fractured surfaces remain in contact.

But, when the fracture is oblique, and the surfaces not extensive, the derangement may happen in the direction of the axis of the bone, and the limb be shortened.

The third way, in which a fracture may be displaced, has not been much attended to; it is when the portions of the broken bone form an angle one with the other. In comminuted fractures this is most common; but, it also occurs both in simple fractures of the leg and thigh, when the foot is too much elevated, or depressed.

The fourth species of derangement is produced by a rotation of the inferior fractured portion on the superior, as is very common in fractures of the thigh.

The bones being only passive instruments of loco-motion, possess not, in their own organization, any cause of the change of situation, which takes place, but yield to exterior causes, to the weight of the member, and to muscular contraction. The force producing the fracture may, in some instances, not merely break the bone, but, also, displace the ends of the broken part.

Of all the causes, however, which tend to separate the ends of a fracture from each other, the action of the muscles, is the most important, and difficult to counteract.

Mr. Pott, after censuring the violent extension, and counter-extension, indiscriminately practised and recommended by the old surgeons, proceeds to inquire, whence arose the evils and difficulties formerly encountered. "Neither extension, nor counter-extension, says he, can ever be necessary on account of the mere fracture, considered abstractedly. The broken ends of the bone, or bones, are of themselves inactive, and, if not acted upon by other parts, they would always remain motionless. When any attempt is made to put them into motion, they of themselves can make no possible resistance; nor can any be made on their part, save an accidental one arising from the points of the fracture being entangled with each other; and when they have been once, by the hand of the surgeon, placed properly and evenly with regard to each other, they would of themselves for ever remain so. What then is the reason why fractured bones always suffer a greater or a less degree of displacement? why is a broken limb almost always shorter than its fellow? what creates the resistance which we always find in attempting to bring the fractured parts aptly together? whence does it proceed, that when we have done all that is in our power (according to this mode of acting) the ends of the fracture will, in many cases, become again displaced, and lameness and deformity frequently ensue? In short, what are the parts or powers which act on the bones, and which, by so acting on them, produce all these consequences?

"These parts are the muscles, the only moving powers in an animal body. By the action of these on the bones, all locomotion is performed, and cannot be performed without them; and although all bones, when broken, are in some degree displaced and shortened, yet it will always be found, that in proportion as the muscles surrounding, or in connexion with a bone, are strong or numerous, or put into action by inadvertence or spasm, so will the displacement of the ends of such bone, when fractured, be. The even and smooth position of the fractured ends of a tibia, when the fibula of the same leg is entire and unhurt; that is, when the muscles therefore cannot act upon the former; the visible and immediate deformity, when both the before mentioned bones are broken nearly in the same place; that is, when the muscles can act upon and displace such fracture; the great difficulty frequently met with, in endeavouring to get a broken os femoris to lie even tolerably smooth, and to prevent such broken limb from being much shorter than the other, are, among others which might be produced, such strong, and irrefragable proofs, as need no comment.

"From the muscles then, and from them only, proceeds all the difficulty which we meet with in making our extension; and by the resistance of these, and of these only, are we prevented from being always able to put the ends of a fractured bone immediately into the most apt contact.

"Let us in the next place consider, what it is which gives to a muscle, or to the principal muscles of a limb, the greatest power of resisting any force applied to them *ab externo*, in order to draw them out into greater length; for whatever that is, the same thing will be found to be the cause of the different degrees of resistance in setting a fracture.

"Does not the putting the muscles in a state of tension, or into a state approaching nearly to that of tension, almost necessarily produce this effect?

or, in other words, does not that position of a limb, which puts its muscles into, or nearly into such a state, give such muscles an opportunity of exerting their greatest power, either of action, or of resistance? This I believe cannot be denied. On the other hand, what is the state or position of a muscle which is most likely to prevent it from acting, and to deprive it of most of its power of resistance, or what is that position of a limb which, in the case of a broken bone, will most incapacitate the muscles from acting on, and displacing it; and in the greatest degree remove that resistance which they have it in their power to make to the attempts for the reduction of such fracture? Is it not obvious, that putting a limb into such position as shall relax the whole set of muscles, belonging to, or in connexion with, the broken bone, must best answer such purpose? Nothing surely can be more evident. If this be granted, will it not, must it not follow, that such posture of a broken limb must be the best for making the reduction; that is, it must be that in which the muscles will resist the least, and be least likely to be injured; that in which the broken bone will be most easily set, the patient suffer least pain in present, and that from which future lameness and deformity will be least likely to happen. A little attention to what frequently occurs, may perhaps serve to illustrate and confirm this doctrine better than mere assertion.

"What is the reason why no man, however superficially acquainted with his art, ever finds much trouble in setting a fractured os humeri, and that with very little pain, and a very small degree of extension? Is it not because both patient and surgeon concur in putting the arm into a state of flexion; that is, into such a state as relaxes all the muscles surrounding the broken bone? and is it not for the same reason that we so very seldom see (comparatively speaking of this bone with others) a deformity in consequence of a fracture of it? Let the reduction be attempted with the arm extended from the body, and the difficulty of setting will be much increased: let the arm be deposited in an extended straight position, and the fracture will be displaced and lie uneven.

"Apply the same kind of reasoning to the os femoris; that bone whose fracture so often lames the patient, and disgraces the surgeon.

"Will it not be more cogent, and more conclusive, in proportion as the muscles in connexion with this bone are more numerous and stronger? I would ask any man, who has been much conversant with accidents of this kind, what is the posture which almost every person (whose os femoris has been newly broken) puts himself into in order to obtain ease, until he gets proper assistance? Do such people stretch out their limb, and place their leg and thigh straight, and resting on the calf and heel? I believe seldom or never. On the contrary, do not such people almost always bend their knee, and lay the broken thigh on its outside? and is not the reason, why this must be the most easy posture, obvious?

"From want of attention to, or from not understanding these few self-evident principles, many people permit their patients to suffer considerable inconvenience, both present and future.

"It is a maxim universally taught and received, that a fractured limb may be in such state as not to admit of the extension necessary for its being set; that is, if assistance be not at hand, when the accident happens; if they who bring the patient home, do it so awkwardly or rudely, as to bruise and hurt the part; if from drunkenness, folly, or obstinacy in the patient, it happens that the limb is so disordered that it is found to be much swollen, inflamed, and painful, it is allowed not to be in a state to admit extension.

"This, I say, is a general maxim, and founded upon very just principles; but what is the general practice in consequence of it? It is, to place the limb in an extended, straight position, to secure it in that, and then by proper means, such as fomentation, poultice, &c. to endeavour to remove the tension and tumour. Now, if it be considered, that the swollen, indurated, and inflamed state of the muscles, is the circumstance which renders extension improper, surely it must be obvious, that such position of the limb as necessarily puts these very muscles in some degree on the stretch, must be a very improper one for the accomplishment of what ought to be aimed at. Under this method of treatment, the space of time which passes in the removal of the tension, is sometimes considerable; so

considerable, that a happy and even coaptation becomes afterwards impracticable: and then this accident, which nine times in ten is capable of immediate relief, is urged as an excuse for unnecessary lameness and deformity.

"How then are we to conduct ourselves in such circumstances? The nature of the complaint points out the relief. Extension is wrong; a straight position of the thigh or leg is a degree of extension, and a still greater degree of it in proportion as the muscles are in such circumstances as to be less capable of bearing it. Change of posture then must be the remedy, or rather the placing the limb in such manner as to relax all its muscles, must be the most obvious and certain method of relieving all the ills arising from a tense state of them: which change of posture will be attended with another circumstance of very great consequence; which is, that the bones may in such posture be immediately set, and not one moment's time be thereby lost; a circumstance of great advantage indeed! For, whatever may be the popular or prevailing opinion, it is demonstrably true, that a broken bone cannot be too soon put to rights; as must appear to every one who will for a moment consider the necessary state of the muscles, tendons, and membranes surrounding, and the medullary organs contained within, a large bone broken and unset; that is, lying in an uneven irregular manner. Can any truth be more clear, than that if the fracture, tension, and tumefaction be such, that the muscles cannot bear to be stretched out in the manner necessary for setting the broken bone without causing great pain, and perhaps bringing on still worse symptoms, the more the position of that limb makes its muscles approach toward a state of tension, the less likely it must be that such symptoms should remit, and the longer it must be before the wished for alteration can happen; and consequently, that while the accomplishment of such purpose is by every other means aimed at, the position of the limb ought most certainly to contribute to, and not to counteract it? In short, if the experiment of change of posture be fairly and properly made, the objections to immediate reduction, from tension, tumour, &c. will most frequently be found to be groundless; and the fracture will be capable of being put to rights, as well at first, as at any distance of time afterward."

For some criticisms on the foregoing remarks, relative to the relaxation of the muscles, in cases of fractures, the reader is referred to *Fractures of the Thigh.*

Mr. Pott next continues: "Extension having been made, and the broken ends of the bone having been placed as smooth and as even as the nature of the case will admit, the next circumstance to be attended to is the application of some medicament to the limb; particularly to the fractured part of it.

"The intention in applying any kind of external medicine to a broken limb is, or ought to be, to repress inflammation, to disperse extravasated blood, to keep the skin lax, moist, and perspirable, and at the same time to afford some, though very small degree of restraint or confinement to the fracture, but not to bind or press; and it should also be calculated as much as possible to prevent itching, an herpetic eruption, or an erysipelatous efflorescence. At St. Bartholomew's hospital, we use a cerate made by a solution of litharge in vinegar, which with soap, oil, and wax, is afterwards formed into such consistence as just to admit being spread without warming.

"This lies very easy, repels inflammation, is not adherent, comes off clean, and very seldom, if ever, irritates, or causes either herpes or erysipelas. But let the form and composition of the application made to the limb be what it may, one thing is clear, viz. that it should be put on in such manner, as that it may be renewed and shifted as often as may be necessary, without moving the limb in any manner: it being certain, that when once a broken thigh or leg has been properly put to rights, and has been deposited properly on the pillow, it ought not ever to be lifted up or moved from it again without necessity, until the fracture is perfectly united; and it is as true, that such necessity will not very often occur. This may perhaps seem strange to those who are accustomed to roll simple fractures, and consequently to lift them up every three or four days, in order to renew such kind of bandage: but the necessity of this motion arises merely from the kind of bandage made use of, and not from any circumstance of the fracture itself. That the

frequent motion of a fractured limb cannot possibly contribute to the ease of the patient, will, I suppose, be readily admitted; as I suppose it will, that when a broken limb has been once deposited in the best position possible, it is impossible to mend that position merely by taking such limb up and laying it down again; from whence it must follow, that such kind of apparatus as necessitates the surgeon frequently to disturb the limb, cannot be so good as one that does not; provided the latter will accomplish the same kind of cure as the former: the truth of which position will appear in the most satisfactory manner to any, who will take a view of the method, in which simple fractures are treated at the before mentioned hospital. Such application having been made as the surgeon thinks right, the next thing to be done is to put on a proper bandage.—That used by the ancients, and by the majority of the present practitioners, is what is commonly called a roller. This is of different lengths, according to the surgeon's choice, or as it may be used in the form of one, two, or more pieces. Hippocrates used three; (see *Fab. ab Aquapendente, Wiseman, Scultetus, Hildanus, Petit, Duverney;*) Celsus six; but the present people seldom use more than one. By such kind of bandage three intentions are aimed at, and said to be accomplished, viz. to confine the fracture, to repress or prevent a flux of humours, and to regulate the callus, (see *Duverney:*) but whoever will reflect seriously on this matter, will soon be convinced, that although some sort of bandage is necessary in every simple fracture, as well for preserving some degree of steadiness to the limb, as for the retention of the applications, yet none, nor either of these three ends can be answered merely, or even principally, by bandage of any kind whatever: and, therefore, if this should be found to be true, that is, if it should appear, that whatever kind of deligation be made use of, it cannot be a principal, but only an accessory kind of assistance, and that in a small degree and very little to be depended upon, it will follow that such kind of bandage as is most difficult to be applied with justness and exactitude, such as is soonest relaxed and out of order, such as stands most frequently in need of renewal, and, in such renewal, is most likely to give pain and trouble, must be more improper and less eligible, than one which is more easily applied, less liable to be out of order, and which can be adjusted without moving the limb.

"The ancient method of applying the roller, in case of simple fracture of the leg or thigh, was to make (see *Fab. ab Aquapendente, and Wiseman,*) four or five turns round the fracture first, and then to continue the bandage upward and downward, until the whole limb was enveloped properly. This was done in this manner with a double view; to keep the broken ends of the bone in their place, and to prevent the influx of humour. Modern practitioners, although they have the same ends in view, generally begin their bandage from the inferior extremity of the limb, and continue it up to the top. Whether the old or the later method be followed, whether one or more rollers be made use of, the whole is executed while the limb is kept, by means of the assistants, in the same extended posture in which the coaptation was made, so that the whole bandage is finished before the leg is deposited on the pillow; in the doing of all which, if from the tired state of the surgeon, or either of his assistants, or if, from the awkwardness, or unhandiness of any of the parties concerned, the true and exact position of the limb be at all deviated from, the ends of the bone will again be in some degree displaced, and the bandage, instead of being of use, will become prejudicial, by pressing hard on the inequalities of the fracture: to which let me add, that the roller, especially when applied to a leg, if it be not put on with due dexterity, that is, if it does not sit perfectly smooth and even, is the most unequal and worst kind of bandage in use.

"These objections, however just, are not the least to which the roller in the case of simple fracture of the leg or thigh are liable; for, as I have already hinted, it must, in a very short space of time, even while the parts surrounding the fracture are in the most tender and most painful state, be renewed, and that more than once; which renewal cannot be executed without again taking the limb off from the pillow, again committing it to the hands of assistants, and again running a risk of displacing the fracture; all which, not to mention the repetition of pain to the patient every time such operation

is performed, and which must be at least every four or five days, are, (as I have already said) very material objections to the roller, even in the most judicious and dexterous hands, and still more so in those of the rude and ignorant.

"The prevention of a flux of humours to a broken limb by bandage, is a common phrase: but they who use it have either no idea at all annexed to it, or a very erroneous one.

"If by the points and edges of the broken bone, the muscles and membranes be unavoidably wounded and torn, or if the same kind of mischief be incurred by the inadvertence or indiscretion of the patient, or of those who assisted in getting him home, or from the violence used in extending the limb and setting the fracture, inflammation must be excited, and pain and tumefaction will be the consequence; and these will continue for some time in every fracture; but that space will be longer or shorter in different cases, and under different circumstances: evacuation, rest, and a favourable position of the limb, will, and do in general, remove all these complaints; but bandage can contribute nothing more than by keeping the applications in their proper place; so far from it, that if the bandage be a roller, it must, by the frequent necessity of its being adjusted, and the frequent motion of the limb, in some degree counteract the proper intention of cure.

"The old writers are, in general, very precise as to the number of days during which the roller should be suffered to remain without being shifted; and the number of times which such shifting should be repeated within the first fortnight. (See *Fab. ab Aquapendente.*) This exactitude is by no means necessary; but if the bandage be supposed to be of any use at all, it is obvious, that it ought to be renewed or adjusted as often as it may cease to perform the office for which it is designed, or whenever it shall be found to counteract such office; that is, as often as it shall become so slack as not to contain the fracture at all; or whenever the limb shall be so swollen, that the roller makes an improper degree of stricture; the former generally occurs every four or five days; the latter is most frequent within the first week.

"In most of the writers on the subject of fractures, we also find marks or signs laid down for our information concerning the due or undue effect of the bandage on the limb. They tell us, that when that part of it which is below the termination of the roller, does not swell at all, that the bandage is not sufficiently strict, and will not retain the fracture; that when the same part is considerably swollen, or tense, or inflamed, it implies, that the binding is too strait; and that a moderate degree of tumefaction is a sign that the deligation is properly executed. (See *Fabricius ab Aquapendente.*)

"In consequence of these precepts, many practitioners look more anxiously after this degree of tumefaction, than after the true and exact position of the limb; and cannot be induced to believe, that any thing can be wrong under this appearance; although, if they would for once assume the liberty of thinking for themselves, they might be convinced, that even this degree of swelling is wrong; that it implies some kind of obstruction to the circulation, and cannot serve any good purpose; and consequently, that as far as it may be supposed to be the effect of bandage, so far that bandage must be faulty.

"The third purpose for which the roller is said to be used, is the regulation and restraint of the callus.

"If we were to form our notion of callus by what the generality of writers have said on this subject, we should suppose, that it was not only a particular juice always ready for the purpose, but that, if not restrained and regulated by art, it would always flow in such quantity, as to create trouble and deformity; that there were specific remedies for increasing or decreasing it; and that it always required the hand and art of surgery to manage it. That the callus is so far a particular juice, as that it consists of whatever is destined to circulate through the bones for their particular nourishment, is beyond all doubt; and that this gelatinous kind of fluid is the medium by which fractures are united, is as true; but that it requires art to manage it, or that art is in general capable of managing and directing it, is by no means true. That this callus or uniting medium does oftentimes create tumefaction and deformity, or even lameness, is true also; but the fault in these cases does not lie in the mere redundance of such juice; it is derived from the na-

ture of the fracture, from the inequality of it when set, and from the unapt position of the broken ends with regard to each other; nor is surgery or the surgeon any otherwise blameable in this case, than as it was or was not originally in their power to have placed them better. It is the inequality of the fracture which makes both the real and apparent redundance of callus, and the tumefaction in the place of union. When a bone has been broken transversely, or nearly so, and its inequalities are therefore neither many nor great, when such broken parts have been happily and properly coaptated, and proper methods have been used to keep them constantly and steadily in such state of coaptation, the divided parts unite by the intervention of the circulating juice, just as the softer parts do, allowing a different space of time for different texture and consistence. When the union of a broken bone, under such circumstances, has been procured, the place where such union has been made will be very little perceptible, it will be no deformity, nor will it occasion any inconvenience. It will, indeed, be discoverable like a cicatrix of a wound in a softer part; but there will be no redundance of callus, because none will be wanted; neither will there be any necessity for any particular management on the part of the surgeon, to repress or keep it in order: but when a bone has been broken very obliquely or very unequally, when the parts of a fracture are so circumstanced as not to admit of exact coaptation, when such exact coaptation as the fracture perhaps would have admitted has not been judiciously made, when from unmanageableness, inadvertence, or spasm, the proper position of the limb has not been attended to or preserved, in all such cases there must be considerable inequality of surface; there must be risings on one side, and depressions on another; and in such cases the juices circulating through the bone, cannot accomplish the union in the same quantity, the same time, or in the same manner. The broken parts not being applied exactly to each other, there cannot be the same aptitude to unite; and according to the greater or lesser degree of exactitude in the coaptation, that is, according as the ends of the bones are, or have been, placed more or less even with regard to each other, will the inconvenience and the deformity be; and still most where the fracture is not set at all; but the broken ends of the bone unite laterally or by touching each other's sides. The reason of all this is so obvious, without having recourse to a particular specific juice under the name of callus, that it would be an insult upon the reader's understanding to explain it farther. The periosteum covering every fracture will remain thickened for some time, and a degree of fulness or rising will be thereby caused about the place where such fracture has been united; but time and the use of the muscles, soon in general remove this.

"In short, this doctrine of callus, considered as a particular kind of juice, and as being liable to great redundance, if not prevented by art, has not only misled many people, but has often been made use of as a cover to ignorance and neglect. When lameness and deformity have been the consequences of one or both these causes, more than of the nature and circumstances of a fracture, the callus has been found ready at hand to take the blame; and the ideal exuberance of this cement has often been urged as an excuse for real want of knowledge, or for gross neglect.

"The best and most useful bandage for a simple fracture of the leg or thigh, is what is commonly known by the name of the eighteen-tailed bandage, or rather one made on the same principle, but with a little difference in the disposition of the pieces. The common method is to make it so, that the parts which are to surround the limb make a right angle with that which runs lengthways under it; instead of which, if they are tacked on so as to make an acute angle, they will fold over each other in an oblique direction, and thereby sit more neatly and more securely, as the parts will thereby have more connexion with and more dependence on each other. In compound fractures, as they are called, every body sees and acknowledges the utility of this kind of bandage preferably to the roller, and for very obvious and convincing reasons, but particularly because it does not become necessary to lift up and disturb the limb every time it is dressed, or every time the bandage loosens.

"The pain attending motion in a compound fracture, the circumstance of the wound, and the greater degree of instability of parts thereby produced,

are certainly very good reasons for dressing such wound with a bandage, which does not render motion necessary; but I should be glad to know what can make it necessary, or right, or eligible, to move a limb in the case of simple fracture? what benefit can be proposed by it? what utility can be drawn from it? When a broken bone has been well set, and the limb well placed, what possible advantage can arise from moving it? surely none; but, on the contrary, pain and probable mischief. Is it not the one great intention to procure unition? Can moving the limb every two or three days contribute to such intention? must it not, on the contrary, obstruct and retard it? Is not perfect quietude as necessary toward the union of the bone, in a simple as in a compound fracture? It is true, that in the one there is a wound which requires to be dressed, and the motion of the limb may in general be attended with rather more pain than in the other; but does motion in the simple fracture give ease, or procure more expeditious union?

"Every benefit then which can be supposed to be obtained from the use of the common bandage or roller, is equally attainable from the use of that which I have just mentioned, with one additional, and to the patient, most invaluable advantage, viz. that of never finding it necessary to have his leg or thigh once, during the cure, removed from the pillow on which it has been properly deposited. In short, to quit reasoning and speak to fact, it is the constant practice at St. Bartholomew's and attended with all possible success. We always use the eighteen-tailed bandage; and never move the limb to renew or adjust it.

"The parts of the general apparatus for a simple fracture, which come next in order, are the splints.

"These are generally made of pasteboard, wood, or some resisting kind of stuff, and are ordered to be applied lengthways on the broken limb; in some cases three, in others four; for the more steady and quiet detention of the fracture.

"That splints, properly made and judiciously applied, are very serviceable, is beyond all doubt, but their utility depends much on their size and the manner in which they are applied.

"The true and proper use of splints, is, to preserve steadiness in the whole limb, without compressing the fracture at all. By the former they become very assistant to the curative intention; by the latter they are very capable of causing pain and other inconveniences; at the same time that they cannot, in the nature of things, contribute to the steadiness of the limb.

"In order to be of any real use at all, splints should, in the case of a broken leg, reach above the knee, and below the ankle; should be only two in number, and should be so guarded with tow, rag, or cotton, that they should press only on the joints, and not at all on the fracture.

"By this they become really serviceable; but a short splint, which extends only a little above and a little below the fracture, and does not take in the two joints, is an absurdity, and, what is worse, it is a mischievous absurdity.

"By pressing on both joints, they keep not only them, but the foot steady; by pressing on the fracture only, they cannot retain it in its place, if the foot be in the smallest degree displaced; but they may, and frequently do, occasion mischief, by rudely pressing the parts covering the fracture against the edges and inequalities of it.

"I suppose it will be said, that although short splints do not of themselves sustain and keep steady the two joints, and consequently the limb, yet that purpose in the broken leg may be and is fulfilled by junks, fanons, and other contrivances: to which I answer, that then the short splints are in that case of no use at all, and had better be laid aside; they should be used for no other purpose but that of keeping the limb steady; and if they do not answer that end, they are an incumbrance, and multiply the articles in the apparatus for a fractured leg, very unnecessarily.

"In the case of a fractured os femoris, if the limb be laid in an extended posture, one splint should certainly reach from the hip to the outer ankle, and another (somewhat shorter) should extend from the groin to the inner ankle. In the case of a broken tibia and fibula, there never can be occasion for more than two splints, one of which should extend from above the knee to below the ankle on one side, and the other splint should do the same on the other side. The manner of applying

them, if the limb be deposited in a state of flexion, will come under the next article.

"This, and indeed the most essential article in the treatment of a fracture, is, the position of the limb. Upon the judicious or the injudicious, the proper or improper execution of this, depends the ease of the patient during his confinement, and the free use and natural appearance of his limb afterward.

"If I meant to describe, or if I approved (pardon the phrase) the common method of placing the broken leg and thigh in a straight manner, this would be the place to mention the many very ingenious contrivances and pieces of machinery, which practitioners, both ancient and modern, have invented for the purpose of keeping the whole limb straight and steady, that is, of keeping all the muscles surrounding the fractured bone constantly upon the stretch, and at the same time, of preventing any inequality in the union of it, and any shortening of the limb, in consequence of such inequality.

"But as it is my intention by these sheets, to inculcate another, and, as it appears to me, a better disposition of the limb, in which such boxes, cradles, and pieces of machinery are not wanted, nor can be used, it is needless for me to say any thing about them.

"According to this plan, the fractured leg and thigh should be deposited on the pillow, in the very posture in which the extension was made, and the fracture set, that is, with the knee bent.

"I have already been so explicit, or perhaps prolix, on the tense and lax state of the muscles, as depending on posture, under the head of extension, that I shall spare the reader, as well as myself, a good deal of trouble by referring back to that article. All that is there urged, or that can be urged for making the extension, that is, for setting a fracture in such disposition of a limb or its muscles, is equally powerful and conclusive with regard to the manner of depositing and leaving it after it has been set. Whatever renders reduction and coaptation easy, must as necessarily maintain ease during the confinement, preserve rectitude of figure, and prevent displacement. The same principle must act on both occasions; and whether the doctrine be right or wrong, considered by itself, it must be equally so in both circumstances, that is, in the manner of setting a fracture, and in the manner of depositing the limb afterward. In the case of the fractured os humeri, the only position in which it can with any tolerable convenience to the patient be placed is, with the elbow bent, that very position which necessarily relaxes and removes all the resistance of the surrounding muscles. Daily experience evinces the utility of this, by our very seldom meeting with lameness or deformity after it, notwithstanding the prevailing apprehension of exuberant callus.

"The deformity frequently consequent to the fracture of the bones of the cubit, particularly that of the radius only, will generally, if not always, be found to be in proportion as the muscles concerned in the pronation and supination of the hand happen to be put more or less into a state of action or tension by the position of the limb.

"In the thigh, the case is still more obvious, as the muscles are more numerous and stronger.

"The straight posture puts the majority of them into action, by which action that part of the broken bone, which is next to the knee, is pulled upward, and by passing more or less underneath that part which is next to the hip, makes an inequality or rising in the broken part, and produces a shortness of the limb.

"In the fracture of both bones of the leg, the case is still the same: a straight position puts the muscles upon endeavouring to act; a moderate flexion of the knee relaxes them, and takes off such propensity.

"The disposition, therefore, of the broken cubit ought to be that which, by putting the hand into a middle state between pronation and supination, and by bending the fingers moderately, keeps the radius superior to the ulna; or, in other words, the palm of the hand should be applied to the breast, the thumb should be superior, the little finger inferior; and the hand should be kept in this posture constantly by means of two splints, which should reach from the joint of the elbow on each side, and should be extended below the fingers; or the same purpose may be still better answered by a simple neat contrivance of the very ingenious Mr. Gooch of Norfolk; of which he has given a draught, and which is

preferable to a common splint, by its admitting the fingers to be more easily bent.

"Extension will be made with more facility, and coaptation more happily executed; a patient will suffer a great deal less pain during these operations, as well as during the necessary confinement for a broken leg or thigh, and both patient and surgeon will be less likely to be disappointed in their intention and wish, that is, the former will be less liable to lameness or deformity, when a fractured thigh or leg has been treated in the way I have described, than in the common one.

"The resistance necessarily made by the muscles, joined to the great instability of parts in every species of fractured leg or thigh, except in the few where the bones are broken transversely, has constantly exercised the invention and ingenuity of practitioners, in devising means to prevent inequality in the callus as it is called, and shortness and deformity of the limb. Our books abound with draughts and descriptions of machines for this purpose; ligatures, pulleys, leaden weights and fracture-boxes, so constructed as to overcome and constantly to resist that action of the muscles surrounding the broken bone, that natural tendency in them to contract, which the extended position of the limb necessarily induces. Every body who has been conversant with matters of this sort knows, that even the best of these various contrivances often prove successless; and every one who will reflect ever so little, may see why they must be so. That they do prove ineffectual, the number of deformed legs and shortened thighs, which are daily met with, evinces; and that they must frequently prove so, will be obvious to every one, who will consider that the effect can last no longer than the cause is continued, unless there happens to be some very favourable circumstance in the fracture itself. What I mean is this; when the reduction of the fracture is set about, the limb is put into such position, that the surrounding muscles resist the extending force very considerably, and this in proportion to their strength and number: that force is continued and increased till the muscles give way, and the resistance being overcome, an opportunity is thereby obtained of placing the ends of the fracture in as apt position with regard to each other as the nature of it will admit. If the fracture be of the transverse kind, that is, if the ends of the broken bone be large, and afford a good deal of space for contact with each other, such apposition will contribute a good deal to the keeping the limb steady, and the fracture even; but if the fracture be of the oblique kind, if there be several loose pieces, and consequently neither large contact nor stability from the apposition, or if due extension has not been made, or could not, or if the ends of the bones have not been properly and judiciously set, the muscles will act as soon as the extension is relaxed, the fracture will be more or less displaced, according to the nature of it, the limb will be shortened, the time of union will be prolonged, and the place of it (the callus as it is called,) will be in proportion more or less unequal.

"I take it for granted that it will be asked, have not our ancestors in all times happily redressed fractured legs and thighs, by the method which they have delivered down to us, and which in the preceding pages I have taken the liberty to object to? have not such limbs frequently been rendered as straight, as useful, and as little deformed as possible? I answer, most certainly, yes; it is an undoubted truth, and cannot be denied. But in my turn, let me be permitted to ask, whether in the same method great and even unsurmountable difficulty is not frequently met with? whether in many cases the act of setting, as it is called, is not excessively painful at the time, and productive of inflammation and other disagreeable symptoms afterward? and whether, in spite of all care, of every contrivance, of every species of machinery which has yet been used, broken thighs and legs are not often, very often, left deformed, crooked, and shortened, and that merely from the action of the muscles, and the obliquity or shattered state of the fracture? The fact is notorious, and the sole question is, whether or no a different disposition of the parts, preventing such action and such resistance, will in many instances prevent these evils? To which, from repeated experience, I answer, yes. If this should be found to be the case in general, of which I make no doubt that it is; if by this method, many of such unfortunate cases, as in the common method of treatment disappoint both patient and surgeon,

should be found in general to succeed so well as to satisfy both, it will prove all I wish it to prove. Superior utility and more frequent success are all I contend for.

"Many people did very well under amputation before the double incision was practised; but is the double incision therefore no improvement? The operation for the bubonicele may be performed with that clumsy instrument the probe scissars, but is the bistoury therefore not preferable? A surgeon may cut off some ounces, or even pounds of flesh from a patient's backside, in order to cure a sinus, but is the cure by the simple division of that sinus therefore not easier or more expeditious? Neither of these can, I think, be proved, unless it can at the same time be proved, that pain is no evil, confinement not at all irksome, and that deformity and elegance of figure are synonymous terms.

"Let not the reader fancy that I would dare to amuse him with speculation, or merely specious reasoning on a subject like this. What I have said is from experience, repeated experience, both of myself and of others for a considerable length of time past, and on a great variety of subjects; from an experience which has perfectly satisfied me, and I think will every man who will make the trial fairly and candidly.—I do not pretend to say, that by these means every kind of broken bone will infallibly and certainly be brought to lie smooth, even, and of proper length; if I did, they who are versed in these things, would know that I said too much: but I will say, (what is sufficient for my purpose) that it will not only succeed in all those, in which the old method can ever be successful; but also in the majority of those in which it is not, nor in the nature of things can. In those fortunate cases, in which either method will do, the old one is fatiguing, inconvenient, and even sometimes offensive, from the supine and confined posture of the patient; whereas that which is here proposed, gives the patient much greater liberty of motion for every purpose either of choice or necessity; and in many of those cases, wherein the old method proves most frequently so far successless, as to leave the limb short, lame, or deformed; I say, in most of these, the proposed method will not be attended with these inconveniences.

"I have already said, that in most cases of broken thigh or leg, the method just described will be attended with great success; but there is one particular case in which its utility is still more conspicuous; a case which, according to the general manner of treating it, gives infinite pain and trouble both to the patient and surgeon, and very frequently ends in the lameness and disappointment of the former, and the disgrace and concern of the latter: I mean the fracture of the fibula attended with a dislocation of the tibia.

"Whoever will take a view of the leg of a skeleton, will see that although the fibula be a very small and slender bone, and very inconsiderable in strength, when compared with the tibia, yet the support of the lower joint of that limb (the ankle) depends so much on this slender bone, that without it the body would not be upheld, nor locomotion performed, without hazard of dislocation every moment. The lower extremity of this bone, which descends considerably below that end of the tibia, is by strong and inelastic ligaments firmly connected with the last named bone, and with the astragalus, or that bone of the tarsus which is principally concerned in forming the joint of the ankle. This lower extremity of the fibula has, in its posterior part, a superficial sulcus for the lodgment and passage of the tendons of the peronei muscles, which are here tied down by strong ligamentous capsulæ, and have their action so determined from this point or angle, that the smallest degree of variation from it, in consequence of external force, must necessarily have considerable effect on the motions they are designed to execute, and consequently distort the foot. Let it also be considered, that upon the due and natural state of the joint of the ankle, that is, upon the exact and proper disposition of the tibia and fibula, both with regard to each other and to the astragalus, depend the just disposition and proper action of several other muscles of the foot and toes; such as the gastrocnemii, the tibialis anticus, and posticus, the flexor pollicis longus, and the flexor digitorum pedis longus, as must appear demonstrably to any man who will first dissect, and then attentively consider these parts.

If the tibia and fibula be both broken, they are both generally displaced

in such manner, that the inferior extremity, or that connected with the foot, is drawn under that part of the fractured bone which is connected with the knee; making by this means a deformed, unequal tumefaction in the fractured part, and rendering the broken limb shorter than it ought to be, or than its fellow, And this is generally the case, let the fracture be in what part of the leg it may.

If the tibia only be broken, and no act of violence, indiscretion, or inadvertence be committed, either on the part of the patient or of those who conduct him, the limb most commonly preserves its figure and length; the same thing generally happens if the fibula only be broken, in any part of it between its upper extremity, and within two or three inches of its lower one.

"Two kinds of fracture there are, and only two that I can recollect (relative to the limbs) which do not admit of the bent position of the joints, I mean that of the processus olecranon at the elbow, and that of the patella; in these a straight position of the arm and leg is necessary; in the former to keep the fractured parts in contact till they are united, in the latter, to bring them as near to each other as may best serve the purpose of walking afterward.*

"With regard to the fracture of the patella, an opinion has long and generally prevailed, which seems to me to have no foundation in truth, or (when duly considered) even in probability; it is, that the great degree of stiffness in the joint of the knee, which is sometimes found to be the consequence of this kind of fracture, is owing to, or produced by, a quantity of callus falling into it from the edges of the broken bone: and that the nearer the broken pieces are brought to each other, the more likely such consequence is.

"Every part of this doctrine seems equally absurd. In the first place, the fractured bone is by no means capable of supplying such a quantity of callus as to produce this end, unless it may be supposed to run from it as solder from a plumber's ladle; in the second place, if this was the case, the most likely, and indeed the only probable way of preventing the deposition of such juice, must be by bringing the broken pieces into close contact; and in the third place, there is no authority from the appearance of such joints after death, (at least as far as my experience goes) to suppose this to be the case, or to countenance such opinion. The cause therefore of this rigidity, which is now and then found to attend the broken patella, must be sought for elsewhere, viz. in the long rest and confinement of the joint as a means used by many to procure exact union; in mischief done to the ligament, which is formed by the united tendons of the four extensor muscles of the leg, at the time of and by the fracture; and in the nature of the fracture itself, that is, the manner in which the bone shall happen to be broken.

"But, be all this as it may, the fact undoubtedly is, that they walk best after such accident, whose patella has been broken transversely, and that into two nearly equal fragments; whose confinement to the bed has been short,

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* "Although a straight position of the limb is necessary for the broken patella, yet this very position becomes so upon the same principle, as renders the bent posture most advantageous in the broken tibia and femur, viz. the relaxation of the muscles and tendons attached to the fractured bone.

"Whoever will for a moment attend to the disposition of the pieces in a patella, which has been broken transversely, will see how little necessary or useful the many contrivances of bandages, straps, compresses, buckles, buttons, &c. to be found in writers are, especially all that part of them which are applied to the inferior fragment.

"By the action of the united tendons of the extensores muscles of the leg, the superior fragment is pulled upward and separated from the inferior, but the latter remains nearly, if not absolutely, where it was before the accident; there is nothing to act upon it, and therefore it cannot, nor does it move.

"The extension of the leg puts the muscles attached to the upper part of the broken bone into a state of relaxation, and prevents their acting; and though a small compress just above this piece, with a moderate bandage may be useful toward retaining it, yet it is the position of the leg, which must keep the broken piece down, and effect the cure." *(Pott.)*

that is, no longer than while the inflammation lasted; whose knee, after such period, has been daily and moderately moved; and in whom the broken pieces are not brought into exact contact, but lie at some small distance from each other.

"I cannot take leave of this subject of simple fractures, without mentioning a circumstance relative to them, which although, when rightly understood, is of little or no importance, yet by being misunderstood, becomes frequently of considerable consequence.

"I mean, the use of the term, *rising end of a broken bone.*

"By the expression, any one unacquainted with these things would be inclined to think, that the prominent part of a broken bone rose, or was elevated from its natural place; and became, by such rising, superior to the other part or extremity of the fracture. This would certainly be the idea of an ignorant person, and as such would be of little consequence; but by the practice of many, who call themselves surgeons, it is as certainly their idea also, and this renders it a matter of great consequence. Many instances are producible, in which our conduct is in a great measure regulated by the language which we use. Having no ideas annexed to our words, leads us into absurdity and unintelligibility; but false ones influence us still more, and frequently produce very material errors.

"The fistula lachrymalis, the fistula in perinæo, and that in ano, are glaring proofs of this; and my present subject is full as much so: for upon the erroneous idea annexed to the term *rising end*, stands all the absurd practice of compress, bolster, and strict bandage, in the cases of simple fracture.

"The truth is, that there is really no *rising end* to a broken bone; I mean, when applied, as the term usually is, to the leg, thigh, and clavicle. There is indeed a superior or prominent end or part, and an inferior or depressed one, but the former of these is in its proper place, from which it cannot by art be moved; and the latter, which is not in its proper place, is very capable by art of being put into it.

"Perhaps this may to some appear a mere play of words, a nominal distinction, without a real difference; but when the influence, which a right, or wrong idea of this produces on practice, is attended to, the consequence will be obvious and serious.

When a collar-bone, os femoris, or tibia and fibula are broken, by the action of the muscles, by the motions of the patient, and by the mere weight of the inferior part of the arm, thigh, or leg, the fractured ends of such bones are displaced, and always displaced in such manner, that the inequality occasioned necessarily by such displacement, proceeds from the inferior end of the fractured bone being retracted or drawn under the superior: this produces a tumefaction or unequal rising, and the upper extremity of the fracture is therefore called the rising end of it. Now the man who regards this rising end as that part of the fracture which has by such rising got out of its place, and not as having accidentally become the prominent part merely by the insinuation or retraction of the other part underneath it, will go to work with bolster, compress and bandage, in order to bring and keep such end down; by which means he will give his patient considerable pain, and while he depends on such means alone, will most certainly be frustrated in his intention and expectation, the means not being adequate to the proposed end. But the man who looks on this in the true light, that is, who looks on the superior part as being in its proper place, and the inferior as being displaced by the weight of the limb, and the action of the muscles, will know, that by the mere position of such limb, he shall be able to remedy all the inconvenience and deformity, as far as they are by art capable of remedy, without the parade or the fatigue of useless apparatus.

"He will, for example, know that the prominent part of a broken clavicle, that part of it which is next to the sternum, is just where it should be; and that the inferior part, that which is connected with the scapula, is out of its place, by being drawn down by the weight of the arm; and therefore instead of loading, as is usual, the prominent part with quantities of compress, which never can do any service, he, by a proper elevation of the arm, will bring the lower end upward into contact with the other; and thereby, with very little trouble, easily accomplish what he never can do in any other manner, however operose.

"The same thing will happen from the same principles in the leg and thigh: a prominence, or a rising end, there always will be, but that rising end is never to be brought down by any pressure from compress or bandage; the fallen or inferior one must always be brought up to it by the proper position of the rest of the limb; this will always remove the inequality as far as it is removeable, and nothing else can.*"

COMPOUND FRACTURES.

"I use the term compound fracture, (says Mr. Pott) in the sense in which the English have always used it; that is to imply a broken bone complicated with a wound.

"In this kind of case the first object of consideration is, whether the preservation of the fractured limb can, with safety to the patient's life, be attempted; or, in other words, whether the probable chance of destruction, from the nature and circumstances of the accident, is not greater than it would be from the operation of amputation. Many things may occur to make this the case. The bone or bones being broken into many different pieces, and that for a considerable extent, as happens from broad wheels, or other heavy bodies of large surface, passing over or falling on such limbs; the skin, muscles, tendons, &c. being so torn, lacerated and destroyed, as to render gangrene and mortification the most probable and most immediate consequence; the extremities of the bones forming a joint being crushed, or as it were comminuted, and the ligaments connecting such bones being torn and spoiled, are, among others, sufficient reasons for proposing and for performing immediate amputation. Reasons, which (notwithstanding any thing that may have been said to the contrary) long and reiterated experience has approved, and which are vindicable upon every principle of humanity, or chirurgic knowledge.

"When a surgeon says, that a limb, which has just suffered a particular kind of compound fracture, ought rather to be immediately cut off, than that any attempt should be made for its preservation, he does not mean by so saying, that it is absolutely impossible for such limb to be preserved at all events; he is not to be supposed to mean so much in general, though sometimes even that will be obvious; all that he can truly and justly mean is, that from the experience of time it has been found, that the attempts to preserve limbs so circumstanced, have most frequently been frustrated by the death of the patients, in consequence of such injury; and that from the same experience it has been found, that the chance of death from amputation is by no means equal to that arising from such kind of fracture.

"Every man knows, that apparently desperate cases are sometimes cured; and that limbs so shattered and wounded, as to render amputation the only *probable* means for the preservation of life, are now and then saved. This is an uncontroverted fact, but a fact which proves very little against the common opinion; because every man of experience also knows, that such escapes are very rare, much too rare to admit of being made precedents, and that the majority of such attempts fail.

"This consideration relative to amputation is of the more importance, because it most frequently requires im-

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* "In a professed regular treatise on this subject, it would be right to take notice of what may be called the infortunia, or accidental evils, which sometimes accompany even simple fractures: such are, disease arising from injury done to the medullary membrane, within the bones, in bad habits: hemorrhage, or a species of spurious aneurism, from a wound of the interosseal artery, between the tibia and fibula, or of either of the carpal arteries: mischief from the fracture becoming accidentally the seat of the crisis of a fever: deficiency of callus, or the accident of the broken bone not uniting: the fractured limb becoming the seat of an erysipelas, terminating in a slough of the common membrane and periosteum: the gelatinous juice or callus, which should unite the fracture, being in so morbid a state, as to produce a kind of caries with exostosis, instead of its doing its proper duty, &c. Of all these there are examples, but they do not come within the plan which I prescribed to myself when I began these papers." *(Pott.)*

mediate determination; every minute of delay is, in many instances, to the patient's disadvantage; and a very short space of time indeed, frequently makes all the difference between probable safety and fatality. If these cases in general would admit of deliberation for two or three days, and during that time such circumstances might be expected to arise, as ought necessarily to determine the surgeon in his conduct, without adding to the patient's hazard, the difference would be considerable; the former would not seem to be so precipitate in his determination as he is frequently thought to be; and the latter, being more convinced of the necessity, would submit to it with less reluctance. But unhappily for both parties, this is seldom the case; and the first opportunity having been neglected or not embraced, we are very frequently denied another. Here therefore the whole exertion of a man's judgment is required, that he may neither rashly and unnecessarily deprive his patient of a limb, nor through a false tenderness and timidity, suffer him to perish, by endeavouring to preserve such limb. Some degree of address is also necessary upon such occasion, in order to convince the patient, that what seems to be determined upon hastily and with precipitation, will not safely admit of longer deliberation.

"The limb being thought capable of preservation, the next consideration is the reduction of the fracture. The ease or difficulty attending this, depends not only on the general nature of the case, but on the particular disposition of the bone with regard to the wound.

"If the bone be not protruded forth, the trouble of reducing, and of placing the fracture in a good position, will be much less than if the case be otherwise: and in the case of protrusion or thrusting forth of the bone or bones, the difficulty is always in proportion to the comparative size of the wound, through which such bone has passed. In a compound fracture of the leg or thigh, it is always the upper part of the broken bone which is thrust forth. If the fracture be of the transverse kind, and the wound large, a moderate degree of extension will in general easily reduce it; but if the fracture be oblique, and terminates, as it often does, in a long sharp point, this point very often makes its way through a wound no larger than just to permit such extension. In this case, the very placing the leg in a straight position, in order to make extension, obliges the wound or orifice to gird the bone tight, and makes all that part of it, which is out of such wound, press hard on the skin of the leg underneath it. In these circumstances, all attempts for reduction in this manner will be found to be impracticable; the more the leg is stretched out, the tighter the bone will be begirt by the wound, and the more it will press on the skin underneath.

"Upon this occasion, it is not very unusual to have recourse to the saw, and by that means to remove a portion of the protruded bone.

"I will not say that this is always or absolutely unnecessary or wrong, but it most certainly is frequently so. In some few instances, and in the case of extreme sharppointedness of the extremity of the bone, it may be, and undoubtedly is right: but in many instances, it is totally unnecessary.

"The two most proper means of overcoming this difficulty are, change of posture of the limb, and enlargement of the wound. In many cases the former of these, under proper conduct, will be found fully sufficient; and where it fails, the latter should always be made use of. Whoever will attend to the effect, which putting the leg or thigh (having a compound fracture and protruded bone) into a straight position always produces; that is, to the manner in which the wound in such position girds the bone, and to the increased difficulty of reduction thereby induced, and will then, by changing the posture of such limb from an extended one, to one moderately bent, observe the alteration thereby made, in both the just-mentioned circumstances, will be satisfied of the truth of what I have said, and of the much greater degree of ease and practicability of reduction in the bent, than in the extended position; that is, in the relaxed, than in the stretched state of the muscles. Reduction being found impracticable, either by extension or change of posture, the obvious and necessary remedy for this difficulty is enlargement of the wound. This to some practitioners, who have not seen much of this business, appears a disagreeable circumstance, and therefore they endeavour to avoid it; but their apprehensions are in general ground-

less and ill-founded : in enlarging the wound there is neither difficulty nor danger, it is the skin only which can require division, and in making such wound there can be no possible hazard. It is needless to say that the division should be such as to render reduction easy ; or to remind the practitioner, that such enlarged opening may serve very good future purposes, by making way for the extraction of fragments, and the discharge of matter, sloughs, &c.

" If the bone be broken into several pieces, and any of them be either totally separated, so as to lie loose in the wound, or if they be so loosened and detached as to render their union highly improbable, all such pieces ought to be taken away ; but they should be removed with all possible gentleness, without pain, violence or laceration, without the risk of hemorrhage, and with as little poking into the wound as possible. If the extremities of the bone be broken into sharp points, which points wound and irritate the surrounding parts, they must be removed also. But the whole of this part of the treatment of a compound fracture should be executed with great caution ; and the practitioner should remember, that if the parts surrounding the fracture be violated, that is, be torn, irritated, and so disturbed as to excite great pain, high inflammation, &c. it is exactly the same thing to the patient, and to the event of the case, whether such violence be the necessary consequence of the fracture, or of his unnecessary, and awkward manner of poking into, and disturbing the wound. The great objects of fear and apprehension in a compound fracture, (that is, in the first or early state of it) are, pain, irritation, and inflammation ; these are to be avoided, prevented, and appeased by all possible means, let every thing thing else be as it may ; and although certain things are always recited, as necessary to be done, such as removal of fragments of bone, of foreign bodies, &c. &c. &c. yet it is always to be understood, that such acts may be performed without prejudicial or great violence, and without adding at all to the risk or hazard necessarily incurred by the disease.

" Reduction of, or setting a compound fracture is the same as in the simple ; that is, the intention in both is the same, viz. by means of a proper degree of extension to obtain as apt a position of the ends of the fracture with regard to each other, as the nature of the case will admit, and thereby to produce as perfect and as speedy union as possible.

" To repeat in this place what has already been said under the head of extension, would be tedious and unnecessary. If the arguments there used for making extension, with the limb so moderately bent as to relax the muscles, and take off their power of resistance, have any force at all, they must have much more when applied to the present case : if it be allowed to be found very painful to extend, or to put or keep on the stretch, muscles which are not at all or but slightly wounded, and only liable in such extension to be pricked and irritated, it is self-evident that it must be much more so when the same parts are torn and wounded considerably ; when the ends of the fractured bone have made their way quite through them, divided the skin, and laid all open to the access of the air.

" Every consequence, which does, or may be supposed to flow from wound, pain, or irritation, in consequence of violence, must necessarily be much greater, when a lacerated wound, and that made by the bone, is added to the fracture ; not to mention the ills arising from extending or stretching out muscles already torn or half divided.

" One moment's reflection must be sufficient to convince any reasonable man : but experience is the only proper test of all these kind of things. Let this method of treatment, then, be fairly and properly subjected to it ; and if the great advantage of the one over the other does not appear, that is, if the less sensation of pain by the patient, and the more happy, more perfect, and more expeditious accomplishment of his purpose by the surgeon, do not determine greatly in favour of relaxed position, I am, and have for a considerable length of time, been greatly mistaken.

" The wound dilated, (if necessary) loose pieces removed, (if there were any) and the fracture reduced, and placed in the best possible position, the next thing to be done is to apply a dressing.

" On this subject a great deal has been said by writers, particularly by such of them as have implicit faith in external applications ; but, in order to

be able to execute this part of the process properly, a man has only to ask himself, What are the intentions which, by any kind of dressing to a compound fracture, he means to aim at the accomplishment of? And a rational answer to this will give him all that he can want to know.

" The dressing necessary in a compound fracture is of two kinds, viz. that for the wound, and that for the limb. By the former, we mean to maintain a proper opening for the easy and free discharge of gleets, sloughs, matter, extraneous bodies, or fragments of bone, and this in such manner, and by such means, as shall give the least possible pain or fatigue, shall neither irritate by its qualities, nor oppress by its quantity, nor by any means contribute to the detention or lodgment of what ought to be discharged. By the latter, our aim should be the prevention or removal of inflammation, in order, if the habit be good, and all other circumstances fortunate, that the wound may be healed, by what the surgeons call the first intention, that is, without suppuration or abscess; or, that not being practicable, that gangrene and mortification, or even very large suppuration may be prevented, and such a moderate and kindly degree of it established as may best serve the purpose of a cure. The first, therefore, or the dressing for the wound, can consist of nothing better, or indeed so good, as soft dry lint, laid on so lightly as just to absorb the sanies, but neither to distend the wound, or be the smallest impediment or obstruction to the discharge of matter. This lint should be kept clear of the edges, and the whole of it should be covered with a pledget spread with a soft easy digestive. The times of dressing must be determined by the nature of the case; if the discharge be small or moderate, once in twenty-four hours will be sufficient; but if it be large, more frequent dressing will be necessary, as well to prevent offence, as to remedy the inconveniences arising from a great discharge of an irritating sharp sanies.

" The method of treating the limb, with a view to the prevention of such accidents and symptoms, as pain, inflammation, and laceration of parts are likely to produce, is different with different practitioners; some using from the very first, relaxing, greasy applications; others applying medicines of very different nature. Both these may be right conditionally, that is, according to different circumstances in the case, but they cannot be equally so in the same circumstances.

" Many practitioners are accustomed to envelope compound fractures in a soft, warm, relaxing cataplasm from the very first; whether the limb be in a tense swollen state, or not. This, if I may take the liberty of saying so, appears to me to be injudicious. When from neglect, from length of time passed without assistance, from misconduct or drunkenness in the patient, from awkwardness and unhandiness in the assistants, or from any other cause, a tension has taken possession of the limb, and it is become tumid, swollen and painful, a warm cataplasm is certainly the best and most proper application that can be made, and that for very obvious reasons; the state of the parts under these circumstances is such, that immediate union is impossible, and nothing but a free and plentiful suppuration can dissipate or remove impending mischief: every thing therefore which can tend toward relaxing the tense, swollen, and irritable state of the parts concerned, must necessarily be right; the one thing aimed at, (plentiful suppuration) cannot be accomplished without it. But when the parts are not in this state, the intention seems to be very different. To relax swollen parts, and to appease pain and irritation by such relaxation, is one thing; to prevent inflammatory defluxion and tumefaction, is certainly another; and they ought to be aimed at by very different means. In the former, a large suppuration is a necessary circumstance of relief, and the great means of cure; in the latter it is not, and a very moderate degree of it is all that is required. The warm cataplasm therefore, although it be the best application that can be made use of in the one case, is certainly not so proper in other, as applications of a more discutient kind, such as mixtures of spirit. vini, vinegar and water, with crude sal ammoniac, spirit. mindereri, acet. litharg. and medicines of this class, in whatever form the surgeon may choose. By these, in good habits, in fortunately circumstanced cases, and

with the assistance of what should never be neglected,* (I mean phlebotomy, and the general antiphlogistic regimen,) inflammation may sometimes be kept off, and a cure accomplished, without large collections or discharges of matter, or that considerable degree of suppuration, which, though necessary in some cases, and almost unavoidable in others, are and must be rather promoted, and encouraged, than retarded, or prevented, by warm relaxing applications of the poultice kind.

"Compound fractures in general require to be dressed every day; and the wounded parts not admitting the smallest degree of motion without great pain, perfect quietude becomes as necessary as frequent dressing.

"The common bandage therefore (the roller) has always in this case been laid aside, and what is called the eighteen-tailed bandage substituted, very judiciously, in its place. Of this I have already spoken so largely, as to make repetition unnecessary.

"Splints, that is, such short ones as are most commonly made use of in simple fractures, are by all forbid in the compound, and that for the same reason which ought to have prevented them from having ever been used in the former, viz. because the probable good to be derived from them can be but little; and the probable mischief is obvious and considerable.

"But although short splints are for many reasons palpably improper, in both cases, yet those of proper length, those which reach from joint to joint, comprehend them both, and are applied on each side of the leg only, are very useful both in the simple and in the compound fracture, as they may, thus applied, be made to keep the limb more constantly steady and quiet, than it can be kept without them.

"With regard to position of the limb, I have already been so explicit, when speaking of the simple fracture, that to say any thing more about it here would be an abuse of the reader's time and patience. The only, or the material difference between a simple and a compound fracture, as far as relates to this part of the treatment, is, that as the parts surrounding the broken bone in the latter are more injured, and consequently more liable to irritation, pain, inflammation, and all their consequences, therefore every method and means, by which the alleviation of such symptoms, and the prevention of such consequences can be obtained, is still more necessary and requisite. Among these, the posture of the limb is so principal a circumstance, that without its concurrence every other will be fruitless. The points to be aimed at are, the even position of the broken parts of the bone, and such disposition of the muscles surrounding them, as is most suitable to their wounded, lacerated state, as shall be least likely to irritate them, by keeping them on the stretch, or to produce high inflammation, and at best large suppuration. These, I say, are the ends to be pursued; and how much the position of the limb does, and must necessarily contribute to the advantage, or disadvantage just recited, must be so obvious to any body capable of reflection, that nothing more need be said about it.

"At the beginning of these sheets, I have said, that it was not my intention to write a regular treatise, but only to throw out a few hints which I hoped might prove useful to such as have not yet received better information. The part of my subject at which I am now arrived, does not indeed admit of much more: a few general precepts are all which a writer can give; the particular method of conducting each particular case must be determined by the nature of that case, and by the judgment of the surgeon.

"Every body knows, or ought to know, that these cases, of all others, require at first the most rigid observance of the antiphlogistic regimen; that pain is to be appeased, and rest obtained, by anodynes; that inflammation is to be prevented or removed, by free and frequent bleeding, by keeping the body open, and by the administration of such medicines as are best known to serve such purposes.—And that, during this first state or stage, the treatment of the limb must be calculated, either for the prevention of inflammatory tumefaction, by such applications as are in general known by the title of discutients; or, such tumour and tension having already taken possession of the limb, that warm fomentation, and relaxing and emollient medicines are required.

* Bleeding is now not frequently practised, except on very plethoric persons, and out of large cities.

"If these, according to the particular exigence of the case, prove successful, the consequence is, either a quiet easy wound, which suppurates very moderately, and gives little or no trouble; or a wound, attended at first with considerable inflammation, and that producing large suppuration, with great discharge, and troublesome formation and lodgment of matter. If, on the other hand, our attempts do not succeed, the consequence is gangrene and mortification.

"These are the three general events or terminations of a compound fracture, and according to these must the surgeon's conduct be regulated.

"In the first instance, he has indeed nothing to do but to avoid doing mischief, either by his manner of dressing, or by disturbing the limb. Nature let alone, will accomplish her own purpose; and art has little more to do than to preserve the due position of the limb, and to take care, that the dressing applied to the wound proves no impediment.

"In the second stage, that of formation and lodgment of matter, in consequence of large suppuration, all a surgeon's judgment will sometimes be required in the treatment both of the patient and his injured limb. Enlargement of the present wound, for the more convenient discharge of matter*; new or counter-openings for the same purpose, or for the extraction of fragments of broken or exfoliated bone, will very frequently be found necessary, and must be executed. In the doing this, care must be taken, that what is requisite be done, and no more; and that such requisite operations be performed with as little disturbance and pain as possible; the manner of doing business of this kind, will make a very material difference in the sufferings of the patient.

"Very contrary, or at least very different intentions, seem to me to require the surgeon's very particular attention in the two parts of this stage of the disease.

"Previous to large suppuration, or considerable collections and lodgments of matter, tumefaction, induration, and high inflammation, attended with pain, irritation, and fever, require evacuation by phlebotomy, an open belly, and antiphlogistic remedies, as well as the free use of anodynes, and such applications to the limb as may most serve the purpose of relaxation. But the matter having been formed and let out, and the pain, fever, &c. which were symptomatic thereof, having disappeared, or ceased, the use and purpose of such medicines and such applications cease also, and they ought therefore to be discontinued. By evacuation, &c. the patient's strength has necessarily (and indeed properly) been reduced; by cataplasm, &c. the parts have been so relaxed as to procure an abatement or cessation of inflammation, a subsidence of tumefaction, and the establishment of a free suppuration; but these ends once fairly and fully answered, another intention arises, which regards the safety and well-doing of the patient, nearly, if not full as much as the former; which intention will be necessarily frustrated by pursuing the method hitherto followed. The patient now will require refection and support, as much as he before stood in need of reduction; and the limb, whose indurated and inflamed state hitherto required the emollient and relaxing poultice, will now be hurt by such kind of application, and stand in need of such as are endued with contrary qualities, or, at least, such as shall not continue to relax. Good light, easily digested nutriment, and the Peruvian bark, will best answer the purpose of internals; the discontinuation of the cataplasms, and the application of medicines of the corroborating kind, are

* "It is a practice with some, from a timidity in using a knife, to make use of bolsters and plaster-compresses for the discharge of lodging matter. Where another, or a counter opening can conveniently and safely be made, it is always preferable, the compress sometimes acting diametrically opposite to the intention with which it is applied, and contributing to the lodgment by confining the matter; beside which, it requires a greater degree of pressure to make it efficacious, than a limb in such circumstances generally can bear."

as necessary with regard to externals.*

"In short, if there be any rationale in the use of the cataplasm in the first stage, its impropriety in the second, must be evident from the same principles. So also with regard to evacuation and the antiphlogistic regimen, when all the good proposed to be obtained by them has been received, a pursuit of the same method must become injurious, and that for the same reason why it was before necessary and beneficial.

"A non-attention to this has, I believe, been not unfrequently the cause of the loss both of limbs and lives.

"Every body who is acquainted with surgery knows, that in the case of bad compound fracture, attended with large suppuration, it sometimes happens, even under the best and most judicious treatment, that the discharge becomes too great for the patient to sustain; and that, after all the fatigue, pain, and discipline, which he has undergone, it becomes necessary to compound for life by the loss of the limb.† This, I say, does sometimes happen under the best and most rational treatment; but I am convinced that it also is now and then the consequence of pursuing the reducing, the antiphlogistic, and the relaxing plan too far. I would therefore take the liberty seriously to advise the young practitioner, to attend diligently to his patient's pulse and general state, as well as to that of his fractured limb and wound; and when he finds all febrile complaint at an end and all inflammatory tumour and hardness gone, and his patient is rather languid than feverish, that his pulse is rather weak and low than hard and full, that his appetite begins to fail, and that he is inclined to sweat, or purge, without assignable cause, and this in consequence of a large discharge of matter from a limb which has suffered great inflammation, but which is now become rather soft and flabby, than hard and tumid; that he will in such circumstances set about the support of his patient, and the strengthening of the diseased limb *totis viribus*; in which I am from experience satisfied, he may often be successful, where it may not be generally expected that he would. At least, he will have the satisfaction of having made a rational attempt; and if he is obliged at last to have recourse to amputation, he will perform it, and his patient will submit to it, with less reluctance, than if no such trial had been made.

"I have said that a compound fracture either unites and heals, as it were, by the first intention, which is the case of some of the lucky few, (and was my own‡;) or it is attended with high inflammation, multiplied abscesses, and large suppuration, demanding all a surgeon's attention and skill, and even then sometimes ending in the loss of life, or limb, or both; or, that all our attempts prove fruitless from the first, and gangrene and mortification are the inevitable consequence of the accident.

"The two first I have already spoken to, the last only remains.

"Gangrene and mortification are sometimes the inevitable consequences of the mischief done to the limb at the time that the limb is broken; or they are the consequences of the laceration of parts made by the mere protrusion of the said bone.

"They are also sometimes the effect of improper or negligent treatment; of great violence used in making extension; of irritation of the wounded parts, by poking after, or in removing fragments or splinters of bone; of painful dressings; of improper dispo-

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* "It is surprising how large and how disagreeable a discharge will be made for a considerable length of time, in some instances, from the detention and irritation of a splinter of bone. If therefore such discharge be made, and there be neither sinus nor lodgment to account for it, and all other circumstances are favourable, examination should always be made, in order to know whether such cause does not exist, and if it does, it must be gently and carefully removed."

† "There is one circumstance relative to compound fractures, which perhaps may be deemed worth noting; which is, that I do not remember ever to have seen it necessary to amputate a limb for a compound fracture, on account of the too great discharge, in which the fracture had been united. In all those cases, where the operation has been found necessary on account of the drain, the fracture has always been perfectly loose and disunited." (*Pott.*)

‡ Mr. Pott met with a compound fracture himself.

sition of the limb, and of the neglect of phlebotomy, anodynes, evacuation, &c. Any, or all these, are capable either of inducing such a state of inflammation as shall end in a gangrene, or of permitting the inflammation, necessarily attendant upon such accident, to terminate in the same event.

"When such accident or such disease, is the mere consequence of the injury done to the limb, either at the time of, or by the fracture, it generally makes its appearance very early; in which case also, its progress is generally too rapid for art to check. For these reasons, when the mischief seems to be of such nature as that gangrene and mortification are most likely to ensue, no time can be spared, and the impending mischief must either be submitted to or prevented by early amputation. I have already said, that a very few hours make all the difference between probable safety and destruction. If we wait till the disease has taken possession of the limb, even in the smallest degree, the operation will serve no purpose, but that of accelerating the patient's death. If we wait for an apparent alteration in the part, we shall have waited until all opportunity of being really serviceable is past. The disease takes possession of the cellular membrane surrounding the large blood-vessels and nerves, sometime before it makes any appearance in the integuments; and will always be found to extend much higher in the former part, than its appearance in the latter seems to indicate. I have more than once seen the experiment made of amputating, after a gangrene has been begun, but I never saw it succeed; it has always hastened the patient's destruction.

"As far therefore as my experience will enable me to judge, or as I may from thence be permitted to dictate, I would advise that such attempt should never be made; but, the first opportunity having been neglected, or not embraced, all the power of the chirurgic art is to be employed in assisting nature to separate the diseased part from the sound; an attempt which now and then, under particular circumstances, has proved successful, but which is so rarely so, as not to be much depended upon.

"If the parts are so bruised and torn, that the circulation through them is rendered impracticable, or if the gangrene is the immediate effect of such mischief, the consequence of omitting amputation, and of attempting to save the limb is, as I have already observed, most frequently very early destruction: but, if the gangrenous mischief be not merely and immediately the effect of the wounded state of the parts, but of high inflammation, badness of general habit, improper disposition of the limb, &c. it is sometimes in our power so to alleviate, correct, and alter these causes, as to obtain a truce with the disease, and a separation of the unsound parts from the sound. The means whereby to accomplish this end must, in the nature of things, be varied according to the producing causes or circumstances: the sanguine and bilious must be lowered and emptied; the weak and debilitated must be assisted by such medicines as will add force to the *vis vitæ*; and errors in the treatment of the wound or fracture must be corrected; but it is evident to common sense, that for these there is no possibility of prescribing any other than very general rules indeed. The nature and circumstances of each individual case must determine the practitioner's conduct.

"In general, inflammation will require phlebotomy and an open belly, together with the neutral antiphlogistic medicines; pain and irritation will stand in need of anodynes, and the Peruvian bark, joined in some cases, and at some times, with those of the cooling kind, at others with the cordial, will be found necessary and useful. So also tension and induration will point out the use of fomentation and warm relaxing cataplasms, and the most soft and lenient treatment and dressing. But there are two parts of the treatment of this kind of case mentioned by the generality of writers, which I cannot think of as they seem to have done. One is, the use of stimulating antiseptic applications to the wound; the other is what is commonly called scarification of the limb. [Let it be remarked, that I speak of both these, as prescribed and practised while the gangrene is forming, as it were, and the parts are by no means mortified.] While the inflammatory tension subsists, alleviation of pain, and relaxation of the wounded and swollen parts, in order to obtain a suppuration, and consequently a separation, seem to constitute the intention, which ought

to be pursued upon the most rational principles: warm irritating tinctures of myrrh, aloes, and euphorbium; mixtures of tinct. myrrh. with mel. Ægyptiac. and such kind of medicines, which are found to be frequently ordered, and indeed are frequently used, particularly in compound fractures produced by gun-shot, seem to me to be very opposite to such intention, and very little likely to produce or to contribute to the one thing which ought to be aimed at, I mean the establishment of a kindly suppuration. I know what is said, in answer to this, viz. that such kind of stimulus assists nature in throwing off the diseased parts: but this is a kind of language, which I believe will be found upon examination to have been first used without any sufficient or good ground, and to have been echoed ever since upon trust. It had its foundation in the opinion that gun-shot wounds were poisonous, and that the mortification in them was the effect of fire; and it has been continued ever since, to the great detriment of many a sufferer. A gun-shot wound, whether with or without fracture, is a wound accompanied with the highest degree of contusion, and with some degree of laceration; and every greatly contused and lacerated wound requires the same kind of treatment which a gun-shot wound does, as far as regards the soft parts. The intention in both ought to be to appease pain, irritation, and inflammation; to relax the indurated, and to unload the swollen parts; and by such means to procure a kindly suppuration; the consequence of which must be, a separation of the diseased parts from the sound. Now, whether this is likely to be best and soonest accomplished by such dressings and such applications as heat and stimulate, and render the parts to which they are applied crisp and rigid, may fairly be left to common sense to determine.

"Scarification, in the manner, and at the time, in which it is generally ordered and performed, has never appeared to me to have served any one good purpose. When the parts are really mortified, incisions made of sufficient depth will give discharge to a quantity of acrid and offensive ichor; will let out the confined air, which is the effect of putrefaction; and thereby will contribute to unloading the whole limb; and they will also make way for the application of proper dressings. But while a gangrene is impending, that is, while the parts are in the highest state of inflammation, what the benefit can be which is supposed or expected to proceed from scratching the surface of the skin with a lancet, I never could imagine; nor, though I have often seen it practised, do I remember ever to have seen any real benefit from it. If the skin be still sound, and of quick sensation, the scratching it in this superficial manner is painful, and adds to the inflamed state of it; if it be not sound, but quite altered, such superficial incision can do no possible service; both the sanies and the imprisoned air, are beneath the membrana adiposa; and merely scratching the skin in the superficial manner, in which it is generally done, will not reach to, or discharge either.

"From what has been said, it will appear, that there are three points of time, or three stages of a bad compound fracture, in which amputation of the limb may be necessary and right; and these three points of time are so limited, that a good deal of the hazard or safety of the operation depends on the observance or non-observance of them.

"The first is immediately after the accident, before inflammation has taken possession of the parts. If this opportunity be neglected or not embraced, the consequence is either a gangrene or a large suppuration, with formation and lodgment of matter. If the former of these be the case, the operation ought never to be thought of, till there is a perfect and absolute separation of the mortified parts. If the latter, no man can possibly propose the removal of a limb, until it be found, by sufficient trial, that there is no prospect of obtaining a cure without; and that, by not performing the operation, the patient's strength and life will be exhausted by the discharge. When this becomes the hazard, the sooner amputation is performed the better. In the first instance, the operation ought to take place before inflammatory mischief is incurred; in the second, we are to wait for a kind of crisis of such inflammation; in the third, the proportional strength and state of the patient, compared with the discharge and state of the fracture, must form our determination."

(*Pott's Remarks on Fractures.*)

PARTICULAR FRACTURES.

Fractures of the Ossa Nasi.

These bones, from their situation, are much exposed to fractures. The fragments are sometimes not deranged; but, most frequently, they are depressed. In order to replace them, the surgeon must pass a female catheter, a ring-handled forceps, or any such instrument, into the nostrils, and, using it as a lever, push the fragments outwards; while, with the index finger of the left hand, he prevents them from being pushed out too far. When the fragments are inclined to fall inwards again, authors advise supporting them with an elastic gum cannula, or lint, introduced into the nostril.

Fractures of the ossa nasi are sometimes attended with very dangerous symptoms; which may depend, either on the concussion of the brain, produced by the blow, which caused the fracture; or, on the cribriform lamella and the crista galli of the os ethmoides being driven inwards, so as to injure and compress the brain.

When the symptoms of pressure on this viscus exist, (see *Head, Injuries of*) and the ossa nasi are much depressed, the surgeon must immediately raise them, together with the perpendicular process of the os ethmoides, which is connected with the cribriform lamella and crista galli. Perhaps, a pair of closed common forceps introduced into the nostrils, might best enable the surgeon to do what is necessary. In all cases, in which the ossa nasi are broken, bleeding and the antiphlogistic treatment are proper; for the vicinity of the eye renders it very liable afterwards to become inflamed; and when there are symptoms of the brain being also injured, the necessity of such practice is still more strongly indicated.

Fractures of the Lower Jaw.

This bone is sometimes fractured near the chin; but, seldom so as to produce a division of the symphysis of that part, though this is not impossible. In other instances, the fractures occur near the angles of the jaw. The bone may also be broken in two places at the same time; in which event, the middle portion is extremely difficult to keep right, because many of the muscles, which draw the lower jaw downwards, are attached to that part.

The condyles and coronoid processes are also sometimes broken; the former the most frequently.

Fractures of the lower jaw may be either perpendicular to its basis, oblique, or longitudinal: of this latter, examples have been known, in which a portion of the alveolar part, with the teeth in it, was detached from the rest of the bone.

In the present cases, the soft parts are commonly contused and wounded. J. L. Petit mentions a case, in which the bone was broken, and the coronoid process quite denuded, by the kick of a horse.

Fractures of the lower jaw are deranged in the following way. When the fracture is near the symphysis, the side on which the processus innominatus is situated, is drawn downward and backward by the sub-maxillary muscles, while the other fragment is supported by the muscles which close the jaw. When the fracture is more backward, the derangement occurs in the same way, but not so easily. When the bone is fractured in two places, the middle portion is always pulled downward and backward by the muscles attached to the chin, while the two lateral pieces are kept up by the levator muscles. When the ramus of the jaw is broken, the masseter, being attached to both pieces, prevents much derangement. When the neck of the condyle is fractured, the pterygoideus externus may pull the condyle forward.

When a blow is received on the lower jaw, or the bone is injured by a fall, or by the pressure of some heavy body; when an acute pain is experienced in the part, and an inequality may be felt at the basis of the bone; when some of the teeth, corresponding to that inequality, are lower than the others; and when a crepitus is perceptible on moving the two pieces of the jaw on each other; there can be no doubt of a fracture. When the gums are lacerated, or the bone denuded by a wound, the case is, (if possible) still more manifest.

Fractures of the rami and condyles, though not so easily distinguishable, may be known by the great pain felt near the ear; particularly when the jaw is moved, and the crepitus, which the surgeon may discover with his fingers.

Fractures of the lower jaw, whether simple, or double, are easily set, by pushing the deranged part upward, and

a little forward, and then pressing on the basis of the bone, so as to bring it exactly on a level with the portion, which has preserved its natural position. The maintenance of the reduction, however, is difficult; and can only be well executed by supporting the lower jaw, and keeping it applied to the upper one.

As soon as the fracture is set, the surgeon should adapt some thick pasteboard, previously wet and softened with vinegar, to the outside of the jaw, both along its side and under its basis. Over this moistened pasteboard, a bandage with four tails is to be applied, the centre being placed on the patient's chin, while the two posterior tails are to be pinned to the front part of a nightcap, and the two anterior ones fastened to a part of the same cap more backward. When the pasteboard becomes dry, it forms the most convenient apparatus imaginable for incasing and supporting the fracture. A piece of soap-plaster may now be applied to the skin underneath, which will prevent any ill effects of the hardness and pressure of the pasteboard.

Until the bone has become united with some firmness, the patient should be allowed only such food as does not require being masticated, which may be given by introducing a small spoon between the teeth a little separated. Indeed, he should be recommended to live principally on broths, soups, jellies, &c.

To keep the middle portion of the bone from being drawn downward, and backward, toward the larynx, it is frequently necessary to apply tolerably thick compresses just under and behind the chin; which are to be well supported by the bandages already desbribed.

I need hardly state the necessity of enjoining the patient to avoid talking, or moving the jaw in any manner whatever.

When the condyle is fractured, as it is incessantly drawn forward by the action of the pterygoideus externus; and, on account of its deep situation, cannot be pressed back, the lower portion must, if possible, be pushed into contact with it. For this purpose, the bandage must be made to operate particularly on the angle of the jaw, where a thick compress should be placed.

Compound fractures of the lower jaw, are to be treated on the same principles, as such injuries of the bone. The external wound should, if possible, be healed by the first intention; and, when this attempt fails, care must be taken to keep the wound clean by changing the dressings about once in three days: oftener would disturb the fracture too much. It is observed, that compound fractures of the jaw, and even simple ones, which are followed by abscesses, are particularly liable to be followed by troublesome and tedious exfoliations.

In very bad fractures, in which all motion of the jaw must have the most pernicious effect, it might even be prudent to administer every kind of nourishment in a fluid form, through a hollow bougie, introduced from one of the nostrils down the œsophagus.

Fractures of the Vertebræ.

The shortness and thickness of these bones do not render them very apt to be broken. The spinous processes, which project backwards, are the most exposed to such an injury; for they are the weakest, and most superficially situated. The violence, which is great enough to break the vertebræ, must produce a greater, or less concussion, or other mischief, of the spinal marrow; from which accident much more perilous consequences are to be apprehended, than from the injury of the bones, abstractedly considered. The displaced pieces of bone may press on the spinal marrow, or even wound it, so as to occasion a paralytic affection of all the parts, which derive their nerves from the continuation of this substance below the fracture.

As the mere concussion of the spine may occasion symptoms, which very much resemble those, which usually occur when the vertebræ are fractured, the diagnosis is certainly very obscure. Perhaps, an inequality in the line of the spinous processes might be observed. The lower extremities, and the rectum, and bladder, are generally paralytic; the patient is afflicted with retention of urine and fæces, or with an involuntary discharge of the latter.—(*Boyer.*)

Fractures of the spinous processes, without any other serious mischief, are not dangerous; and are the only instances of fractures of the vertebræ, which admit of being ascertained with certainty.

Any attempt to set fractures of the bodies of the vertebræ, even were they known to exist, would be both useless

and dangerous. General treatment can alone be employed. Cupping will tend to prevent inflammation in the situation of the injury. When the patient is affected with a flatulent distention of the abdomen, vomiting, hiccough, &c. the belly may be rubbed with a camphorated liniment, and purgative clysters, and anti-spasmodics, given. If requisite, the urine must, be drawn off with a catheter. The removal of the paralysis of the bladder rectum, and lower extremities, if it should be inclined to take place, ought to be promoted by rubbing the back, loins, sacrum, and the limbs, with liniments containing the tinct. canthar. (*Boyer.*)

Some authors recommend trepanning, or cutting out a portion of the fractured bone, when the compression of the spinal marrow, or its injury by a splinter, is suspected; but, exclusively of the difficulty of that operation, on account of the great depth of the intervening soft parts, the indication is never sufficiently evident to authorize it. (*Boyer.*)

A fracture of the upper cervical vertebræ, or of the processus dentatus, is always suddenly fatal. In such cases, the paralysis of the diaphragm, immediately produced, affords ample cause for instantaneous death.

Fractures of the Sternum.

When these accidents occur, the fractured portions may be driven inward so as to wound the pericardium, heart, or lungs; and a considerable quantity of blood may be extravasated from ruptured vessels, and collect in the anterior mediastinum. Such an effusion, however, does not cause symptoms so urgent as those, which blood extravasated beneath the cranium produces.

Fractures of the sternum, when mere solutions of continuity, only require common treatment, viz. a piece of soap-plaster to the situation of the injury, a roller round the chest, quietude, and, in particular, bleeding, with a view of preventing, what may be considered as the most dangerous consequence, inflammation of the parts within the chest.

In cases, attended with great depression of the fractured bone inward, the necessary incisions should be made for raising with an elevator the portions of bone driven inward, or extracting with forceps any splinters, which seem to be similarly circumstanced. It is very seldom necessary to trephine the sternum, either to raise a depressed portion, or to give vent to extravasated fluid. The only case, in which such an operation may be considered proper, is when the bone becomes carious, and the diseased part is exceedingly tedious in separating.

The ensiform cartilage, being ossified in old subjects, may in them be fractured. Little more, however, can be done in such a case, than relaxing the abdominal muscles by raising the thorax and pelvis, and then applying a piece of soap-plaster and a roller over the part, for the purpose of keeping it steady. When the blow has been violent, the patient should always be bled.

Fractures of the Ribs.

These generally happen near the greatest convexity of the bones, several of which are often broken together. The first rib, being protected by the clavicle, and the lower ones being very flexible, are less liable to be fractured, than the middle ones.

When a spicula of a fractured rib is beaten inward, it may lacerate the pleura, wound the lungs, and cause the dangerous train of symptoms attendant on emphysema. (See *Emphysema.*)

A pointed extremity of the rib, projecting inwards, may also cause an extravasation of blood; or, by its irritation, produce inflammation in the chest. A fracture, which is not at all displaced, is very difficult to detect, particularly in fat subjects; and, no doubt, is very frequently never discovered. The surgeon should place his hand on the part, where the patient seems to experience a pricking pain in the motions of respiration, or where the violence has been applied. The patient should then be requested to cough, in which action the ribs must necessarily undergo a sudden motion, by which a crepitus will often be rendered perceptible. All the best practitioners, however, are in the habit of adopting the same treatment, when there is reason to suspect a rib to be fractured, as if this were actually known to be the case, by the occurrence of a crepitus, or the projection of one end of the fracture; which, indeed, in instances, which are displaced, makes the nature of the accident sufficiently plain.

A broken rib cannot be deranged, either in the direction of the diameter of the bone, nor in that of its length. The ribs, being fixed posteriorly to the spine, and anteriorly to the sternum, cannot become shortened. Nor can one of the broken pieces become higher, or lower, than the other, because the same muscles are attached to both fragments, and keep them at the same distance from the neighbouring ribs. The only possible derangement is either outward, or inward. *(Boyer.)*

Simple fractures of the ribs, free from urgent symptoms, require very simple treatment. The grand object is to keep the broken bones as motionless as possible. For this purpose, after applying a piece of soap-plaster to the side, and over it proper compresses; a broad linen roller is to be firmly put round the chest, so as to impede the motion of the ribs; and compel the patient to perform respiration chiefly by the descent and elevation of the diaphragm. A scapulary will prevent the bandage slipping downwards. When the fractured part seems depressed inward, the compresses should be placed on the anterior or posterior part of the bone. As a roller is very apt to become slack, many surgeons, with good reason, never employ one in the present case; but take a piece of strong linen, large enough to surround the chest, and lace it with pack-thread, so as to compress the ribs in the necessary manner.

When there is reason from the symtoms to think the lungs injured, or disposed to inflame, copious and repeated bleedings should be practised. Indeed, as peripneumony is always apt to succeed the accident, and is a most dangerous occurrence, every person, free from debility, either having a broken rib, or supposed to have such, should always be bled in the very first instance. The spermaceti mixture, with opium, is an excellent medicine for appeasing any cough, which may disturb the fracture, and give the patient infinite pain.

Fractures of the Sacrum.

These accidents do not often occur; and, when they do, must be occasioned by some powerful cause, such as the fall of a very heavy body, or the passage of a carriage wheel on the convex side of the bone, or a fall from a great height on that part. No muscle tends to derange the position of the broken portions. Indeed, the principal danger depends on the injury, which the pelvic viscera may have suffered from the violence which broke the bone. To prevent the inflammation of such parts, of course, antiphlogistic means, particularly bleeding, are highly proper. Another source of grievous complaints, occasionally arising from fractures of the sacrum, is the injury done to the sacral nerves. Hence often proceed, retention of urine, inability to retain this fluid, involuntary discharge of the fæces, paralysis of the lower extremities, &c.

With respect to the relief of these symptoms, we need add nothing to what we have already said on the subject, in speaking of fractured vertebræ. The reader must also refer to the articles, *Urine, Retention of; Incontinence of, &c.* Should the lower portion of the sacrum be displaced inward by the force applied, it is to be reduced in the same way as the os coccygis. With regard to the particular means for promoting the union of the fractured sacrum, all that can be done is to apply a piece of the emplastrum saponis to the part, and put a roller round the pelvis, or a T bandage.

Fracture of the Os Coccygis.

Though much slighter than the sacrum, it is less frequently broken. Its not being much exposed to external force, and its moveableness, are the reasons of this. When the os coccygis is fractured by a fall on the buttock, the pain, arising from the accident, is increased by walking, in consequence of some fibres of the glutei being attached to this bone, and disturbing it when in action *(Boyer.)*

When the detached piece of bone is driven inward, the surgeon is to introduce his fore-finger, previously oiled, into the rectum, and, with the assistance of the fingers of his other hand externally, he is to reduce the displaced part. This being accomplished, little more can be done, than applying a piece of soap-plaster to the injured part, together with a T bandage; adopting the antiphlogistic regimen, and enjoining the patient to avoid lying on his back, or sitting down. He should also avoid walking, so as to put the glutei muscles into action, which would disturb the broken bone.

Fractures of the Ossa Innominata.

Such cases are not common; and, when they happen, are generally produced by the passage of heavy carriage wheels, over the pelvis; and are always attended with considerable contusion of the external soft parts, and sometimes with great injury of the pelvic viscera. The anterior superior spinous process has been broken off, by the kick of a horse. (*Boyer.*)

In St. Bartholomew's hospital, several instances occurred, during my apprenticeship to Mr. Ramsden, in which the os ilium, os ischium, and os pubis, were found fractured on opening the bodies after death; and, when we consider the great violence necessary to produce such accidents, we cannot wonder that the injured state of the pelvic viscera should frequently prove fatal. The fractures themselves are seldom displaced, so that what relates to their treatment is exceedingly simple, merely consisting in applying a roller round the pelvis, and putting a piece of soap-plaster on the broken part. The grand indication is to obviate the consequences of inflammation of the parts within the pelvis, and even of the peritonæum and abdominal viscera, by copious and repeated bloodletting. Any complaints respecting the evacuation of the urine and fæces, must also be attended to. When the contusion is excessive, and the bones very badly broken, the patient cannot move, nor go to stool, without suffering the most excruciating pain. To afford some assistance in such circumstances, Boyer, in a particular case, passed a piece of strong girth web under the pelvis, and, collecting the corners into one, fastened them to a pulley suspended from the top of the bed. Thise nabled the patient to raise himself with very little effort, so that a flat vessel might be placed under him. Certainly, a bed on the principles recommended by Sir James Earle, might be of infinite service, both in these cases, as well as in many others, particularly compound fractures, and paralytic affections from diseased vertebræ. (See *Observations on Fractures of the Lower Limbs; to which is added, an account of a contrivance to administer cleanliness and comfort to the bed-ridden; by Sir J. Earle*, 1807.)

Sometimes, notwithstanding the rigorous adoption of antiphlogistic measures, abscesses cannot be prevented from forming in the pelvis; particularly, when there are detached splinters driven inwards. Such splinters may wound the bladder, and cause an extravasation of urine. Desault extracted a splinter, which had done so, from the bottom of a wound, which he had made to give exit to the effused urine. In these cases, a catheter should be kept introduced, to prevent the urine from collecting in the bladder, and afterwards insinuating itself into the cavity of the abdomen. (*Chopart.*)

Fractures of the Thigh.

To this subject I shall allot as much room as the work will possibly afford, because it is one, which strongly claims the consideration of modern surgeons, and may be deemed even yet unsettled; the illustrious Pott defending one method of treatment; the celebrated Desault another.

The os femoris is liable to be broken at every point, from its condyles to its very head. It is, however, at the middle third of this extent, that fractures mostly occur. The fracture is sometimes transverse, but, more frequently oblique. The latter direction of the injury makes a serious difference in the difficulty of curing the case, without future deformity, or lameness. Sometimes the fracture is comminuted, the bone being broken in more places than one; and sometimes the case is attended with a wound, communicating with the fracture, and making it, what is termed, *compound*. As Petit remarks, however, the thigh-bone is less seldom broken into several pieces, than others more superficially situated.

A fractured thigh is attended with the following symptoms: a local acute pain at the instant of the accident; a sudden inability to move the limb; a preternatural mobility of one portion of the bone; sometimes a very distinct crepitus, when the two ends of the fracture are pressed against each other, deformity, in regard to the length, thickness, and direction, of the limb. The latter change, viz. the deformity, ought to be accurately understood; for, having a continual tendency to recur, especially, in oblique fractures, our chief trouble in the treatment is to prevent it. (*Desault, par Bichat.*)

Almost all fractures of the thigh are attended with deformity. When this is considered, in relation to length, it appears, that, in oblique fractures, the

broken limb is always shorter than the opposite one; a circumstance denoting, that the ends of the fracture ride over each other. We may also easily convince ourselves, by examination, that the deformity is owing to the lower end of the fracture having ascended above the upper one, which remains stationary. What power, except the muscles, can communicate to the lower portion of the fractured bone, a motion from below upwards? At one end, attached to the pelvis; and, at the other, to this part of the bone, the patella, the tibia, and fibula, they make the former insertion their fixed point, and drawing upward the leg, the knee, and the lower portion of the thigh, they cause directly, or indirectly, the derangement in question. In producing this effect, the triceps, semitendinosus, semimembranosus, rectus, gracilis, sartorius, &c. are the chief agents.

To shew the power of the muscles to displace the ends of such fractures, mention is made, in Desault's works by Bichat, of a carpenter, who fell from a scaffold, and broke his thigh. The limb, the next day, was as long as the other? but, the man had a complete palsy of his lower extremities, and could not discharge his urine. The moxa was applied, and the muscles soon regained their power, and then the shortening of the limb began to make its appearance.

Besides the action of muscles, there is another cause producing a derangement of the fracture, in the course of the treatment.

How firm soever the bed may be on which the patient is laid, the buttocks, more prominent than the rest of the body, soon form a depression in the bedding, and thence follows an inclination in the plane on which the trunk lies; which, gliding from above downward, pushes before it the upper end of the fracture, and makes it ride over the lower one. The muscles, irritated by the points of the bone, increase their contraction, and draw upward the lower part of the bone; and from this double motion of the two ends of the fracture in opposite directions, their riding over each other results. (*Desault, par Bichat.*)

Transverse fractures are less liable to be displaced in the longitudinal direction of the bone, because, when once in contact, the ends of the fracture form a mutual resistance to each other; the lower one, drawn upward by the muscles, meets with resistance from the upper one, which itself inclined downward by the weight of the trunk, pushes the former before it, and thus both retain their position in relation to each other.

The deformity of a fractured thigh, in the transverse direction, always accompanies that which is longitudinal; but, sometimes, it exists alone. This is the case, when, in a transverse fracture, the two ends of the bone lose their contact; one being carried outward, the other inward; or, one remaining in its place, while the other is separated. The upper end of the fracture is not now, as in the foregoing instance, motionless in regard to the muscular action; the contraction of the pectineus, psoas, iliacus internus, and upper part of the triceps, deranges it from its natural direction, and contributes to displace it.

The deformity of the limb, in regard to its direction, is either the consequence of the blow, which produced the fracture, or, what is more common, of the ill directed exertions of those who carry the patient. Thus we see that an injudicious posture bends the two portions, so as to make an angle. (*Desault, par Bichat.*)

Whatever may be the kind of deformity, the lower end of the fracture may retain the natural position, in which it is placed, or else undergo a rotatory motion on its axis outward, which is very common, or inward, which is more unusual. This rotation always aggravates the displaced state of the fracture, and should be attended to in the reduction. (*Desault, par Bichat.*)

Having presented the reader with these accurate remarks on the kinds of derangement, to which fractured thighs are subject, I shall beg his attention to a few observations of my own, on Mr. Pott's account of the effects of posture on fractured limbs; on what constitutes the chief displacement of a broken thigh, and what muscles can principally produce this effect; and, lastly, on the actual condition of such muscles in the bent position of the limb.

1. Almost every one, initiated in the surgical profession, imbibes a vague kind of information, that relaxation of the muscles, both in the reduction, and during the whole cure of fractures, was what Mr. Pott most strenuously re-

commended, as the proper condition, in which those powers ought to be placed, under such circumstances; and was what he had in view in adopting the bent position for a fractured thigh.

The love of truth, leads me, however, to remark, that this eminent surgeon has not availed himself of the light, resulting from anatomical inquiries, to elucidate the effects of posture upon fractured limbs. Though many practitioners may now feel persuaded, how much greater the advantages are in the bent, than in the straight posture of the limb, in the case of a broken thigh; yet, few are so well acquainted with the exact reasons why, and precise manner how those advantages arise. It is true, as already stated, it is known in a vague manner, that the advantages alluded to, arise from the relaxation of muscles connected with the fractured bone: Mr. Pott contents himself with making mere assertions to this effect, and supporting them upon an appeal to experience, leaves the rationale of the subject in perfect obscurity. When we have practical evidence in favour of any adoption, and when, at the same time, no rational theory can be formed to coincide with it, certainly, it behoves us to follow the more useful dictates of the former, and to beware of any dangerous hypothesis into which too eager a pursuit of the latter might allure us. When numerous surgeons, however, are in a state of indetermination, nay, what is more urgent, when one half of the profession seems to be at variance with the other upon a point important to be decided, and without the prospect of approaching harmony of practice, what resource remains, but that of reason, to instil into the mind those facts and principles, by which all must be governed; and, from a due observation of which, only one opinion and practice would result? To rest contented with barely knowing, that the superior utility of the bent posture, in the case of a broken thigh, proceeds from the relaxation of muscles, is to remain in a certain state of ignorance, from which, by an unfettered exercise of our own intellects, we might possibly disengage ourselves. Nor will any man of reflection contend, that such naked information, so void of illustration, is enough to saturate with full conviction that philosophical spirit of inquiry, from which the present enlightened state of medical science is so eminently derived. And might it not tend to advance, and very usefully to improve our knowledge of the subject, if we could ascertain more accurately upon what principle the posture of the limb ought to be selected with the greatest possible advantage to the patient? Until that is accomplished, we are acting as mere surgical automatons; without true science, and without a ray of judgment. Neither will it be satisfactory to answer, that posture is to be determined upon the principle of relaxing the majority of the muscles connected with the broken bone. More is essentially required to make the solution in this way accurate; for, even admitting, what some may be inclined to doubt, that the bent position does relax more muscles than the straight one, its precision will vanish, when we shall have explained, that certain muscles, moving the thigh bone, possess much greater power to impede the favourable coaptation and union of the fracture, than others performing the same office, and of not inferior bulk. I am humbly of opinion, that those practitioners, who still adhere to the old plan of placing fractured thighs in the straight posture, have never been struck with this distinction; and, in contending that their mode of treatment relaxes as many muscles connected with the broken bone as the opposite one, they have not reflected upon what constitutes the relative displacement of the two ends of the fracture. I have heard it more than once remarked, that what Mr. Pott terms the relaxed position of the limb, cannot really merit that appellation, because there are, perhaps, as many muscles thrown into a state of tension in this very posture, as in the straight one. According to my ideas, there is some reason in this criticism; but no one must thence infer, that the straight position is equally proper; for provided we shall be able to make out the truth of what has been delivered above, the question under consideration will be much altered, and, instead of inquiring, "Are more muscles relaxed in the bent, than in the straight position?" we must inquire, "Are more of those muscles, *possessing most influence over the fracture*, relaxed in this or that position of the limb?"

Were we to resign the privilege of thinking for ourselves, and implicitly to mould our opinions, according to any

authority, however high, we should often fall into very avoidable errors. Were we to believe the literal sense of several passages in Mr. Pott's Remarks upon Fractures, we should then suppose it possible and practicable to relax at once, by a certain posture of the limb, every muscle connected with a fractured bone. In the first vol. of his works, page 389, edit. 1783, he observes, in speaking of what must best answer the purpose of incapacitating the muscles from displacing the fracture. "Is it not obvious, that putting the limb into such position as shall relax the whole set of muscles, belonging to, or in connexion with, the broken bone, must best answer such purpose?" and, in the next page, "What is the reason why no man, however superficially acquainted with his art, ever finds much trouble in setting a fractured os humeri? is it not because both patient and surgeon concur in putting the arm into a state of flexion, that is, into such a state as relaxes all the muscles surrounding the broken bone?" Also in page 393, he continues, "Change of posture must be the remedy, or rather the placing the limb in such manner as to relax all its muscles." That to have all the muscles relaxed in cases of fracture would be desirable, were it practicable, every one will admit; but the possibility of accomplishing it, so long as different muscles have different uses, different situations, and different attachments to the bones, every one must grant to be more than visionary. For instance, do not the patient and surgeon, in the case of fractured os humeri, adverted to above, rather concur in putting the fibres of the triceps and anconeus into a state of tension, at the same moment that they relax the biceps and brachialis internus?

In short, the indetermination of many practitioners, with regard to the greater propriety of placing a fractured thigh-bone in the bent, than in the straight position, must, in a great measure, be attributed to the imperfect explanations, hitherto offered of the way, in which the former becomes more advantageous, than the latter; especially, if it be true, that a comparative and fair trial in practice would shew, that the bent posture is in no respect inferior to the straight one, and will even succeed in many instances, where deformity, shortening of the limb, and lameness, would be inevitable consequences of the other.

2. By what I am now going to remark, I do not mean to question the accuracy of Desault's account of the various kinds of derangement to which a broken thigh is liable. The rising end of the bone has now been put into its proper point of view, and even ordinary practitioners are well aware of the erroneous ideas once entertained concerning it, and the more pernicious treatment often had recourse to in consequence. In the fractured thigh, the rising end of the bone is the upper extremity of the fracture, that which is connected with the hip, that which is truly in its right and natural situation, and that which no surgical means can therefore possibly alter for the better. On the other hand, the lower end of the fracture, or that which is connected with the knee, is that which is displaced, that which is drawn more or less underneath the other extremity of the bone, and that which well directed surgery can generally set right again.

No doubt can, I think, exist about the accuracy of these preceding propositions, when we consider, that the superior portion of the broken bone is properly articulated with the acetabulum; that its broken extremity is neither removed further from, nor nearer to, that cavity than nature placed it; that the position, in which the upper portion of the broken os femoris is found, is not in the least deranged, and precisely such as it has oftentimes been put into previously to the occurrence of the accident. But, the lower end of the fracture is not only wrong in relation to the upper end, it is out of its due situation in all other respects; it is drawn upward nearer to the pelvis than it ever could be naturally, and hence the limb is shortened; the position, in which it is constantly found, is so deranged in relation to the pelvis, its axis is so altered, that even were we to overleap the bounds of possibility, and to suppose the upper end of the fracture brought into apposition with it so situated, we should at the same time be obliged to construct in our wanton imagination a new acetabulum, differently situated from the natural one for the reception of the head of the bone; or, perhaps, it might best suit such chimera to alter the or-

dained shape of the thigh-bone. The deviation from the natural and relative situation of the two ends of the fracture, it is then my wish to imply, proceeds, not from any derangement of the upper portion, but, from a refraction of the inferior part of the broken bone.

If it be received as an irrefragable truth, that the upper extremity of the fracture is not out of its due situation, and that the lower end is so, it must necessarily follow from the admission of this principle, that the first grand indication in the management of the case, is to put the lower end of the fracture into its right and relative situation, by drawing it downward, and placing it into as perfect apposition, as the nature of circumstances will allow, and not to make any vain attempts to press down the prominent end of the bone; a thing altogether impracticable and highly improper.

Let us now suppose, that the surgeon proceeds to replace the lower end of the fracture, which we have described as being retracted, more or less, underneath the other.

Mr. Pott has judiciously remarked, that to impede the accomplishment of this purpose, little or no difficulty can arise from the fracture itself, the broken ends of the bone being of themselves inactive. The muscles must be looked upon as those powers, which can, and do make opposition to the reduction of the fracture; and, when set right, to its continuing so. The muscles alone are the powers causing the retraction of the bone and shortening of the limb.

It is well, and universally known, that muscles can only contract to a certain length; and, it is upon a knowledge of this fact, that the principle and utility of relaxing their fibres are founded; for, in proportion as they become relaxed by the approximation of their attachment, they are partly deprived both of their disposition and power to act. What then is implied by relaxation of a muscle is most simple of comprehension; it is that condition, in which its origin and insertion are more or less approximated to each other.

We shall now inquire, what muscles are so circumstanced as to be capable of making most resistance to the reduction and coaptation of the fracture; for, should we succeed in ascertaining them with precision, it must be a primary consideration to relax them, rather than any others, less empowered to do harm; and, after what has been delivered, it seems a most easy matter to determine them.

That those muscles, destined to move the os femoris, and affixed only to part of this bone above the situation of a fracture, cannot make any opposition to its reduction, nor principally disturb the coaptation; and that, therefore, their relaxation is not what the skilful surgeon ought primarily to aim at, appear to my mind two very manifest propositions, arising from the facts already premised.

But, that he ought to aim principally at the relaxation of those muscles which can concur to retract the lower end of the fracture; all which must necessarily have their insertions below the breach of continuity in the bone, appears to me a fact equally obvious; and, is what I think not unworthy the attentive consideration of all practical surgeons.

My sentiments, however, are not at all repugnant to Desault's description of the derangement; for, I would not take upon me to deny altogether a circumscribed power in muscles attached only to the superior portion of the broken bone to affect the fracture unfavourably; especially, when such fracture is of the transverse kind. It is possible, that they may do so in a limited degree; though, I am inclined to believe, that, in the bent posture, their power of acting injuriously must be so trivial, as to be unworthy of serious notice. The reasons, for my entertaining this opinion, I shall explain.

When a transverse fracture is reduced, and its broken extremities are placed in even apposition with each other, it is possible to conceive, that the first deviation from the proper situation of the two ends of the fracture, may arise from the contraction of some muscle, that has only a power of moving the upper portion of the bone, and that, in consequence of the superior end of the fracture being removed, and its resistance taken away, the inferior end may become more easily retracted. This idea, however, plausible it may at first appear, will, upon mature consideration, be found in no degree to militate against the opinion advanced, *that the muscles attached to the lower*

portion of the broken bone have most influence over the fracture: and it is at once obvious, that, without the action of these latter muscles, no retraction of the lower end of the fracture could take place, into whatever position the other might be drawn by the contraction of other muscles. I am also of opinion, that most of those fractures of the thigh, which I have seen, have been oblique, and the ample experience of Pott and Desault seems to have made them of a similar sentiment. Whether this remark be true, to the extent which I have stated, or not, it must at least be granted, that, in oblique fractures of the thigh, the resistance made by the upper end of the fracture to the retraction of the lower, will not be effectual enough to defeat the continual tendency of the muscles to produce that effect. It seems rational to suppose, that those few instances, where little difficulty is experienced in maintaining the fracture in a proper state of coaptation, and where no retraction happens, are cases of the transverse kind, and, consequently, if in such rare instances alone, and in such instances, as constantly end well, the muscles attached above the fracture can do harm, it is not of so much importance. Besides, admitting (what indeed I have already admitted) that, in transverse fractures of the thigh, the resistance made by the upper end of the fracture to the retraction of the lower, becomes of considerable utility, it is evident, that it becomes so only by counteracting the action of those muscles, which tend to draw upward the inferior portion of the fractured bone. Were it only in our power effectually to incapacitate them by posture, or any other means, oblique fractures of the thigh would be no more difficult to unite favourably, than transverse ones. The majority of cases also being oblique, and these being such as so often baffle the surgical art, we can only rely upon our means of diminishing the power of muscles to retract the inferior portion of the fractured bone for the accomplishment of a good cure.

In the bent position of the limb, an advocate of which I am, let me also inquire, in what direction can the superior end of the fracture be first drawn by the action of muscles? The flexors of the thigh being relaxed, we cannot suppose, that they make it project forward, as it actually does, or at least has done in every instance of displacement that I have yet seen. It may be suggested, that the adductor muscles may do so; but, as these ought also to be perfectly relaxed in the bent position, they cannot, when the bone is set right, and placed as circumstances demand, do what we are considering.

The glutei are tense, and may therefore be conceived capable of disturbing the coaptation; but, to appeal to fact, and the incontestable evidence of experience, do we ever find the upper end of the fracture situated either behind, or on the outside of the lower end? Do we not constantly find it projecting in front, and the latter drawn up more or less behind it? Even supposing the upper end of a transverse fracture were first drawn in a direction backward, would it not rather tend to prevent retraction of the lower end, according to the manner in which it is uniformly found to be displaced? In short, we can account for every thing, relating to the displaced condition of the fracture, without having recourse to the doctrine admitting much influence over the fracture to reside in muscles attached only to the superior portion of the fractured bone. If, at the same time, we concede, for the sake of a reconciliation of opinions, that muscles inserted into the os femoris, above the situation of a fracture, may act in some degree unfavourably, it yet remains a manifest and unshaken truth, that since no posture of the limb will at once relax all its muscles, it is the duty of the surgeon to select that one, which brings with it the greatest share of advantages, and which disarms, as it were, those muscles, endued with most power to disturb the union of the fracture.

What renders the foregoing remarks more deserving attention is, that the majority of fractures of the thigh-bone happen at some joint below the attachment of the gluteus maximus, and that the majority of the muscles, inserted directly into the os femoris, have their attachments so high, that they cannot be supposed to possess great influence over fractures situated at any point much below the trochanters. The psoas magnus and iliacus internus, the glutei, and all the rotators of the thigh-bone outward come within this description, together with, the pectinalis, the superior fibres of the

adductor magnus, and all the adductor brevis.

What muscles now remain to antagonize so powerfully the endeavours of the surgeon? In this general view of the subject, the greater part of the triceps will be the only power, inserted immediately into the os femoris, possessing considerable influence; yet, there are several other very bulky muscles, concerned in the motions of the knee-joint, which may combine very forcibly to retract the lower end of the fracture, and thus resist the reduction and disturb the coaptation, and union of the bone.

Such are the extensor muscles of the leg, especially, the rectus, as we presently shall explain, and the flexor muscles, sartorius, gracilis, semimembranosus, semitendinosus, and biceps. If these are really the muscles, capable of exerting themselves, with most effect, in producing the difficulties accompanying the treatment of all those fractures of the thigh, which happen below the tendon of the gluteus maximus, it certainly becomes a matter of considerable importance to observe, if possible, their relaxation, rather than that of any other set of muscles, less empowered to do harm.

When the fracture is above this point, other muscles come into power, and hence the difficulties augment.

3. In noticing the condition, into which the above muscles are put in the bent position of the limb, we shall, as occasion requires, mention those circumstances, which diminish, or increase, their influence over the fracture.

The triceps is the principal adductor of the thigh; it may also, from the nature of its attachments, combine to bring the thigh-bone forward, and hence, bending the thigh must in a certain degree contribute to its relaxation. It is probable, that of all the muscles capable of impeding, with the greatest effect, the setting of a broken thigh, the triceps is that, which possesses the highest share of power, considering its vast bulk, and its extensive insertion into the bone. Its perfectly relaxed state cannot, therefore, be too particularly insisted upon; it is not enough, for this purpose, to bend the thigh upon the pelvis; this alone can only produce a very partial relaxation of its fibres.

The patient ought to be placed upon a firm mattress, and, as he lies upon his side with the thigh bent to an acute angle with the trunk, the pelvis is to be turned completely upon its lateral part, and the fractured bone somewhat raised by pillows. Thus the os pubis and os ischium (from which the three heads of the triceps arise) will become approximated to the linea aspera, and the ridge above the internal condyle of the os femoris (into which they are inserted) as much as circumstances will permit, and thus the relaxation of the muscle will be effected.

The pectinalis can only be a primary power in disturbing the fracture, when the accident has occurred very high up. As it is an assistant both in the flexion and adduction of the thigh, it must be relaxed in the above position. I need only observe further respecting it, that the majority of fractures happen below its insertion, and, consequently, in such instances, it will, with the upper fibres of the triceps, possess no power of displacing the lower end of the fracture,

The next muscles, claiming our attention, are the extensors of the leg.

In considering the effect of the action of different muscles upon a fractured thigh-bone, it is useful to carry in our mind the precise direction in which the inferior end of the fracture is displaced. We should bear in our recollection, that it is drawn up more or less behind the upper portion of the bone; and muscles, which can most concur to produce such retraction, are those, which can most impede the favourable union of the fracture. The situation of the extensor muscles of the leg at once suggests to us, that they cannot produce this effect nearly in so great a degree as the flexors. It is true, that the sartorius is situated in front of the thigh, and has been enumerated as possessing much influence over the fracture; but, it is to be remembered that the direction of its force is entirely changed in consequence of its spiral course, and its passing behind the internal condyle of the os femoris. The rectus may undoubtedly aid in the retraction of the lower end of an oblique fracture: its power to disturb a transverse one seems doubtful. Being a loose muscle, not attached to the thigh-bone, and acting only from two points very remote from each other, viz. the anterior inferior spine of the ilium, and the

patella, it can on this account exert the strength of every fibre, both above and below the breach of continuity in the bone, in combining to retract the inferior end of an oblique fracture. The vasti and cruralis, on the contrary, being muscles intimately attached to the os femoris, and having no origin whatever from the pelvis, can only employ the force of those fibres, which happen to be situated above the fracture in aiding to retract the lower portion of the broken bone. For instance, supposing the fracture to be situated about the middle of the thigh, all those fibres of the vasti and cruralis deriving their origin from the os femoris below the breach of continuity in the bone, and inserted into the patella, can obviously have no effect in producing the retraction and displacement of the inferior end of the fracture. This fact must considerably lessen the influence of these three extensors in acting injuriously toward fractures. There are yet other circumstances, which must tend to diminish their power. If we reflect upon the lower end of the fracture, when displaced; if we remind ourselves, that it is constantly drawn up behind the other; it must immediately strike us, that the vasti and cruralis, the fibres of which embrace and adhere so intimately to the surface of the bone, both above and below the fracture, must be more or less detached from their origin, in proportion to the degree of retraction and displacement; that the fibres of the vasti, taking their origin from the lower part of the linea aspera above the fracture, must in all probability be detached from such connexion by the retraction of the lower end of the fracture in that situation; and that the fibres of the cruralis must at the same time be partially detached from their intimate connexion with the anterior surface of the bone below the fracture. Such separated fibres can exert no power over fractures. When we also reflect, that the fibres of the cruralis and the anterior ones of the vasti must inevitably be more or less stretched round the upper end of the fracture, by which the direction of their force upon the lower end must be so changed, that, instead of tending to draw it upward, they can only pull it forward, I think it must be granted that their faculty of materially disturbing a fractured thigh is involved in doubt. The rectus is certainly to be considered, in every respect, as one of the primary powers acting in the displacement of fractures, and, as such, it ought to be perfectly relaxed, if other considerations should not forbid it; that is, if we should not throw a larger bulk of muscular fibres, disposed to act unfavourably on the fracture, into a state of tension, by observing its perfect relaxation, than we should, by such means, relax, and according to our principles, this would undoubtedly happen. Consequently, in the bent position of the limb, though we do not completely relax the rectus, since, the knee is bent, at the same time that the thigh is in a state of flexion, yet we must, of necessity, be content with a partial relaxation of its fibres, for the sake of relaxing a more powerful set of muscles next to be considered. It may not however be inapplicable to state, that in the bent position, the anterior inferior spine of the ilium is almost, if not quite, as near to the patella as in the straight one, and of course even the rectus must be equally favoured in point of relaxation. The vasti and cruralis are tense in the bent position; but, I cannot consider their power over the generality of fractures to be of primary importance. The higher the fracture is situated, the less can they exert that little share of influence which they may be supposed to possess; and accidents of this description, when in a high situation, being always the most troublesome, is a circumstance proving, that it is to other powers we ought to attribute the augmentation of difficulty.

The flexor muscles of the leg, above enumerated, are capable of acting very powerfully in resisting the reduction, and disturbing the coaptation of the fracture. For the sake of surveying them more clearly in this surgical point of view, they may be divided into two classes. The first comprehends two muscles arising from the pelvis in front, viz. the gracilis and sartorius, which are favoured in all respects by the bent position of the limb, as well by flexion of the thigh, as by that of the leg; and also in a very important degree by observing to place the pelvis strictly upon its side, and to raise the thigh by proper pillows. The second class consists of three muscles coming from the tuberosity of the ischium behind, viz. the semimembranosus, se-

mitendinosus, and long head of the biceps, being such as are only favoured, with a view to relaxation, by flexion of the knee.

That the sartorius and gracilis are in every respect favoured by the bent posture, no one acquainted with the origins and insertions of those muscles; no one knowing the effect of their action, will feel inclined to deny; and presuming upon the admission of this truth, I shall pass on to reflect upon the state of the three other flexors enumerated above.

In deriving their origin from the tuberosity of the ischium, they acquire a power of contributing to draw the limb backward, as well as of bending the knee. Hence, their perfect relaxation is obviously unaccomplished in the bent position. One might even conjecture *à priori*, that they are little, or not in the least, benefited in such condition, because bending the thigh may seem to counteract all the good effect, in regard to relaxation, resulting from flexion of the knee. Measurements on the skeleton, however, will shew, that the tuberosity of the ischium is approximated considerably more to the heads of the tibia and fibula in the bent, than in the straight posture. I may also take the liberty of remarking, that horizontally situated, as the thigh bone is in a straight position, it cannot be regarded, as affording an equal degree of relaxation to such muscles, as if it actually were in a state of perfect extension. The short head of the biceps will, in many instances, be enabled to assist in the retraction of the inferior end of the fracture, and it is manifestly relaxed in the bent position. I am not inclined to allow any share of power to reside in the popliteus.

Daily experience justifies my laying it down, as a fact, that the higher the fracture is situated, *cæteris paribus*, the greater is the difficulty experienced in keeping it in a state of apposition. In contemplating the subject, upon the principles advanced in the preceding remarks, we immediately discern the reason of it. When the fracture is very high, almost the whole of the triceps and pectinalis concur to retract the bone. When immediately below the trochanters, the gluteus maximus is to be added to the numerous class of muscles, capable of disturbing the union of the fracture. When in the neck of the bone, the multitude of muscles, inserted into the two trochanters, become enabled to assist in the retraction and displacement of the main portion of the bone. Hence, the immense difficulty to be surmounted in accomplishing the union of such cases, without shortening the limb, and the foot being distorted outward. In cases of this kind, the short head of the biceps, the vasti, and the cruralis, will however, have no force over the fracture. When the neck of the os femoris is fractured within the orbicular ligament (which remains entire,) it is clear, that the retraction must be much limited.

I might strengthen the preceding observation, that in proportion as the fracture is high, the greater is the difficulty experienced in maintaining the ends of the fracture in contact, by noticing, that I have seen several cases, in which the os femoris was broken very low indeed, and in which no retraction nor displacement whatever happened. Perhaps, these fractures might have been of the transverse kind, and, perhaps the greater surface for apposition, on account of the expanded form of the bone, at this part, might have had some share in preventing retraction. But, it must appear certain, that, in such instances, several muscles would have lost almost, or entirely, their influence to produce that effect; such as the triceps, pectinalis &c. and the muscles moving the leg, remained the only powers capable of such action.

The position of the fractured os femoris, says Mr. Pott, should be on its outside, resting on the great trochanter; the patient's whole body should be inclined to the same side; the knee should be in a middle state between perfect flexion, or extension, or half-bent; the leg and foot lying on their outside also, should be well supported by smooth pillows, and should be rather higher in their level, than the thigh; one very broad splint of deal, hollowed out, and well covered with wool, rag, or tow, should be placed under the thigh, from above the trochanter quite below the knee; and another somewhat shorter should extend from the groin below the knee on the inside, or rather in this posture on the upper side. The bandage should be of the eighteen-tail kind, and when the bone has been set, and the thigh well placed on the pillow, it should not without necessity, (which necessity in

this method will seldom occur) be ever moved from it again, until the fracture is united; and this union will always be accomplished, in more or less time, in proportion as the limb shall have been more or less disturbed. (*Pott.*)

Here only two splints are mentioned; the surgeons of the present day always employ four. After placing the patient in a proper position, the necessary extension is to be made. Then the under-splint, having upon it a broad soft pad, and an eighteen-tailed bandage, is to be laid under the thigh, from the great trochanter to the outer condyle. The surgeon, before applying the soap plaster, laying down the tails of the bandage, and putting on the other three splints, is to take care that the fracture lies as evenly as possible.

In the position for a fractured thigh, Mr. Pott, we find, directs the leg and foot to be rather higher in their level, than the thigh; with what particular design I have not myself been able to make out. Whoever meditates upon the consequence of elevating the leg and foot above the level of the thigh, in the bent position, will know, that it is to twist the condyles of the os femoris more outward than is natural. When a patient is placed, according to Mr. Pott's direction, upon a common bed, the middle soon sinks so much that the leg becomes situated very considerably higher than the thigh, and I am disposed to think, that this is one cause, why so many broken thighs are united in so deformed a manner, that the foot remains permanently distorted outward. The great propensity of the triceps, and other muscles to produce this effect, may also serve to explain the frequency of the deformity. It is not merely the depression of the middle of the bed which is disadvantageous, as the weight of the patient's body falls more upon one side of the bed, than the other, in the bent position of the limb, unless the sacking is tight and the mattress very firm, it happens, that such a declivity is formed, as to render it exceedingly difficult, if not impracticable, to make the patient continue duly upon his side. It cannot be enjoined too forcibly, that fractured thighs should always be laid upon beds not likely to sink much. When this happens, no rational dependence can be put in the efficacy of the bent position, and, as Desault has explained, the same thing is hurtful also in the straight posture.

From what has been delivered it may easily be discerned, that inferences from anatomical circumstances are in most fractures of the thigh chiefly in favour of the bent position; for it appears, that of all those muscles which have primary influence over the majority of such accidents, that is, over all those which occur below the insertion of the gluteus maximus, there is only one muscle, viz. the rectus femoris, that is not more, or quite as much relaxed in it, as in the straight position. Since, however, experience is the great arbitrator of all practical questions, we must still look to it for decisive information, and to form a true judgment in this way, the straight and bent positions ought to be contrasted in every hospital with due attention to all collateral circumstances; the progress and termination of every case ought to be registered; and the comparative view, thus kept up, would quickly diffuse one kind of conviction throughout the profession.

There are some very excellent remarks on the treatment of fractured thighs in *Les Œuvres Chirurgicales de Desault par Bichat.* It is observed, that, if we compare the natural powers of displacement with the artificial resistance of most of our apparatuses, we shall find, that the disproportion between such forces is too great to make the former yield to the latter. The action of the muscles, however, which is always at first very strong, may afterwards be gradually diminished by the extension exercised on them. A power incessantly operating can effect, what another greater power temporarily applied, cannot at once accomplish, and the compression of circular bandages tends also to lessen the force of the muscles.

Desault cured in the Hôtel-Dieu an immense number of fractured thighs, without any kind of deformity. It was particularly to the well-combined employment of extension, and compression of the muscles, that such success was owing. The advantage of keeping the muscles a long while extended, in order to diminish their power, is especially evident in the reduction of certain dislocations, as those of the shoulder, in which we often cannot succeed till the muscles have been kept

on the stretch for a greater, or lesser time. The fracture of the patella and olecranon equally demonstrates the utility of compression for the same purpose; as when the muscles are not compressed by the bandage they draw upward the fragment of bone with double, or triple force. (*Desault par Bichat.*)

Against reducing fractured thighs in the bent posture, Desault entertained the following objections: the difficulty of making the extension and counter-extension, when the limb is so placed: the necessity of then applying them to the fractured bone itself, instead of a situation remote from the fracture, as, for example, the lower part of the leg; the impossibility of comparing with precision the broken thigh with the sound one, in order to judge of the regularity of its shape; the irksomeness of this position long continued, though it may at first seem most natural; the inconvenient and painful pressure of a part of the trunk on the great trochanter of the affected side; the derangement, to which the limb is exposed when the patient has a motion; the difficulty of fixing the leg firmly enough to prevent the effect of its motion on the thigh-bone; the manifest impossibility of adopting this method, when both thighs are fractured; lastly, experience in France having been little in favour of such posture.

Also, what is gained by the relaxation of some muscles, is lost by the tension of others. For such reasons, (certainly strong ones,) Desault abandoned the bent position, and always employed the straight one, which was advised by Hippocrates, and all the Greek physicians.

Petit, Heister and Duverney, recommend applying the extending means just above the condyles of the os femoris. Dupouy was one of the first to remark, that this practice rendered it necessary to employ very great force, and that it would be better to make the extension from the foot. Fabre takes into consideration also the inconvenience of the pressure, made on the muscles, which irritating and stimulating them to action, multiplies the obstacles to setting the fracture. Desault adopted their doctrine, for nearly the same motives, introduced it at the Hotel-Dieu, and the success he experienced in consequence, did not contribute a little to its wider diffusion. (*Desault par Bichat.*)

Desault, as we have stated, preferred the straight posture, and laid his patients on surfaces, not likely to sink with the weight of the body. The feather beds, formerly in common use at the Hotel-Dieu had this inconvenience; for these, in cases of fractures, Desault substituted a firm, tolerably hard mattress, which did not allow the continual change of posture to occur, which a soft bed does. The object of every apparatus being to keep the ends of the fracture from being displaced, the mechanism of every contrivance, for this purpose, should be directed against the causes of the derangement. These are, 1. the action of the muscles, drawing upward the lower end of the fracture; 2. the weight of the trunk propelling downward the upper end. Hence, every apparatus, intended to prevent derangement of a thigh fractured obliquely, should, 1. draw and keep downward the lower end of the fracture; 2. carry and maintain upward the upper end of the fracture, and the trunk, which is above it. The principle is of general application, and only subject to a few exceptions in transverse fractures, attended only with derangement in the direction of the diameter of the limb, or else none at all. 3. There must also be in the apparatus a resistance to the rotation of the lower portion of the broken bone, which will keep the limb steady, even in case of any sudden motion. (*Desault par Bichat.*)

If we compare the operation of the different pieces of our apparatuses with the above indications, we shall find, that, without permanent extension, they are not very effectual. With regard to bandages, whether a roller, or eighteen-tailed bandage, be used, they all have one common mode of operating; they press the muscles towards the end of the fracture, so as to make them form a kind of natural case for the fracture, and thus they make lateral resistance against the parts. In this manner, bandages materially aid in preventing derangement side-ways, and are particularly useful in transverse fractures. But, what is there to hinder the two inclined surfaces of an oblique fracture from slipping one over the other? What power is there to keep the limb from receiving the effects of

accidental shocks? Is the pelvis kept back? Is the action of the muscles resisted? The latter is indeed somewhat diminished by the pressure, and this is the chief use of the bandage; but, will such compression be enough to prevent the longitudinal derangement of the broken bone, especially, if the bandage be applied slackly, as some advise? (*Desault par Bichat.*)

These remarks apply also to compresses; *petit moyen contre une grande cause.*

Splints are useful in firmly fixing the limb, and guarding it from the effects of accidental shocks, or of contractions of the muscles. They operate more powerfully, than bandages, in preventing lateral derangement, and, hence, they suffice for transverse fractures, without any permanent extension being employed. They can also resist the rotation of the thigh outward, or inward. But, when the breach of continuity is oblique, will they hinder the ends of the bone from gliding over each other, and the consequent shortening of the limb? They obviously could only do so, by the friction of the different pieces of the apparatus, especially, the tapes, which fasten it, and then, to make the resistance effectual, they must be tied so tightly as to create a danger of mortification. Will the splints prevent the trunk from descending, and propelling before it the upper end of the fracture? Will they paralize the action of the muscles on the lower end? Will they, in short, fulfil all the above indications? Their use is almost limited to preventing lateral derangement, and steadying the limb. Hence, they should extend along the leg, as well as the thigh, which is disturbed by the motions of the lower part of the limb.

The pads are chiefly useful in keeping the limb from being galled by the splints, and tend only trivially to keep the fracture from being displaced.

From the above account, it appears, that the ordinary pieces of apparatus, which do not execute any permanent extension, may perhaps suffice for transverse fractures, which are not common; but, that they are always ineffectual, when the division is oblique, because they do not fulfil the two fold indication of drawing downward the lower end of the fracture, and keeping the other one upward. (*Desault par Bichat.*)

Desault ascertained, that the object particularly to be aimed at, was such a disposition as that the foot, leg, thigh, and pelvis, should constitute but one whole; so that, though the different parts thereof should be drawn in different directions, yet they should still, with the respect to one another, preserve the same mutual relation. He invented the following apparatus to answer these purposes.

A strong splint, long enough to extend from the ridge of the os ilium to a certain length beyond the sole of the foot, is a principal part of this apparatus: this splint should be two inches and a quarter broad, and have each of its extremities pierced in shape of a mortise, and terminated by a semicircular niche. It is applied on the exterior side of the thigh, by means of two strong linen bands, each being more than a yard long.

[Dr. Physick has greatly improved this splint by increasing the length of it sufficiently to extend up to the axilla; an account of this improvement is contained in the following extract from Dr. Caldwell's translation of Desault.

"Dr. Physick having observed that in the application of Desault's apparatus, the patient was sometimes injured by the pressure of the strap or roller which passes under the tuberosity of the ischium for the purpose of making counter-extension, devised the following method of remedying this inconvenience in which he succeeded to his wishes.

"He directed the upper end of the long external splint to be formed like the head of a crutch, and the splint itself to be lengthened so as to reach and bear against the axilla of the affected side, which must be well defended from pressure by a bolster of flannel or some other soft material. By this expedient the Dr. evidently formed two points, of counter-extension, instead of one, as in the case in the apparatus of Desault. Between these two points, namely, the axilla and the perineum, the same quantity and force of pressure is, by Dr. Physick's improvement, *divided*, which, in the original apparatus of Desault, is borne by the *perineum alone.* The risk of excoriation and injury to the patient, then, in the former case, is to that which he runs in the latter, only as one to two, or nearly so. As it is no less the duty of the surgeon to prevent suffering than it

is to remove deformity, or to save life, Dr. Physick has certainly in this respect made an important step in the advancement of his profession.

"But there is still another advantage derived from the lengthening of the external splint. In the original apparatus of Desault, the strap intended for counter-extension, by passing no higher up than the spine of the ilium, runs too much across, and therefore acts too much on, the upper part of the thigh. By this it not only irritates the muscles of the part, and induces them to contract, but also tends to draw the upper fragment of the os femoris a little outward, and thus to render the thigh in some measure deformed. But, in the improvement of Dr. Physick, the strap is secured in a mortise cut in the external splint, about midway between the spine of the ilium and the axilla. This strap, by being thus carried higher up on the body, does not run across the thigh at all. It consequently presses on and irritates the muscles much less, acts more in the direction of the os femoris, and has no tendency to draw the superior fragment outward."]

The middle part of one of these bands is to be applied to the inside of the thigh, at its upper part; its ends are brought to the exterior side of the thigh, passed through the mortice, and knotted on the semicurcular niche. Compresses are to be previously placed under the middle part of the band, in order to prevent any disagreeable pressure; as well as on the tuberosity of the ischium, which Desault considered as the principal point of action of this band. The inferior part of the leg is, in the next place, covered with compresses, on which the middle part of the second band is placed: the extremities of this band are crossed on the instep and upper part of the foot, then on the sole, after which they are conveyed outward, and one end passed through the mortise and knotted with the other on the niche, with such a degree of force as to pull the inferior portion of the femur downward, and to push the splint upward, and, by this means, the pelvis and superior fractured portion. On the internal side of the limb is placed a second splint, which xtends from the superior part of the thigh, to a certain distance beyond the foot. A third is placed on the anterior part, and extends from the abdomen to the knee. The superior extremities of the anterior and exterior splints are fixed by means of a bandage passed round the pelvis. A band, the middle part of which is placed under the sole of the foot, and the extremities crossed on its superior surface, and fastened to the splints, prevents the motion of the foot, as do also the splints.

Before applying the apparatus, the whole limb is to be covered with compresses, wet with a solution of the acetite of lead. Over these, Scultetus's bandage is to be put, and a roller round the foot, all moistened in the same manner. For more particulars, the reader is referred to the *Journal Chirurgicale, ou les Œuvres Chirurgicales de Desault par Bichat; and Boyer's Lectures on the Bones, Vol. I.*

[The reader must decide for himself between the two opposite methods of treatment here recommended in fractures of the lower extremity. The method taught in the University of Pennsylvania is that of Desault improved by Dr. Physick; its success is such, as perfectly satisfies me, and I believe most of those who have properly tried it.]

Fractures of the Neck of the Thigh-bone.

This part of the bone may be fractured either by falls on the great trochanter, on the sole of the foot, or the knee. But the first accident produces the injury much more frequently, than the latter ones. Of thirty cases, which occurred to Desault, four-and-twenty arose from falls on the side. All those inserted by M. Sabatier in his interesting Memoir, were the result of a similar accident.

1. The fracture may take place in the middle of the neck, where there is less thickness, and the texture is not compact, as in the middle of the cylindrical bones, which are so much exposed to fractures.

2. Where it is united to the head of the bone.

3. Where it joins the great trochanter; in which event, the breach of continuity may be on the outside of the joint, which happens more frequently, than has been supposed.

The division is seldom oblique, almost always transverse; the neck being sometimes, in the latter case, wedged in the body of the bone, as Desault found in several instances; a model of one of which, in wax, is preserved in the collection of *L'Ecole de Santé*, and

the natural specimen of which was in the possession of Bichat. The fracture of the neck of the thigh-bone is sometimes complicated with that of the trochanter major.

The diagnosis is occasionally so difficult, that the best-informed practitioners cannot always ascertain the accident with certainty. At the instant of the fall, an acute pain is felt, (sometimes a crack is distinctly heard) and sudden inability to walk occurs; the patient cannot raise himself from the ground, which, however, is not invariably the case. In the fourth vol. of the *Mem. de l' Acad. de Chirurgie*, a case is related, in which the patient walked home after the accident, and even got up the next day. Desault published a similar example. The locking of one end of the fracture in the other, may offer an explanation of this circumstance.

A shortening of the limb almost always takes place; but this symptom is more or less striking, according as the breach of continuity is out of the cavity of the orbicular ligament, which then keeps the bone from being retracted; or as the extremity of the fracture is confined by this ligament, The action of the muscles drawing upward the lower end of the fracture, the weight of the trunk propelling downward the pelvis and upper end of the fracture, are the two causes of the shortening of the limb. A slight effort suffices, in general, for the removal of this shortening of the limb; but, the symptom recurs almost as soon as such effort ceases; and Goursault and Sabatier have remarked, that it sometimes does not take place at all, till a long while after the accident. A swelling is observable at the upper and front part of the thigh, always proportioned to the retraction, of which it appears to be an effect.

The projection of the great trochanter is almost entirely effaced. Directed upwards and backwards, this eminence becomes approximated to the crista of the os ilium; but, if pushed in the opposite direction, it readily yields; and, when arrived at its natural level, the patient becomes capable of moving his thigh.

The knee is a little bent. Adduction of the limb always occasions acute pain. If, while the hand is placed on the great trochanter, the limb is rotated on its axis, this bony projection may be felt revolving on itself, as on a pivot, instead of describing, as in the natural state, the segment of a circle, of which the neck of the femur is the radius. This symptom, which was particularly noticed by Desault, is very manifest when the fracture is situated at the base of the neck, less so when at its middle; and it is not very perceptible when the breach is near the head of the bone. In the rotatory motions, the lower fragment rubbing against the upper one, produces a distinct crepitus, which, however, is not an invariable symptom.

The toes are usually turned outward; a position which Sabatier, &c. consider as the inevitable effect of the fracture, though Paré and Petit have noticed, that it did not constantly occur. Two cases adduced by these illustrious surgeons, were not credited by M. Louis; but the experience of Desault has fully confirmed the possibility of the occurrence.

The position outward is commonly imputed to the rotator muscles. But, then it is clear, that such position ought always to exist; that all the muscles, which proceed from the pelvis to the trochanter, are, with the exception of the quadratus, in a state of relaxation, by the approximation of the femur to their point of insertion; and that the contracted muscles would not allow the foot to be so easily turned inward again. It is not more probable that the weight of this part itself may pull it into the position, in which it is commonly found.

It follows from the preceding account, that none of the symptoms of a fracture of the neck of the thigh-bone are exclusively characteristic; that each considered separately, would be insufficient, and that their assemblage can alone throw light on the diagnosis. In every instance of doubt, however, the sure course must be pursued, and the apparatus applied, which, though useless, is not dangerous, should the injury not exist, and is indispensably necessary when it does. (*Desault par Bichat.*)

It was at one time supposed, that fractures of the neck of the thigh-bone could not be cured, without some shortening of the limb, and lameness, remaining afterwards. Professor Ludwig, Sabatier, and M. Louis, broached this doctrine, and imputed the circumstance to the destruction of the neck of

the bone. Desault, however, rarely met with instances of such lameness in his practice.

The treatment of these cases is not at all different from that of other fractures of the body of the bone. Most surgeons in this country adhere to Mr. Pott's plan of laying the limb in a bent posture; while, in France, they prefer the straight position, with Desault's apparatus, above described.

Fracture of the Patella.

This bone is almost always broken transversely, and the accident may be occasioned either by the action of external bodies, or by that of the extensor muscles. In the latter case, the fall is only consequent to the fracture, and, as Camper has remarked, is most frequently only an effect of it. For instance, the line of gravity of the body is, by some cause or another, inclined backward; the muscles in front contract to bring it forward again; the extensors act on the patella; this breaks, and the fall ensues. A soldier broke his patella in endeavouring to kick his serjeant; the olecranon has been broken in throwing a stone. A man, at the Hôtel-Dieu, fractured both bones of his knee, in the operating theatre there, by the violent spasms of the muscles, which followed an operation for the stone. The force of the muscles occasionally ruptures the common tendon of the extensor muscles, or, what is more frequent, the ligament of the patella. Petit, Desault, and Sabatier, have remarked these occurrences. The patella can only be broken longitudinally by outward violence. Here it is only necessary to treat of transverse cases.

The symptoms are, a considerable separation between the two fragments of the bone, very perceptible to the finger, when the hand is placed on the knee. This separation is not occasioned equally by both portions; the upper one, embraced by the extensor muscles, is drawn upward very forcibly by these powers, which the patella no longer resists. The inferior portion, being merely connected with the ligament below, is, on the contrary, not moved by any muscle, and can only be displaced by the motions of the leg, to which it is attached. Hence the separation is least when the limb is extended, as it is then only produced by the upper fragment; greatest, when the limb is bent, because both pieces contribute to it; and it may be increased, or diminished, by bending the knee more or less.

The diagnosis is also made clearer, by the possibility of moving the two portions of bone transversely, so as to cause a crepitus and pain. The swelling of the knee, apt to follow fractures of the patella, may, when very great, obscure the other diagnostic symptoms. The difficulty of standing up, and the almost utter inability of walking, in consequence of the extensors not being able to move the leg, unless the fracture be very low down, are other symptoms.

The two grand indications, in the treatment of the fractured patella, are to overcome the action of the extensor muscles of the leg, and to keep this part immoveably extended. The latter object is easily accomplished; the first requires, that the contractile force of the muscles should be first lessened, so as to diminish the effort, which they make to draw up the superior portion of the bone, and then to oppose to them a mechanical resistance, which, operating in a diametrically opposite direction, will render their efforts ineffectual.

The power of the muscles is to be diminished by relaxing their fibres, which may easily be done, by bending the thigh on the pelvis, and extending the leg, and by compressing the muscles with a roller. With regard to the mechanical resistance, which must operate directly against the contraction of the muscles, and prevent them from pulling upward the superior portion of the patella, it should consist of something placed and maintained above it, with sufficient force to keep it from ascending.

Desault used to set a fractured patella as follows: one assistant fixes the pelvis, while another keeps the leg completely extended on the thigh, and this on the pelvis. The surgeon, standing on the side of the fractured limb, is to apply a longitudinal linen compress to the whole front of the leg and thigh, taking care to make two openings in it, corresponding with the sides of the patella. This strip of linen is to be then fixed, by two or three turns of a roller, at the ankle; its lower end then turned up, and the roller also applied over it. The circular bandage is next to be continued to just below the knee, when

the surgeon is to push upward the lower portion of the patella, apply two or three turns of the roller just below it, in order to fix it; desire an assistant to hold the roller, enjoin him, who has the care of the longitudinal piece of linen, to draw it up firmly, while the integuments are pushed in the same direction, lest they should sink between the two pieces of the bone. The fingers of the left hand are then to be introduced into the openings of the linen compress, for the purpose of pushing downwards the upper part of the patella.

The two pieces being in accurate contact, the surgeon takes the roller again; carries it obliquely behind the ham, brings it up behind the upper part of the bone, withdraws his fingers, which served to keep it down, substitutes for them two or three moderately tight turns of the bandage, then covers the whole of the knee and thigh with the same. When arrived as high as the upper part of the limb, the assistant, who draws the longitudinal piece of linen forcibly upwards, is to turn down its ends over the circles of the roller, with a few turns of which it is then to be fixed. The bandage is then to be applied round the limb down to the ankle, where its application is to end.

The separation of the lower fragment is further to be prevented by extending the leg on the thigh, and the muscles relaxed by extending the latter on the pelvis. Nothing keeps the leg more surely extended, than a long, strong splint, which Desault next applied to the posterior part of the thigh and leg, and fixed there with a roller, while the thigh itself is to be bent by raising the whole limb, from the heel to the top of the thigh, with pillows, which, of course, must form a gradual ascent from the tuberosity of the ischium to the foot.

Desault used also to keep all the apparatus wet with the saturnine lotion. *(Desault par Bichat.)*

The above method certainly fulfils every indication; and the chief trouble of the surgeon is to keep the bandages from becoming too slack. In this country, practitioners overlook many little niceties of apparatus, which the French are, perhaps, too fond of, and, in the case of a fractured patella, trust to the roller, applied with tolerable tightness, just above the upper piece of the bone, and then over the knee, in the form of a figure of 8, while the limb is kept in the above position, with a splint and pillows.

The broken patella is almost always united by a ligamentous substance, instead of a bony one. Pott, and some others, thought, that there being commonly an interspace afterwards between the two pieces of the patella, with a certain length of the connecting substance might be advantageous in the motion of the joint; but Desault always noticed, that the greater the distance between the two pieces of the bone, the greater was the difficulty afterwards in walking up a rising, or over an unequal ground.

Fractures of both Bones of the Leg.

These may be transverse or oblique. The longitudinal derangement is much less common than the horizontal or angular. In the former case, the inferior pieces are almost always drawn outward and backward, whilst the superior project internally and forward. The angular derangement may be produced either by the action of the posterior muscles of the leg, or the weight of the body, and in either case the angle will be salient anteriorly. The salient angle may take place posteriorly, if the heel be too much raised. The derangement in the circumference arises from the inclination of the foot inward or outward, but it most commonly falls in the latter direction. The longitudinal derangement is extremely rare, and cannot easily take place in transverse fractures, on account of the considerable extent of the fractured surfaces; but, in oblique fractures, the inferior pieces are almost always drawn upward by the action of the posterior muscles of the leg, in which position of the parts the lower ends of the superior portions project anteriorly, and may be felt by the hand. Sometimes, however, when the solution of continuity is obliquely downward and outward, the anterior projection will be produced by the lower pieces. In some cases, the pointed ends of the bones tear and penetrate the integuments in both kinds of derangement, so as to cause a compound fracture.

The usual symptoms denoting a fracture of the leg, are, change of direction and shape of the limb, pain, and

incapability of motion, mobility of the fractured pieces, and a crepitus always distinct, &c.

Fractures, which take place near the knee, are not much subject to derangement, on account of the thickness of the bone in that part; but are, however, more dangerous than those of the middle part, as being subject to be followed by a stiffness of the knee-joint. Fractures of the inferior part are still more dangerous. Oblique fractures are very difficult to be managed; and when their derangement is upward and outward, the integuments are very apt to be torn by the projecting points of the superior portion of bone. (*Boyer.*)

Fractures of the Tibia.

If the fracture take place near the ankle, the great extent of the fractured surfaces prevents any considerable derangement of the fractured portions; and the fibula acting as a support on the external side, contributes also to this effect.

This circumstance renders a diagnosis of fractures of the tibia often very difficult, and the difficulty is further increased by the little pain and inconvenience produced by such a fracture, with which persons have been known to walk.

Whenever there is reason to suspect the accident, in consequence of a blow or a fall on the leg, the part should be minutely examined. The fingers are to be moved along the anterior side of the tibia, the slightest inequality in which may be easily perceived, on account of its being covered only by the skin; and the motion of the pieces may be perceived, by grasping the opposite ends of the bone and pushing them in contrary directions. This motion, however, and the crepitus which accompanies it, are very indistinct, on account of the fibula not allowing the fractured portions to be sufficiently moved on one another. (*Boyer.*)

Fractures of the Fibula.

Sometimes the foot is turned forcibly inwards or outwards, in which case, the ligaments of the articulation are always strained, and very frequently lacerated. It is in a case of this kind, when the foot is forcibly turned outwards, that the fibula is fractured by the pressure of the astragalus. We have given Pott's account of such accident in the article *Dislocation*.

To the fractures, produced by this cause, are to be added those resulting from a fall, or a blow on the external side of the leg, in which the bone always yields in the part to which the force is immediately applied.

Whatever be the manner in which a fracture of the fibula is produced, the pieces are not susceptible of the longitudinal derangement; but are in all cases drawn a little towards the tibia, by the muscles placed in the interval between them. Hence a fracture of this bone will be best ascertained by pressing the fractured portions inward. This symptom, and the consequent crepitus, may be also observed in the abduction and adduction of the foot. These signs are more evident when the fracture takes place near the ankle, than when it happens high up, where the bone is covered with thick muscles. (*Boyer.*)

Treatment of Fractures of the Leg.

As in cases of fractured thighs, the practitioner may adopt either a bent or straight position of the limb. In this country, surgeons mostly follow Mr. Pott's advice, and select the first one, of which alone I shall treat.

"In the fracture of the fibula only, the position is not of much consequence; because by the tibia remaining entire, the figure of the leg is preserved, and extension quite unnecessary; but still, even here, the laying the leg on its side, instead of on the calf, is attended with one very good consequence, viz. that the confinement of the knee, in a moderately bent position, does not render it so incapable of flexion and use afterward, as the straight or extended position of it does, and consequently that the patient will be much sooner able to walk, whose leg has been kept in the former posture, than he whose leg has been confined in the latter.

"In the fracture of both tibia and fibula, the knee should be moderately bent, the thigh, body, and leg, being in the same position as in the broken thigh. If common splints be used, one should be placed underneath the leg, extending from above the knee to below the ankle, the foot being properly supported by pillows, bolsters, &c. and another splint of the same length should be placed on the upper side, comprehending both joints in the same manner; which disposition of splints ought always to be observed, as to their

length, if the leg be laid extended in the common way, only changing the nominal position of them, as the posture of the leg is changed, and calling what is inferior in one case, exterior in the other; and what is superior in one, in the other inferior.

"If Mr. Sharp's splints be made use of, there is in one of them a provision for the more easy support of the foot and ankle, by an excavation in, and a prolongation of the lower, or fibular splint, for the purpose of keeping the foot steady." (*Pott.*)

The strong muscles of the leg being relaxed by placing the limb in the bent position, as advised by Pott, the surgeon is to make such extension as seems requisite, for bringing the ends of the fracture into even apposition. Then he is carefully to raise the leg a little way from the surface of the bed, by taking firmly hold of the limb, above and below the fracture, and elevating the broken bones together, in such a way, as shall keep both the upper and lower portions as nearly as possible on the same level. At this moment, an assistant should put, exactly beneath the leg, the under splint, which has been previously got ready, by covering it with a soft pad, and laying over this an eighteen-tailed bandage. The limb is now to be gently depressed, till it rests on the apparatus. The surgeon, before proceeding further, must once more observe that the ends of the bones are evenly in contact. Being assured of this important point, he is to apply a piece of soap-plaster, and lay down the tails of the bandage. Another soft pad, well filled with tow, is next to be put over the upper surface of the leg, and over that the other splint, when the straps are to be tightened.

Fractures of the Scapula.

The acromion, inferior angle, neck, and coracoid process, are the parts most commonly fractured. When the acromion is broken, the weight of the arm, and the contraction of the deltoid muscle, draw it downward, while the trapezius and levator scapulæ draw the rest of the bone upward and backward. The serratus major anticus draws forward the lower angle, when this part is fractured, while the rest of the scapula remains in its natural situation; or, if the angular portion be considerable, the teres major, and some fibres of the latissimus dorsi, contribute to its derangement forward and upward.

The pectoralis minor, coraco-brachialis, and short heads of the biceps, concur in drawing forward and downward the coracoid process, when it is broken. (*Boyer.*)

When the neck of the scapula is fractured, the weight of the arm makes it drop down so considerably, as to give the appearance of a dislocation; but, the facility of lifting the os brachii upward, the crepitus, and the falling of the limb downward again, immediately it is unsupported, are circumstances clearly marking, that the case is not a dislocation. Sometimes great pains, and a crepitus, are experienced, on moving the shoulder-joint, after an accident; and yet the spine, flat part of the scapula, and all the above parts, are not broken. In this circumstance, we may suspect either that a small portion of the head of the os brachii, or a little piece of the glenoid cavity of the scapula, is broken off; which latter occurrence I think is not a very uncommon one.

Fractures of the acromion are attended with pain, which is increased by the motion of the arm; the form of the shoulder is changed; the broken part which has descended, may be raised, by bringing up the elbow close to the side. (*Boyer.*)

When the inferior angle is broken, the part remains motionless, while the rest of the scapula is moved; and it is so separated, that no mistake can be made. (*Boyer.*)

Fractures of the spine and body of the bone, are all attended with a crepitus; and, in the first cases, an irregularity in the course of the spine of the bone may generally be easily felt.

TREATMENT.

When the scapula is fractured longitudinally, or transversely, it is merely necessary to fix the arm to the side by means of a bandage, which includes the arm and trunk, from the shoulder to the elbow. Thus the motions of the shoulder, which are only concomitant with those of the arm, are prevented. (*Boyer.*)

When the inferior angle is broken, and drawn downward and forward by the serratus major anticus, the scapula must be pushed toward the fragment,

by pushing the arm itself inward, downward, and forward, where it is to be kept with a roller. The fragment is also to be kept backward as much as possible, with compresses and a roller. The arm is to be supported in a sling. (*Boyer.*)

The fractured acromion requires the arm to be so raised, that the head of the os brachii will push up the acromion, while an assistant pushes the scapula forward and downward, in a contrary direction to that of the arm. To maintain this position, a circular bandage is to be applied round the arm and body.

Desault used to apply also a small pillow under the axilla, before putting on the bandage, to make the head of the os brachii project more upward, on bringing the arm near the side. Compresses are to be placed on the scapula, which, with this means, and a roller, are to be kept downward and forward.

When the coracoid process is fractured, the muscles attached to it are to be relaxed, by bringing the arm forwards towards the breast, and confining it there in a sling; while the shoulder is kept downward and forward, and a compress confined just under the broken part, with a roller.

The treatment of a fracture of the neck of the scapula consists in raising the shoulder to its proper height; in completely taking off the weight of the arm, by wearing a proper sling, which always supports the limb from the elbow to the fingers; and in entirely preventing all motion of the arm by binding it to the trunk with a roller.

Fractures of the Clavicle.

This bone being long and slender, unsupported at its middle, and protected externally only by the integuments, is very often broken. Its serving to keep the scapula at a proper distance from the sternum, and as a *point d'appui* for the os brachii, every impulse of which it receives, makes its fractures still more common.

It may be broken at any part; but, its middle, where the curvature is greatest, is most frequently the situation of the injury. It is not very often fractured at its scapulary extremity. However, a direct force, falling on the shoulder, may break any part of the clavicle, on which it immediately acts. The soft parts, in this kind of case, will also be contused, or even lacerated.

A comminuted fracture may be thus occasioned, and, if the violence be very great, the subclavian vessels and nerves may be torn. The fall of a heavy body on the shoulder often gives rise to a paralysis of the arm.

When the fracturing force is applied to the ends of the bone, as by a fall on the point of the shoulder, or on the hands, while the arms are extended, the clavicle may be very much bent, and fractured so obliquely, that the broken portions shall protrude through the skin.

Fractures of this bone are usually attended with derangement of the broken ends, except when the injury takes place at the scapulary extremity, and within the ligament, tying together the clavicle and coracoid process.

The external portion of the clavicle is always that which is deranged. The internal part cannot be moved out of its natural situation, by reason of the costo-clavicular ligaments, and of its being drawn in opposite directions, by the sterno-cleido-mastoideus, and pectoralis major, muscles. The external portion, drawn both by the weight of the arm, and the action of the deltoid muscle, and forward and inward by the pectoralis major, is carried under the internal portion which projects over it. The broken clavicle no longer keeping the shoulder at a due distance from the sternum, the arm falls forward towards the breast. The patient finds it impossible to put his hand to his forehead, because this act makes a semicircular motion of the humerus necessary, which cannot be done while that bone has not a firm *point d'appui*. The shoulder and upper extremity may be observed to be nearer the breast, than those of the opposite side. The motion of the pieces of bone on one another may be felt, as well as the projection of the end of the internal portion. When the shoulder is moved, a crepitus may also be perceived, but doing this is productive of great pain, and the diagnosis is so obvious, that it is quite unnecessary.

The ancients, and many moderns, have supposed, that in order to set a fracture of the clavicle, the shoulder must be drawn back, and fixed in that position. The patient was placed on a low stool, so that an assistant might put his knee between his shoulders,

which he drew back at the same time with both hands, while the surgeon applied the bandage which was to keep the parts in this position. But, in thus drawing the shoulders towards one another, the scapula is obviously pushed towards the sternum, and with it the external portion of the clavicle, which passes under the internal one.

The figure of 8 bandage has commonly been used for maintaining the parts in this portion. While the assistant keeps back the shoulders, as above described, the surgeon is to apply one end of a roller to the armpit on the side affected, and then make it cross obliquely to the opposite shoulder, round which it is to pass, and from this to the other shoulder, about which it is to be rolled in the same manner, and crossed afterwards repeatedly before and behind. The tightness, with which it is necessary to apply this bandage, produces a great deal of excoriation about the armpits, and the effect is to make the ends of the fracture overlap each other, the very thing which it is wished to avoid. Boyer remarks, that the iron-cross proposed by Heister, the corselet described by Brasdor in the *Mem. de l'Acad. de Chir.* and the leather strap recommended by Brunninghaussen, are only modifications of the figure of 8 bandage, and not at all better.

Extension is to be made, by means of the limb, which is articulated with the fractured bone. This is done by converting the humerus into a lever, by carrying its lower end forward, inward, and upward, pushing the shoulder backward, upward, and outward, and putting a cushion in the armpit to serve as a fulcrum.

Desault used to put in the armpit a hair or flock cushion, five or six inches long, and three inches and a quarter thick at its base. Two strings are attached to the corners of the base, placed upward, which cross the back and breast, and are tied on the shoulder of the other arm. The cushion being thus placed in the armpit, and the forearm bent, Desault used to take hold of the patient's elbow, and carry it forward, upward, and inward, pressing it forcibly against the breast. By this manœuvre, the humerus carries the shoulder outward, the ends of the fracture become situated opposite each other, and all deformity is removed.

An assistant is to support the arm in this position, while the surgeon, having a single headed roller nine yards long, is to place one end of it in the armpit of the opposite side, and thence apply the bandage over the upper part of the arm, and across the back to the same situation. The arm and trunk are to be covered with such circles of the roller, as far down as the elbow, drawing the bandage more tightly, the lower it descends.

Compresses, dipped in camphorated spirit, are next to be placed along the fractured bone. Desault then used to take a second roller, of the same length as the first, and put one end of it under the opposite armpit, whence it was carried across the breast over the compress and fracture, then down behind the shoulder and arm, and, after having passed under the elbow, upward on the breast. Desault next brought it across to the sound shoulder, under and round which he passed it, for the purpose of fixing the first turn. He then conveyed the roller across the back, brought it over the compresses, carried it down in front of the shoulder and arm, under the elbow, and obliquely behind the back to the armpit, where the application began. The same plan is repeated, until all the roller is spent. The apparatus is to be secured by pins, wherever they promise to be useful, and the patient's hand is to be kept in a sling.

Boyer has invented an apparatus for fractured clavicles, which is more simple, than that employed by Desault.

The cushion is to be applied under the arm. The apparatus consists of a girdle of linen cloth, which passes round the trunk on a level with the elbow. It is fixed on by means of three straps, and as many buckles. At an equal distance from its extremities are placed externally on each side two buckles, two before and two behind the arm. On the lower part of the arm, is to be laced a piece of quilted cloth, five or six fingers broad. Four straps are attached to it, which correspond to the buckles on the outside of the girdle, and serve both to keep the arm close to the trunk, and from moving either backward or forward. (See *Boyer's Lectures upon Diseases of the Bones.*)

Certainly, the methods recommend- by Desault and Boyer are very judici-

ous and scientific. They are not, however, much adopted in this country, perhaps in consequence of the universal aversion among English surgeons to all apparatuses, which are not exceedingly simple. It is to be hoped, at the same time, that, in the treatment of fractured clavicles, they will always attend to the principles, which Desault and Boyer have inculcated. If they understand, why the position of the arm should be such as these eminent surgeons point out, they will have no difficulty in doing what is proper, and with a cushion sling, and a couple of rollers, they will easily maintain the proper posture.

I cannot quit this subject without cautioning the surgeon never to fall into the error of supposing the rising end of a broken clavicle to be the end which is displaced. This is the one which is truly in its right situation, and which has often been made, by injudicious pressure, to protrude through the integuments, as I myself have seen.

FRACTURES OF THE OS BRACHII, OR HUMERUS.

This bone may be fractured in any point of its length; in the middle, at either extremity, or above the insertion of the pectoralis major, latissimus dorsi, and teres major. This last case is termed fracture of the neck of the humerus; but that denomination has not the merit of being strictly anatomical. It is possible, however, that what is strictly called the neck of the humerus may be fractured, particularly, by a gun-shot wound. By neck of the humerus, we understand that circular narrowing, which separates the tuberosities from the head.

The fractures of this bone may be transverse or oblique, simple or compound. In short, whatever has been said of the differences of fractures in general, is applicable to these in particular. The same may be said of the causes, whether acting on the extremities of the bone, or immediately on the part fractured.

The transverse fractures of the middle part, under the insertion of the deltoid muscle, are attended with but a trifling derangement. The brachialis internus and the triceps, attached posteriorly and anteriorly to both fractured portions, counteract one another, and admit only a slight angular derangement. When the fracture takes place above the insertion of the deltoid muscle, the inferior portion is first drawn outward and then upward on the external side of the superior. Fractures of the humerus, near its lower end, such particularly as are transverse, are not subject to much derangement: an effect which is to be attributed to the breadth of the fractured surfaces; to their being covered posteriorly by the triceps muscle, and, anteriorly, by the brachialis interior, which admit only a slight angular derangement by the inferior portion being drawn a little forward.

Oblique fractures are always attended with derangement, whatever be the part fractured. The inferior portion being drawn upward by the action of the deltoides, biceps, coraco-brachialis, and long portion of the triceps, glides easily on the superior, and passes above its lower extremity. Finally, fractures of the neck of the humerus are always attended with derangement, which is produced by the action of the pectoralis major, latissimus dorsi, and teres major, which being attached to the lower portion near its superior extremity, draw it first inward and then upward, in which last direction it is powerfully aided by the biceps, coraco-brachialis, and long portion of the triceps. The superior portion itself is, in this case, directed a little outward by the action of the infraspinatus, supraspinatus, and teres minor, which make the head of the humerus perform a rotatory motion in the glenoid cavity.

We proceed to examine the different marks, by which these fractures may be ascertained.

The shortening and change in the direction of the limb, the crepitus, which may be very distinctly perceived by moving the broken pieces in opposite directions, the pain, and impossibility of moving the arm, &c. joined to the history of the preceding circumstances, render it easy to establish a diagnosis.

Fractures of the neck of the humerus are not so easily ascertained, and have been frequently, for want of attention, confounded with luxations of that bone. The diagnostic symptoms of these two affections are however very different.

When the neck of the humerus is fractured, a depression is observed at the superior extremity and external

side of the arm, which is very different from that accompanying the luxation downward and inward of that bone. In the latter case, under the projection of the acromion, a deep depression is found in the part which the head of the humerus naturally occupies; whereas, in the fracture of the neck of that bone, the shoulder retains its natural form, the acromion does not project, and the depression is found below the point of the shoulder. Besides, in examining the armpit, instead of finding there a round tumour formed by the head of the humerus, the fractured and unequal extremity of that bone will be easily distinguished. The motion of the broken portions, and the crepitus, which may be produced by moving them, serve still further to establish the diagnosis. (*Boyer on the Bones, Vol.* 1.)

A simple fracture of the body of the humerus is not very dangerous: in that near the ends of the bone, there is some reason to expect the neighbouring joint to inflame, and remain stiff for some time after the cure.

In ordinary fractures of the os brachii, it is usual to apply two pieces of soap-plaster, which together surround the limb, at the situation where the accident has happened. Extension, if necessary, being now made by an assistant, who at once draws the lower portion of the bone downward and bends the elbow, the surgeon is to apply a roller round the limb. The external splint is to extend from the acromion to the outer condyle, and, being lined with a soft pad, the wood cannot hurt the limb by pressure. The internal splint is to reach from the margin of the axilla to a little below the inner condyle, and is to be well guarded with a pad, filled with tow, or any other soft materials.

Some surgeons are content with the application of two splints; but, though the two, above described, are those on which we are to place the greatest reliance, yet, as the cylindrical form of the arm conveniently allows us completely to incase this part of the limb in splints, I shall always be an advocate for the employment of four; one on the outside, one on the inside, one on the front, and another on the back of the arm. These are to be carefully fixed in their respective situations by tapes. (See *First Lines of the Practice of Surgery, p.* 527.)

The elbow and whole of the forearm are to be quietly and effectually supported in a sling, throughout the treatment of the case.

FRACTURE OF THE HEAD, OR NECK OF THE OS BRACHII.

1. *General Considerations.*

Chirurgical language here differs from that adopted by anatomists, and, under the name of fracture of the neck of the humerus, is not meant, that of the circular, hardly perceptible depression, which separates the head from the tuberosities of this bone. By this expression, surgeons imply the fracture of that contracted part of the humerus, which is bounded above by these tuberosities, which below is continuous with the body of the bone; which has the tendons of the pectoralis major, latissimus dorsi, and teres major inserted below it; and which many practitioners extend even as low as the insertion of the deltoid muscle.

Indisputable facts, however, prove the possibility of the anatomical neck of the bone being fractured, and C. Larbaud shewed Bichat the humerus of a young man, aged 17, the head of which bone was accurately detached from its body, by a division which had obliquely interested the upper part of the tuberosities. But there are too few instances of this kind, in the records of surgery, to admit of our taking a general view of this sort of fracture."

2. *Varieties and Causes.*

The operation of external bodies, active, when driven against the shoulder, passive, when the shoulder or arm is driven against them, is the constant cause of the fracture of the neck of the humerus. The solution of continuity, thus occasioned, is sometimes direct, and at other times, the result of a *contre-coup.*

The first almost always arises from a fall on the fleshy part of the shoulder, and, as the motion must be exceedingly violent to produce this effect through the thick covering formed by the deltoid, this muscle is sometimes contused and affected with ecchymosis. Even blood may be effused from some of the ruptured articular veins, or arteries, and form a collec-

tion, which Desault has remarked should be speedily opened.*

The counter-fracture arises from a fall on the elbow, when this part is separated from the trunk, or else from a fall on the hand, which a natural instinct makes us extend, with the arm and forearm, to protect ourselves at the time of falling.

3. *Symptoms, &c.*

The whole of the symptoms of a fracture of the neck of the humerus sufficiently denote its existence; but, it is not always an easy matter to see this whole, and here more difficulties occur in the diagnosis, than in any other fracture of the humerus.

There is an acute pain experienced at the moment of the fall; sometimes, the noise of something breaking is heard. There is always a sudden inability to move the limb, which, left to itself, remains motionless. But, on external force being applied to the member, this readily yields, and admits of being moved, with the greatest ease, in every direction.

An acute pain attends such motion, which, carried too far, may cause bad consequences, as has been observed in patients in whom the fracture has been mistaken for a dislocation.

Below the acromion a depression is remarkable, always situated lower down, than that which attends the latter accident. If we place one hand on the head, while the lower part of the bone is moved in various directions with the other hand; or if, while extension is made, an assistant communicates to the bone a rotatory motion, the following circumstances are perceived: 1. We discover, that the head of the humerus remains motionless. 2. A more or less distinct crepitus, arising from the two ends of the fracture rubbing against each other. These two symptoms are invariably characteristic of the accident; but the swelling of the joint sometimes prevents us from detecting them.

The ends of the fracture are sometimes not at all deranged, and, as then most of the symptoms are absent, the diagnosis is rendered still more difficult. In general, however, the ends of the fracture are displaced, and, in this circumstance, it is the lower one which is out of its proper position, and not the upper one, which is of little extent, and is not acted upon by many muscles.

The displaced state of the fracture is, generally, not very perceptible, in regard to length, unless the fracture be very oblique, and its pointed spiculæ irritate the muscles, and make them contract with increased power; or unless the blow, which is very violent, continue to operate after the bone has been broken, and force the ends of the fracture from their state of apposition. In this way, the body of the bone has been known to have been drawn or driven upward, so as to protrude through the deltoid muscle, and integuments far above the height of the head of the bone.

But commonly, as Petit observes, the weight of the limb powerfully resists the action of the muscles, and the derangement of the fracture is more liable to be transverse. In this circumstance the lower end of the fracture is displaced outward or inward, and very rarely in any other direction. In the latter case, which is much the more frequent, the elbow is separated from the trunk, and cannot be brought near it without pain; in the instance of the bone being displaced outward, the limb has a tendency to the opposite direction.

4. *Prognosis.*

A fracture of the neck of the humerus is not a serious event, and if, as Heister remarks, *prope caput, fractura pejor, et difficilius curatur*, it is less on account of the nature and situation of the disease, than of the difficulty experienced in maintaining the ends of the fracture in contact.

5. *Reduction.*

This object usually presents but few difficulties, and the multiplicity of means formerly employed for its accomplishment, serve only to exhibit the uselessness of such resources.

Most of the machines, designed for reducing dislocations of the humerus, have been applied to this kind of frac-

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* I must enter my protest against such practice, however; both because I have observed that large extravasations of blood about the shoulder are usually very soon absorbed, and making an opening may do harm, and cannot do good.

ture. To such machines succeeded the use of pulleys, weights suspended to the limb, &c. useless plans, as their only tendency was to increase the natural power, which was always more than sufficient.

Petit proposes to reduce the fracture, by first placing the arm at a right angle with the body; and then making extension with the hands of an assistant, applied above the elbow; while the counter-extension is made by another assistant, who is to take hold of the fleshy part of the shoulder. This method is liable to three kinds of inconveniences. It fatigues and even pains the patient; it lessens the extending powers by bringing them near the moveable point; it irritates such muscles as proceed from above to the lower end of the fracture, and thus increases their disposition to contract. Hence difficulties sometimes attended the reduction, which is always simple, when, the trunk being fixed, gentle extension is made on the fore-arm half bent. Desault used to accomplish the reduction in the following way:

The patient may either sit upon a chair, or the edge of a bed. The arm is to be a little separated from the trunk, and carried somewhat forward.

An assistant is to fix the trunk by drawing towards him the arm of the opposite side. This mode of making extension is preferable to that commonly employed, and which is effected by applying the hands to the upper part of the affected shoulder. The other being more distant from the resistance, there is no need for exerting so much power; and the patient's body being quite uncovered, the surgeon can conveniently apply the bandage, without deranging the extension.

A second assistant extends the fore-arm half bent, which he makes use of as a lever, placing one hand behind the wrist for the purpose of a fulcrum. The other hand, applied to the front and middle part of the fore-arm, and making pressure upon it from above downward, represents the power. The ends of the fracture, which are to be placed in apposition, form the resistance.

The relaxation of muscles, produced by the half flexion of the fore-arm, and the position of the arm a little raised from the side, are peculiarly favourable to this mode of extension, recommended by the ancients and English. This method has also the advantage of leaving uncovered every part of the limb, to which the apparatus is to be applied, and thus the assistant's hands can remain in the same position during all the time of applying whatever may be needed.

In this way the reduction takes place of itself, on employing a very little force, methodically directed, according as the fracture is displaced inward or outward. If the surgeon put his hands on the situation of the fracture, it is rather to examine the state of the ends of the broken bone than to accomplish a thing seldom required, namely, what is implied by the term coaptation.

MEANS OF MAINTAINING THE REDUCTION.

All the apparatus for a fracture being only resistances, opposed by art to the powers causing the derangement of the broken part, it follows that the whole should act in an inverse ratio to such powers. We have seen, that these consisted; 1. Of the action of external bodies, favoured by the extreme mobility of the arm and shoulder; 2. Of the action of the latissimus dorsi, pectoralis major, and teres major, which draw inward the lower end of the fracture, or, what is more common, of the deltoid, which pulls it outward; 3. Of the contractions of the muscles of the arm, which tend to draw a little upward the said end of the fracture.

Hence, 1. to render the arm and shoulder immoveable; 2. to bring either outward, or inward, the lower end of the fracture; 3. to draw downward the same; are the three indications, which every bandage, destined for a fracture of the neck of the humerus ought to fulfil. The last object merits less attention, than the two others, because the weight of the arm is alone almost sufficient for the purpose. Desault used to employ the following apparatus for the cure of fractures of the neck of the humerus.

1. Two bandages, one about five or six ells long, the other eight or ten; both being about three finger-breadths wide. 2. Three strong splints, of different lengths, and two finger-breadths broad. 3. A linen pillow, three or four inches thick at one of its ends, terminating at the other in a narrow point, and long enough to reach from the axilla to the elbow. 4. A sling to support

the fore-arm. 5. A towel to cover the whole of the apparatus.

The reduction is to be effected as above explained, and the assistants are to continue the extension. Then the surgeon is to take the first roller, which is to be wet with the aq. veg. min. and is to fix one of its heads by applying two circular turns to the upper part of the fore-arm. The bandage is now to be rolled moderately tight round the arm upward, making each turn overlap two-thirds of that which is immediately below it. When the roller has reached the upper part of the limb, it must be doubled back a few times to prevent the folds, which the inequality of the part would create. The bandage is afterwards to be carried twice under the opposite axilla, and the rest of it, rolled up, is to be brought up to the top of the shoulder, and committed to the care of an assistant.

The first splint is to be placed in front, reaching from the bend of the arm as high as the acromion. The second, on the outside from the external condyle to the same height. The third, behind, from the olecranon to the margin of the axilla. The pillow, interposed between the arm and thorax, serves as a fourth splint, which becomes useless. An assistant applies these parts of the apparatus, and holds them on by applying his hands near the bend of the arm, in order not to obstruct the application of the remainder of the bandage.

The surgeon takes hold of the bandage again, and applies it over the splints with moderate tightness, and the bandage ends at the upper part of the fore-arm, where it began.

The assistants continually keeping up the extension, the surgeon is to place the pillow between the arm and trunk, taking care to put the thick end upward, if the fracture be displaced inward; but downward, if this should be displaced outward, which is most common. It is to be attached by two pins to the upper part of the roller.

The arm is to be brought near the trunk, and fixed upon the pillow, by means of the second roller, applied round the arm and thorax. The turns of this bandage should be very tight below, and rather slack above, if the fracture should be displaced inward; but, if outward, they should be slack below, and tight above.

The fore-arm is to be supported in a sling, and the whole of the apparatus is to be enveloped in a napkin, which will prevent any friction from deranging the bandages.

If we compare the effect of the above apparatus in fulfilling the indications above specified, we shall easily see, that they are very well accomplished. The arm, firmly fixed against the trunk, can only move with it, and then nothing displaces the lower end of the fracture, which is equally motionless. The shoulder cannot communicate any motion to the upper end of the fracture. The pillow, differently disposed, according to the direction, in which the lower extremity of the fracture is displaced, serves to keep this part in the opposite position.

Should this part of the bone project inward, the thick end of the pillow will remove it further from the chest. The bone will be kept at this distance from the side by the turns of the bandage, which being very tight downward, will act upon the limb as a lever, the fulcrum for which will be the pillow, and the resistance, the action of the pectoralis major, latissimus dorsi, and teres major. Thus the bandage will have the effect of bringing the elbow nearer the trunk, and move the lower end of the fracture in the opposite direction, so that it may be here considered as an artificial muscle, directly opposing the natural ones.

When the lower end of the fracture is drawn outward, which is most commonly the case, the contrary effect will be produced, both from the pressure exercised by the bandage on the upper end of the displaced portion of the bone, and from the situation of the elbow, which is kept outward by the thick part of the pillow. The outer splint will also prevent the lower end of the fracture from being displaced outward, both by its mechanical resistance to the bone, and by compressing the deltoid muscle, which is the chief cause of the derangement in this direction. All derangement of the lower end of the fracture, forward or backward, is prevented by the front and back splints.

All derangement in regard to length, already prevented by the weight of the limb, is still more effectually hindered by the compression exercised on the muscles of the arm, causing such de-

rangement both by the splints and roller.*

FRACTURES OF THE LOWER END OF THE OS BRACHII, WITH SEPARATION OF THE CONDYLES.

Fractures of the os brachii, with detachment of its condyles, seem to have escaped the notice of most authors, who have written on the diseases of the bones. The ancients have transmitted to us nothing upon the subject. Heister only mentions the fracture of the lower end of this bone, with a view of making an unfavourable prognosis. This accident is not uncommon, and Desault, in particular, had frequent occasion to meet with it.

Whatever the cause of this kind of fractures may be, they are commonly produced in such a way, that a longitudinal division separates the two condyles from each other, and, extending more or less upward, is bounded by another transverse, or oblique division, which occupies the whole thickness of the bone. Hence, there are three different pieces of bone, and two fractures.

Sometimes the division is more simple. Then, taking a direction outward, or inward, it crosses obliquely downward the lower end of the os brachii, terminates in the joint, and only detaches one of the condyles from the body of the bone. The other remains continuous with it.

In the first case, the deformity is greater, and the fractured part is more moveable. When pressure is made, either before, or behind, on the track of the longitudinal fracture, the two condyles becoming further separated from each other, leave a fissure between them, and the fractured part is widened. The fore-arm is almost always in a state of pronation. On taking hold of the condyles, and moving them in different directions, a very distinct crepitus is perceived.

In the second case, the separation of the condyles from each other is not so easy; but, a crepitus can always be distinguished, on moving the detached condyle. In one case, in which the external condyle was the only one broken, Desault found the limb always supine: a position, in effecting which, the muscles inserted into this part are, doubtless concerned.

An acute pain, the almost inevitable effect of bending, or extending, the fore-arm; the habitual half-bent state of this part of the limb, and sometimes a subsequent swelling of it, together with more or less tumefaction around the joint, are observable in both kinds of cases. These accidents may also be complicated with wounds, splinters of bone, &c. when the blow has been very violent, or a pointed piece of the bone protrudes through the flesh.

PROGNOSIS.

Almost all writers consider the communication of a fracture with a joint, as a fatal kind of complication. Swelling and inflammation of the adjacent parts; continuance of pain after the reduction; large abscesses; even mortification of the soft parts, and caries of the bones, are, according to such authors, the almost inevitable consequences of these fractures, and anchylosis the most favourable termination. Paré, Petit, Heister, Duverney, all give this exaggerated picture of these accidents.

Analogous fractures of the olecranon and patella shew, that this representation is magnified beyond truth. Modern observation has dispelled the ancient doctrine of the effusion of callus in the joint, and with it one of the principal causes, assigned by authors for the symptoms they so much dread.

The communication of the cavity of the joint with the external air might here indeed, have more real influence; this can only occur in compound fractures. Desault has often learned from experience, that the contact of air is not so dangerous, as has been supposed.

The defect in the mode of treatment was, formerly, the general cause of all the ill consequences. Desault has never seen them in his extensive practice.

REDUCTION, AND MANNER OF MAINTAINING IT.

The detached condyles, being drawn in opposite directions by the muscles of the arm and fore-arm, commonly remain unmoved between these two pow-

* See Œuvres Chirurgicales de Desault. Par Bichat. Tome 1.

ers, and are but little displaced. External force may, however, put them out of their proper situation, and they may then become displaced forward, or backward, or they may separate from each other sideways, leaving an interspace between them. The apparatus, should, therefore, resist them in these four directions, and this object is easily accomplished by means of four splints, kept on by a roller. The two lateral splints are, in particular, necessary, when the condyles are separated from the body of the bone, with an interspace between them. If one of them be still continuous with the humerus, the splint on this side will be of less use.

There is no occasion for the apparatus to extend as high as when the arm is fractured higher up. Of what avail, in steadying the fractured part, are the circles of the bandage, applied to the body of the bone, so much above the injury? Their only utility would consist in restraining the action of the brachialis and triceps, by compressing these muscles.

On the other hand, the roller should be continued over the fore-arm, in order that the joint, according to the judicious precept of Paulus Ægineta, may correspond to the middle of the bandage, which is here firmer, than any where else. This method is also of use by producing a gentle compression on the muscles implanted into the condyles.

Desault recommends having the front and back splints flexible at their middle part, which should be applied to the bend of the arm and elbow.*

The detail of the reduction of the fracture, and application of the roller and splints, becomes useless after what has been said. A further account may be found in the work mentioned at the bottom of the page.

FRACTURE OF THE FORE-ARM.

The fore-arm is much more frequently broken, than the arm, because external force operates more directly upon it, than the latter part, especially, in falls, on the hands, which are frequent accidents. Bichat mentions, in his account of Desault's practice, that fractures of the fore-arm often held the first place in the comparative table of such cases, kept at the Hôtel-Dieu.

We know, that the fore-arm is composed of two bones, the ulna and radius. The last is much more liable to fractures, than the first one, because it is articulated with the hand by a large surface. All the shocks, received by the latter part, are communicated to the radius. The situation of this bone more immediately exposes it to such causes, as may break it; a circumstance, which we may readily convince ourselves of on the first inspection. Both bones of the fore-arm may be broken at the same time, or one alone may be fractured One fracture has been absurdly termed complete; the other, incomplete.

FRACTURES OF BOTH BONES.

These may occur at the extremities, or middle of the fore-arm. They are frequent at the middle; very common below; but, seldom happen at the upper part of the fore-arm, where the numerous muscles, and the considerable thickness of the ulna, resist causes, which would otherwise occasion the accident. The bones are usually broken in the same line; but, sometimes, in two different directions. The fracture is almost always single; but, in some instances, it is double, and Desault, in particular, was one day called to a patient, over whose fore-arm the wheels of a cart had passed, so as to break the bones, at their middle and lower part, into six distinct portions. The middle ones, notwithstanding they were quite detached, united very well, with hardly any deformity.

These accidents are most commonly occasioned by direct external violence; but, occasionally, they are produced by a counter-stroke, which is generally the case, when the patient has fallen on his hand. But, in this instance, as the hand is principally connected with the lower broad articular surface of the radius, this bone alone has to sustain almost the whole shock of the blow, and hence is usually the only one broken.

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* Œuvres Chirurgicales de Desault. Par Bichat. Tome 1.

SYMPTOMS.

It is, in general, difficult to be deceived by the symptoms, indicating fractures of the fore-arm. Motion at a part of the limb, where it was previously inflexible; a crepitus, almost always easily felt; sometimes a distinct depression in the situation of the fracture; a projection of the ends of the fracture beneath the skin, but, a less common symptom; pain produced by moving the part; a noise sometimes audible to the patient at the moment of the accident; an inability to perform the motion of pronation and supination; and an almost constant half-bent state of the fore-arm; are the symptoms, which, with the phenomena, common to all other fractures, characterize this one. These are sufficient to dispel all doubts, which immense swelling of the limb may create.

There is one case, however, in which, the fracture being very near the wrist-joint, similar appearances to those of a dislocation of this part may arise. But, attention to whether the styloid processes, are above, or below, the deformity, will discover whether the cause be a fracture, or dislocation. In a fracture the part is also more moveable, and there is a crepitus.* As Boyer remarks, the two cases may be distinguished by simply moving the hand, by which motion, if there be a luxation without fracture, the styloid processes of the radius and ulna will not change their situation; but, if a fracture do exist, these processes will follow the motion of the hand.†

The connexion of the two bones of the fore-arm, by the interosseous ligament, which occupies the interval by which they are separated, and the manner, in which the muscles which are attached to both, are inserted into them, render the derangement of the broken pieces in the longitudinal direction very difficult; and, in reality, a derangement in this direction has been seldom observed, and never to any considerable degree: when it does take place, it is to be ascribed to the cause of the fracture, rather than to muscular contraction. The derangement in the direction of the diameter, on the contrary, always takes place in such a manner, as that the four pieces approach one another, and the interosseous interval diminishes, or is entirely obliterated at that part near the seat of the fracture; which approximation at the ends of the bones causes an evident deformity of the part.

To this must be added the angular deformity, which the fracturing cause always produces, either forward or backward, according to its direction.

Boyer gives the following account of the treatment of a fracture of the fore-arm, both bones being broken.

In order to adjust a fracture of these bones, the fore-arm is to be bent to a right angle with the arm, and the hand placed in a position between pronation and supination. The fore-arm and hand being thus placed, an assistant takes hold of the four fingers of the patient, and extends the fractured parts, while another assistant makes counter-extension by fixing the humerus with both his hands. By these means, the operator is enabled to restore the bones to their natural situation, and to push the soft parts into the interosseous space, by a gentle and graduated pressure on the anterior and posterior sides of the arm Coaptation is very easy in fractures of these bones, as are indeed all the other parts of the operation, in which effort and violence are not at all required.

The fracture being thus set, the bones are kept in their place by applying first on the anterior and posterior sides of the fore-arm two longitudinal and graduated compresses, the base of which is to be in contact with the arm. The depth of these compresses should be proportioned to the thickness of the arm, increasing as the diameter of the arm diminishes. In the next place, the surgeon takes a bandage about six yards long rolled up in one, and makes three turns of it on the fractured part, descends then to the hand by circles partially placed over one another, and envelopes the hand by passing the bandage between the thumb and index: the bandage is then carried upward in the same manner, and reflected wherever the inequality of the arm may render it necessary. The compresses and bandage being thus far applied, the surgeon lays on two splints, one ante-

* Œuvres Chirurgicales de Desault. Par Bichat. Tome 1.
† Boyer on Diseases of the Bones. Vol. 1.

riorly the other posteriorly, and passes the part of the bandage that yet remains over them, in such a manner as entirely to cover them. It may not be unnecessary to remark, that the compresses and splints should be of the same length as the arm. It would be useless to employ lateral splints in this case, unless (what is scarcely ever to be expected or met with) a derangement should have taken place in that direction. It is evident, that lateral splints would counteract the compresses and two other splints, by increasing the radio-cubital diameter of the arm, and by concurring with the action of the pronatores to move the pieces into the interosseous space. The surgeon's attention should be most particularly directed to preserve the interosseous space; for, if this be obliterated, the radius cannot rotate on the cubitus, nor the motion of pronation or supination be executed; and this object may be obtained with certainty by applying the compresses and splints in such a manner as that the fleshy parts may be forced into, and confined in, the interosseous space, and by renewing the bandage every seven or eight days.

If the fracture be simple, and the contusion inconsiderable, the patient need not be confined to bed; he may be allowed to walk about with his arm in a sling.*

OF FRACTURES OF THE RADIUS.

Of all fractures of the fore-arm, this is the most frequent. The radius being almost the sole support of the hand, and placed in the same line with the humerus, is for both these reasons more exposed to fractures, than the ulna.

Fractures of the radius, whether transverse or oblique, near its middle part or extremities, may be caused by a fall or blow on the fore-arm, or, as happens in most cases, by a fall on the palm of the hand. When likely to fall, we extend our arms, and let the hands come first to the ground; in which case, the radius, pressed between the hand on the ground, and the humerus, from which it receives the whole momentum of the body, is bent, and, if the fall be sufficiently violent, broken more or less near its middle part. When, after an accident of this kind, pain and a difficulty of performing the motions of pronation and supination supervene, the probability of a fracture of the radius is very strong. The truth is fully ascertained by pressing with the fingers along the external side of the fore-arm. Also, in endeavouring to perform supination or pronation of the hand, a crepitus and a motion of the broken portions will be perceived, if the bone be in reality fractured. When the fracture takes place near the head of the radius, the diagnosis is more difficult on account of the depth of soft parts over the bone in that part. In this case, the thumb is to be placed under the external condyle of the os humeri, and on the superior extremity of the radius, and at the same time the hand is to be brought into the prone and supine positions. If in these trials, always painful, the head of the bone rests motionless, there can be no doubt of its being fractured. The causes of derangement are here the same as in fractures of the fore-arm, and it can never take place, except in the direction of the diameter of the bone, and is effected principally by the action of the pronating muscles. The ulna serves as a splint in fractures of the radius; and the more effectually so, as these two bones are connected with one another throughout their whole length. Notwithstanding the evident mechanism, which prevents the longitudinal derangement, J. L. Petit has thought that derangement possible.†

When only the radius is fractured, no extension is ordinarily requisite. During the treatment the elbow is to be bent, and the hand put in the mid state, between pronation and supination; that is to say, the palm of the hand is to face the patient's breast. Having reduced the ends of the fracture, when they appear to be displaced, the soap-plaster is to be applied, and over this a slack roller. This bandage is, indeed, of no utility; but it makes the limb seem to the unknowing by-standers more comfortable, than if it were omitted, and, as it does no harm, the surgeon may honestly apply it. However, no one can doubt, that tight bandages may act very perniciously in fractures of the fore-arm, by pressing the radius

* Boyer on the Diseases of the Bones. Vol. 1.
† See Boyer on the Diseases of the Bones. Vol. 1.

and ulna together, causing them to grow to each other, or, at all events, making the fracture unite in an exceedingly uneven manner. Only two splints are necessary; one is to be placed along the inside; the other along the outside of the fore-arm. Soft pads must always be placed between the skin and the splints, in order to obviate the pressure of the hard materials, of which the latter are formed. The inner splint should extend to about the last joint of the fingers; but not completely to the end of the nails; for, many patients, after having had their fingers kept, for several weeks, in a state of perfect extension, have been a very long time in becoming able to bend them again.*

Sometimes, it may be proper to apply a compress just under the ends of the fracture to prevent their being depressed towards the ulna too much, the consequence of which has occasionally been the loss of the prone and supine motions of the hand.

In setting a fractured radius, the hand should be inclined to the ulnar side of the fore-arm.

OF FRACTURES OF THE ULNA.

Fractures of this bone, less frequent than those of the radius, take place generally at its lower extremity, because it is smaller and less covered at that part, than at any other. A fracture of this bone is almost always the result of a force acting immediately on the part fractured; as, for instance, when one falls and strikes the internal side of the fore-arm against a hard resisting body. On applying the hand, judiciously on the inside of the fore-arm, this fracture is easily ascertained by the depression in that part, in consequence of the inferior portion being drawn toward the radius by the action of the pronator radii quadratus. This derangement is in general less, than that which takes place in fractures of the radius. The superior portion of the cubitus remains unmoved, as has been well observed by J. L. Petit.

In this case, the assistant who makes whatever little extension may be necessary, should incline the hand to the radial side of the fore-arm, while the surgeon pushes the flesh between the two bones, and applies the apparatus, as in the preceding case. In all fractures of the bones of the fore-arm, and, particularly, in those which are near the head of the radius, a false anchylosis is to be apprehended, and should be guarded against by moving the elbow gently and frequently, when the consolidation is advanced to a certain degree.†

Fractures of the fore-arm always require this part to be kept quietly in a sling.

FRACTURES OF THE OLECRANON.

The ancients seem to have been little acquainted with fractures of the olecranon, on which subject they have been quite silent, unless Paulus Ægineta alludes to it in the following passage: *Cubitus frangitur—circa partem ad cubiti gibbum.* Even most of the moderns, Petit, Duverney, Bell, &c. have not given a satisfactory account of such cases. The olecranon may be fractured either at its base, or its extremity; but, the first occurrence is the most frequent. The division is almost always transverse, though occasionally oblique. The causes, producing the accident, are, either the action of the muscles, which is a very uncommon one, or external violence, which is much more usual.

With regard to symptoms, the contraction of the triceps, being no longer resisted by being connected with the ulna, draws upward the short fragment, to which it adheres, so as to produce, between it and the lower one, a more, or less evident interspace. This interspace is found situated at the back part of the joint, and it may be increased, or diminished at will, by augmenting the flexion of the fore-arm, and putting the triceps into action, or else extending the limb. Another symptom, is the impossibility of spontaneously extending the fore-arm, the necessary effect of the detachment of the triceps from the ulna. The fore-arm is constantly half-bent, the biceps, and brachialis having no antagonists. The olecranon is, more or less conspicuously, drawn up higher, than the condyles of the os brachii, which latter parts, on the contrary, are naturally situated

* First Lines of the Practice of Surgery. p. 528, 529.

† See Boyer on the Diseases of the Bones. Vol. 1.

higher, than the olecranon, when the fore-arm is half-bent. The upper piece of bone may be moved in every direction, without the ulna participating in the motion. Besides these symptoms, we must take into the account, the considerable pain experienced, the crack sometimes distinctly heard by the patient, and the crepitus frequently perceptible.

The indications are to push downward the retracted portion of the olecranon, and to keep it in this position, at the same time, that the ulna is made to meet it, as it were, by extending the fore-arm. Desault says, however, it should not be completely extended, as when the pieces of bone touch at their back part, they leave a vacancy in front, which is apt to be followed by an irregular callus, prejudicial to the future free motion of the elbow. Hence, this celebrated practitioner used to put the arm between the half-bent state and extension. This posture, however, would soon be changed, if permanent means were not taken to maintain it. Desault, with this view, was in the habit of applying a splint along the fore-part of the arm. But, position evidently only operates on the lower part of the olecranon, by approximating it to the upper one. The latter requires also to be brought near the latter, and fixed there, which is, doubtless, the most difficult object to effect, because the triceps is continually resisting.

Desault used to adopt the following method: the fore-arm being held in the above position, the surgeon is to begin applying a roller round the wrist, and to continue it as high as the elbow. The skin, covering this part, being wrinkled in consequence of the extension of the limb, might insinuate itself between the ends of the fracture, and consequently it must now be pulled upward by an assistant. The surgeon is then to push the olecranon towards the ulna, and confine it in this situation with a turn of the roller, with which the joint is then to be covered, by applying it in the form of a figure of 8.

A strong splint, a little bent, just before the elbow, is next to be laid along the arm and fore-arm, and fixed by means of a roller. The apparatus being applied, the whole limb is to be evenly supported on a pillow.

It is calculated, that, on an average, the olecranon becomes firmly united about the twenty-sixth day.

(Desault par Bichat.)

FRACTURES OF THE FINGERS.

On this subject, we need only remark, that the treatment consists in applying a piece of soap-plaster, rolling the part with tape, incasing it in pasteboard, sometimes placing the hand on a flat splint, or finger-board, and always keeping the hand fore-arm and elbow well supported in a sling.

For *Fractures of the Cranium*, see *Head, Injuries of.*

[Before concluding this article, it is highly proper to remark, that fractures in the limbs, treated by any of the preceding methods, in some instances, do not form a bony union, but leave at the place of fracture a free motion in all directions, and, in fact, a joint. This is a most serious evil, and completely destroys the usefulness of the limb. In order to obviate the evil and produce a bony union of the parts, various remedies have been suggested and employed.

"Whether the fractured portions have passed one another, or whether an articulation has been formed between the fractured surfaces, if the fracture has been already of several months duration, the action of the fractured surfaces ought to be revived, by rubbing them forcibly one against the other, in order to excite the degree of inflammation necessary for the generation of callus. The fractured ends of the bones, having by this means acquired a disposition favourable to their agglutination, the apparatus should be reapplied, the extension continued if necessary, and the treatment prolonged until the cure be complete.

"If, notwithstanding these means, the pieces do not unite, there remains another and last resource, the cutting off of their extremities. This operation is painful, terrifying, and of dubious event. Its success, however, has been frequent enough to warrant the trial. It would be impracticable in fractures of the leg or fore-arm, on account of the difficulty of separating from the integuments the two bones of which each of these parts is formed, and on account of the numerous nerves and arteries which would be in danger of

being wounded by the large incisions necessary for this operation, *it is therefore practicable only in the femur and humerus, especially the latter.*" (*Boyer.*)

Mr. Boyer proceeds to describe the manner of performing this operation, and relates a case in which it was done. The fracture was in the middle of the humerus—The patient aged thirty-six. Gangrene came on, and he died on the sixth day!

In other cases, amputation has been performed. Mr. Hunter proposed exposing the cavity between the ends of the bone, and hoped that this would occasion the necessary degree of inflammation. But a plan has been invented by Dr. Physick, which promises to supersede the horribly cruel and fatal operations hitherto in use, and to procure more effectually, than any ever proposed, the cure of those unfortunate patients, in whom the artificial joints are formed.

In the Medical Repository, Hexade II. vol. 1. p. 122. is recorded a case of fracture, in which an artificial joint formed which was cured by this remedy.

The patient, Isaac Patterson, was admitted into the Pennsylvania Hospital in December, 1802. "I had seen," says Dr. Physick, "in our Hospital, when a student, in 1785, a case similar to this in every essential circumstance, in which an incision was made down to the extremities of the fractured bones, which were then sawed off, putting the parts into the condition of a recent compound fracture. No benefit, however, was derived from this painful operation; and some months afterwards the arm was amputated. This case had made a strong impression on my mind, and rendered me unwilling to perform a similar operation. I therefore proposed to the medical gentlemen of the hospital, who attended in consultation, that a seton needle, armed with a skein of silk, should be passed through the arm, and between the fractured extremities of the bone, and that the seton should be left in this situation, until by exciting inflammation and suppuration, granulations should arise on the ends of the bone, which uniting an ossifying, would form the bony union that was wanting. This operation, being agreed to, was performed on the 18th December, 1802, twenty months after the accident. Before passing the needle, I directed the assistants to make some extension of the arm, in order that the seton might be introduced as much as possible between the ends of the bone. Some lint and a pledget were applied to the orifices made by the seton needle, and secured by a roller.

"The patient suffered very little pain from the operation. After a few days, the inflammation (which was not greater than what is commonly excited by a similar operation through the flesh in any other part) was succeeded by a moderate suppuration. The arm was now again extended, and splints applied. The dressings were renewed daily for *twelve weeks*, during which time no amendment was perceived; but soon afterwards, the bending of the arm at the fracture was observed to be not so easy as it had been, and the patient complained of much more pain than usual, whenever an attempt was made to bend it at that place. From this time the formation of the new bony union went on rapidly, and on the 4th May, 1803, was so perfectly completed, that the patient could move his arm in all directions, as well as before the accident happened. On the 28th May, he was discharged from the hospital, perfectly well, and he has since repeatedly told me, that his arm is as strong as it ever was."

Dr Physick has since effected another cure in the same manner. The operation, however, failed in a case which occurred at Baltimore. Here the cause of failure was, however, evident: The seton remained in the arm but six weeks, and was removed in consequence of the patient's ill health. She was very old and sickly. *Twelve weeks* had elapsed in Patterson's case, before any symptom of amendment was perceived.

We would urge, to any surgeon who may be disposed to avail himself of this remedy, the propriety of continuing the seton at least twelve weeks.]

The best modern works on Fractures are, *Pott's Remarks on Fractures and Dislocations. Boyer's Lectures on Diseases of the Bones, trans. by Farrell. Œuvres Chirurgicales de Desault par Bichat, Tom. 1. Parts of the Parisian Chirurgical Journal.*

FRÆNUM LINGUÆ, (from *fræno*, to curb.) Occasionally it happens, in infants, that their tongues are too closely tied down, by reason of the frænum being too short, or continued too far

forwards towards the point. In the latter case, the child will not be able to use its tongue, with sufficient ease in the action of sucking, swallowing, &c. in consequence of the point being too much confined at the bottom of the mouth. Though this affection, however, is not unfrequent, yet, it is much less common, than it is supposed to be by parents and nurses. When the child is small, and the nurse's nipple large, it is common for her to suppose the child to be tongue-tied, when, in fact, it is only the smallness of the child's tongue, that prevents it from surrounding the nipple, so as to enable it to suck with facility. Mothers also commonly suspect the existence of such an erroneous formation, whenever the child is long in beginning to talk.

The reality of the case may always, however, be easily ascertained by examining the child's mouth. In the natural state, the point of the tongue is always capable of being turned upward towards the palate, as the frænum does not reach along about a quarter of an inch of the lower part of the tongue from the apex. But, in tongue-tied children, by looking upon one side, we may see the frænum extending from the back part to the very point, so that the whole length of the tongue, from the back part to the very point, is tied down, and unnaturally confined in its motion.

The plan of cure is to divide, as much of the frænum as seems proper for setting the tongue at liberty. The incision, however, should not be carried more extensively backward, than is necessary, lest the raninal arteries should be cut; an accident, that has been known to have proved fatal. For the same reason, the scissars, used for this operation, should have no points. (See *Latta's System of Surgery, Vol.* 2.)

FRAGILITAS, (from *frango*, to break.) *Fragilitas Ossium.* A morbid brittleness of the bones. The gelatinous part of the bones, to which they owe their flexibility, may be so deficient in them, that they are capable of being broken by the slightest causes. The state of a bone, thus distempered, may be well conceived, from that of a calcined one.

Boyer imputes the *mollities ossium* to a deficiency of lime in their structure; the *fragilitas ossium* to a deficiency of the soft matter naturally entering into the texture of these parts. He states that a certain degree of the fragilitas ossium necessarily occurs in old age, because the proportion of lime in the bone naturally increases as we grow old, while that of the organized part diminishes. Hence it is, that the bones of old persons more easily break, than those of young subjects, and that they are longer of uniting again.

In persons, who have long been afflicted with cancerous diseases, the bones are said occasionally to become as brittle, as if they had been calcined. Saviard and Louis relate such cases. The latter mentions a nun, who broke her arm by merely leaning on a servant; and in the London Medical Journal an account is given of a person, who could not even turn in bed without breaking some of his bones.

The bones are said sometimes to be remarkably brittle in the latter stages of syphilis.

In bad cases of scurvy, the bones occasionally become so brittle, as to be broken by the slightest causes, and do not grow together again.

The fragilitas ossium of old age is incurable: that which depends on some other constitutional disease can only be relieved, by a removal of the latter. (See *Boyer on Diseases of the Bones, Vol.* 2.)

FUMIGATION, (from *fumigo*) *Fumigatio.* In surgery, means any application in the form of a steam, or vapour.

FUNGUS, (from σφογγος, a sponge.) Any sponge-like excrescence. Granulations are often called *fungous* ones, when they are too high, large, flabby, and unhealthy.

FUNGUS HÆMATODES, (from *fungus*, and αιμα, blood.) *The Bleeding Fungus. Spongoid Inflammation.*

This disease has only been accurately described of late years, having before been generally confounded with cancer. The public are indebted to Mr. Burns, of Glasgow, for the first good account of it; and the subsequent publications of Mr. Hey, of Leeds, and Mr. Freer, of Birmingham, have made us still better acquainted with the subject.

It is perhaps one of the most alarming diseases, incidental to the human body, because, we know of no specific remedy for it; and an operation can only be useful at a time, when it is

very difficult to persuade a patient to submit to it.

Fungus Hæmatodes, is the name applied to it by Mr. Hey. Mr. Burns has called it *spongoid inflammations*, from the spongy elastic feel, which peculiarly characterizes it, and which continues even after ulceration takes place. The disease begins with a small colourless tumour, which is soft and elastic, if there be no thick covering over it, such as a fascia; but otherwise is tense. At first, it is free from uneasiness; but, by degrees, a sharp acute pain darts occasionally through it, more and more frequently, and, at length, becomes incessant. For a considerable time, the tumour is smooth and even; but, afterwards, it projects irregularly in one, or more points; and the skin at this place becomes of a livid red colour, and feels thinner. In this place, it easily yields to pressure, but instantly bounds up again. Small openings now form in these projections, through which is discharged a thin bloody matter. Almost immediately after these tumours burst, a small fungus protrudes, like a papilla, and this rapidly increases, both in breadth and height, and has exactly the appearance of a carcinomatous fungus, and frequently bleeds profusely. The matter is thin, and exceedingly fetid, and the pain becomes of the smarting kind. The integuments, for a little around these ulcers, are red, and tender. After ulceration takes place, the neighbouring glands swell, and assume exactly the spongy qualities of the primary tumour. If the patient still survive the disease in its present advanced progress, similar tumours form in other parts of the body, and the patient dies hectic.

After death, or amputation, the tumour is found to consist of a soft substance, somewhat like the brain, of a grayish colour, and greasy appearance, with thin membrane-like divisions running through it, and cells, or abscesses, in different places, containing a thin bloody matter, occasionally in very considerable quantity. There does not seem uniformly to be any entire cyst, surrounding the tumour; for, it very frequently dives down betwixt the muscles, or down to the bone, to which it often appears to adhere. The neighbouring muscles are of a pale colour, and lose their fibrous appearance, becoming more like liver, than muscle. The bones are always carious in the vicinity of these tumours.

The distemper is sometimes caused by external violence, though in general there is no evident cause whatever. (*Dissertations on Inflammation by J. Burns, Vol. 2.*)

Mr. Hey has given several cases of the fungus hæmatodes. If we notice the most particular circumstances, relative to one of these, it will suffice to inform our reader of the form, in which this terrible affliction has presented itself in this gentleman's practice.

A young man, aged twenty-one, two years before applying to Mr. Hey, perceived a small swelling on the inside of the right knee, not far from the patella. This tumour was moveable, and did not impede the motion of the joint: it was not discoloured, but was painful, when moved, or pressed upon. It continued in this state half a year, and then the man, having hurt his knee against a stone, it gradually increased in bulk, but did not exceed the size of an egg. The skin was now discoloured with blue specks, which he took to be veins. He could still walk with ease, and follow his business.

Two months before his admission into the Leeds Infirmary, he met with a fall, and violently bent his knee, but did not strike it against any thing. The tumour began immediately to enlarge; and, within a few hours, it extended half way up the inside of his thigh. About a fortnight after this accident, the skin burst at the lowest part of the tumour, and discharged some blood. A dark-coloured fungus, about the size of a pigeon's egg, here made its appearance, and, a few weeks afterwards, the skin burst at another part of the large tumour, and some blood was again discharged. From the fissure arose another fungus, which had increased, in the course of the last week, to the size of a small melon, and now measures eight inches from one side of its base to the other. The base of the fungus frequently bled, especially, when the man allowed his limb to hang down.

The whole tumour was now of an enormous size, being nineteen inches across, when the measure was carried over the last mentioned fungus. From its highest part in the thigh to the lowest part, just below the knee, it measured seventeen inches, without in-

cluding the fungus. The base of the tumour at the knee, exclusive of that part, which ran up the thigh, measured twenty-four inches in circumference. The tumour was situated on the inner side of the limb, and was distinctly defined. The skin, covering the disease, was in some places livid, and had several fissures and small ulcerations upon it; but, had not burst asunder, except in the two places above described. The tumour was soft, and gave a sensation of some contained fluid, when gently pressed with the hands alternately in opposite directions. The patient said he had walked without pain in his knee, a week before his admission into the Infirmary; he had lost very little blood in his journey to Leeds. He complained of the greatest uneasiness in the highest part of the tumour. It had become hot and painful in the night-time, for some days past. His pulse was 114 in a minute; his tongue was clean; and his appetite had been good, till the last few days. He had never felt any pulsation in the tumour.

In a consultation it was determined, that the tumour should be laid open, by cutting off a portion of the distended integuments; and that after removing the contents, if the sac should be found in a sound state, the disease should be treated as a simple wound; but, if in a morbid state, amputation of the limb should be immediately performed.

A large oval piece of the integuments being removed, the tumour was found to contain a very large quantity of a substance, not much unlike coagulated blood; but more nearly resembling the medullary part of the brain in its consistence and oily nature. It was of a variegated reddish colour, in some parts approaching to white, and, as blood issued from it, Mr. Hey conceived it was organized. This mass was partly diffused through the circumjacent parts in innumerable pouches, to which it adhered, and was partly contained in a large sac of an aponeurotic texture, which was connected with the capsule of the knee-joint. There was a great and universal effusion of blood from the internal surface of the sac, and from the pouches, containing this morbid mass.

Amputation of the limb was immediately performed, on finding such to be the nature of the case. Mr. Hey, unfortunately, however, left a portion of the diseased surface behind on the inner part of the thigh, and hoping, that a small narrow portion of the upper part of the sac would soon become a clean sore, and not impede the cure, he made the circular incision two inches below its higher part.

On examining the amputated limb, the vastus internus was found to be brown, and much softer, than the other muscles, which were healthy. There were many small portions of blood extravasated in the substance of this muscle. The sac was formed of the aponeurotic covering of the muscle, and ended below where this aponeurosis begins to cover the capsular ligament of the knee. The two fungous substances, above described, appeared to have been only extensions of the morbid mass, where this had made its way through the sac and the integuments. The joint of the knee, and muscles of the leg were perfectly sound.

I need not detail all the particulars after the operation. Suffice it to say, the man suffered a great deal of constitutional disorder. After a few weeks, the granulations upon the stump became good, and the cicatrization was nearly completed at the end of the sixth week, after the amputation. At this period, that small and superficial portion of the upper part of the great sac, which Mr. Hey had unfortunately left, was now healed; but, a tumour, now about four inches in length, and between two and three in breadth, had gradually risen at the lower and under part of the thigh, beneath the cicatrix. This contained a soft substance, exactly similar, as far as the touch could discover, to that which had filled the large sac. This tumour became painful, and sometimes discharged a bloody serum, sometimes dark-coloured blood, through four, or five, small openings in the cicatrix.

Mr. Hey laid open the tumour, and removed its contents; but no advantage was gained by this proceeding. The interior surface was found to be too much diseased to produce good granulations. Blood continued to ooze out of the wound for a few days. Then the inner surface became covered with a blackish substance, which gradually extended itself, and formed a new fungus. A variety of escharotics were applied to destroy the fungus, and morbid surface of the wound; but, to no

purpose, the growth of the fungus always exceeded the quantity destroyed. Undiluted oil of vitriol, applied freely, had very little effect.

An attempt was once more made to cut away the disease; but, on examining the wound carefully, after the contained substance was removed, the muscular substance was found degenerated into a hard mass, which felt somewhat like cartilage. The adipose membrane was also diseased, and formed into large cells, which had contained the fungous substance. Hence, another amputation seemed the only resource.

After this operation, the whole surface of the stump seemed sound, except the principal artery, which was filled with a somewhat stiff matter, resembling coagulated blood, which prevented its bleeding. The inside of the vessel, on being touched with the scalpel, felt hard, and communicated a sensation, like that of scraping bone.

The man was sent home, as soon as his state would admit of it; but, he died consumptive about six months afterwards. Besides this instance, in the thigh, Mr. Hey relates cases of fungus hæmatodes, situated in the female breast, in the leg, in the neck, (extending from the jaw to the clavicle, and producing suffocation,) on the back part of the neck, on the back part of the shoulder, and at the extremity of the fore-arm, near the wrist.

"If I do not mistake, (says Mr. Hey,) this disease not unfrequently affects the globe of the eye, causing an enlargement of it, with the destruction of its internal organization. If the eye is not extirpated, the sclerotis bursts at the last, a bloody sanious matter is discharged, and the patient sinks under the complaint." (*P.* 283.)

Besides some cases, in similar situations, to those mentioned by Mr. Hey, one is related by Mr. Burns, in which the hip-joint was the seat of this terrible affection. After detailing the progress of the case to the poor man's death, this author states, that he found, on dissection, the hip-joint completely surrounded with a soft matter, resembling the brain, inclosed in thin cells, and here and there cells full of thin bloody water; the head of the thigh-bone was quite carious, as was also the acetabulum. The muscles were quite pale, and almost like boiled liver, having completely lost their fibrous appearance, and muscular properties. The same sort of morbid mischief was also found within the pelvis, most of the inside of the bones, on the affected side, being quite carious. An attempt had been made, before the patient died, to tap the bladder; but, the trocar had only entered a cell, filled with bloody water, and situated in a mass of the soft brain-like substance.

We have already said enough, to render the description of the dreadful nature of the fungus hæmatodes tolerably complete. Little can be said of the treatment; for, we know of no one medicine, that seems to have the least power in putting a stop to the disease, and we have no reason to believe, that there is ever the smallest chance even of any spontaneous amendment, much less of such a cure.

We have seen, that when the chief part of a fungus hæmatodes is cut away, and only a small portion of its cyst is left behind, that the fungus is reproduced from this part, and soon becomes as formidable, nay more formidable, than it was before, and this notwithstanding the application of the most powerful escharotics. Neither the hydrargyrus nitratus ruber, the hydrargyrus muriatus, the antimonium muriatum, nor the undiluted vitriolic acid, have always been able to repress the growth of such fungus. (*Hey.*)

There is no remedy, that has the power of checking, or removing the complaint. Friction, with anodyne balsams, sometimes gives relief in the early stages; but, it does not seem to retard the progress of the disease.

In short, the only chance of cure consists in extirpating the whole of the distempered parts, removing not only the soft, brain-like, fungous substance, but every particle of the cysts, sacs, or pouches, in which it may be contained. An operation of this kind, however, is only advisable in the early stages, while the disease is entirely local; for, after the neighbouring glands have become affected, the chance of recovery is almost destroyed. It is sometimes difficult, however, to persuade patients at this time to submit to amputation, or extirpation, because the pain and inconveniences are inconsiderable; but, the operation ought to be urged with all the force, which a conviction of its absolute necessity, and the fatal peril of delay, ought to inspire.

When a fungus hæmatodes is on a limb, and every atom of the disease can be cut away, without amputating the limb, this plan should first be tried. Should the disease repeatedly recur, notwithstanding such a mode of proceeding, or should it be imprudent, or impracticable, to try to cut away the disease and save the limb, the latter must be amputated.

See *Dissertations on Inflammation, by J. Burns, Vol. 2. Hey's Practical Observations in Surgery. Freer on Aneurism.*

A case of this disease is related in Vol. 5. of the London Medical Journal. It was the consequence of an attempt to cure a ganglion by means of a seton, and it proved fatal. A case is also related by Mr. Abernethy in *Surgical Observations*, 1804, *p.* 99.

FURUNCULUS, (from *furo*, to rage.) A boil, so named from the violence of the heat and inflammation attending it.

A boil is a circumscribed, very prominent, hard, deep-red, inflammatory swelling, which is exceedingly painful, and commonly terminates in suppuration. The figure of the tumour is generally that of a cone, the base of which is considerably below the surface. Upon the most elevated point of the boil, there is commonly a whitish, or livid pustule, which is exquisitely sensible, and immediately beneath this is the seat of the abscess. The matter is sometimes slow in forming, is seldom very abundant, never healthy, at first, being always blended with blood. The complaint is seldom attended with fever, except, when the tumour is very large, situated on a very sensible part, or when several of these swellings occur at the same time in different places. In the last circumstance, they often occasion in children, and even in irritable adults, restlessness, loss of appetite, spasms, &c. They seldom exceed a pigeon's egg in size, and they may originate on any part of the body.

Boils commonly arise from constitutional causes.

The suppuration, that attends a boil, is never perfect, and the matter, which forms, is not only tinged with blood, but surrounded with a sloughy substance, which must generally be discharged, before the part affected will suppurate kindly, and the disease end. Richter compares the slough with a kind of bag, or cyst, and the whole boil with an inflamed encysted tumour.

The best plan is always to endeavour to make boils suppurate, as freely as possible, by applying external emollient remedies. This seems to be the natural course of the disease in its progress to a cure, and, indeed, all endeavours to discuss furunculous tumours commonly fail, or succeed very imperfectly; only removing the inflammation, and leaving behind an indolent hardness, which occasions various inconveniences, according to its situation, every now and then inflames anew, and never entirely disappears, until a free suppuration has been established.

In a very few cases, perhaps, it may be proper to try to discuss boils. For this purpose, besides bleeding, gentle evacuations and a low diet, which are requisite in this, as well as other local inflammations, some prescribe as external applications honey strongly acidulated with sulphuric acid; alkohol: or camphorated oil.

But, in the generality of instances, suppuration must be promoted, by the use of emollient poultices. The tumour, when allowed to burst, generally does so at its apex. However, as the opening, which spontaneously occurs, is generally long in forming, and too small to allow the sloughy cellular substance to be discharged, it is always best, as soon as matter is known to exist in the tumour, to make a free opening with a lancet, and immediately afterwards to press out as much of the matter and sloughs, as can be prudently done. This having been accomplished, and the rest of the sloughs pressed out, as soon as it is practicable, healthy pus will be secreted, and the part will granulate and heal. Until the suppuration becomes of the healthy kind, and the sloughy substances are entirely discharged, an emollient linseed poultice is the best application, and when granulations begin to fill up the cavity, plain lint, and a simple pledget, are the only dressings necessary.

When an indolent hardness continues, after the inflammatory and suppurative state of boils has been cured, the part should be rubbed with camphorated mercurial ointment.

Besides the above *acute* boil, authors describe a *chronic* one, which is said frequently to occur, in subjects, who have suffered severely from the small-

pox, measles, lues venerea, scrophula, and in constitutions, which have been injured by the use of mercury.

The *chronic* boil is commonly situated upon the extremities, is of the same size as the acute one, has a hard base, is not attended with much pain, nor any considerable discoloration of the skin, until suppuration is far advanced, and the matter is seldom quite formed, before three, or four weeks. This, like the former, sometimes appears in a considerable number at a time. The discharge is always thinner, than good pus, and when the boil is large, and has been long in suppurating, a great deal of sloughy cellular membrane must be cast off, before the sore will heal

The principal thing, requisite in the local treatment of all furunculous, and carbuncular tumours, is to make an early free opening into them, and to press out the matter and sloughs, employing emollient poultices, till all the mortified parts are detached and removed, and afterwards simple dressings. (See *Pearson's Principles of Surgery. Richter's Anfangsgrunde der Wundarzn. Band.* 1.

G

GANGLION, (γάγλιον.) In anatomy, a knot in the course of a nerve; in surgery, a tumour on a tendon, or aponeurosis.

A ganglion is an encysted, circumscribed, moveable swelling, commonly free from pain, causing no alteration in the colour of the skin, and formed upon tendons in different parts of the body, but, most frequently upon the back of the hand, and over the wrist. A French gentleman consulted me about a year ago, who had one upon the upper part of his foot, which created a great sensation of weakness in the motion of the foot, and I have taken notice, that ganglions occur particularly often just below the kneepan, in housemaids, who are in the habit of kneeling a great deal in order to scour rooms. It is curious to remark, that pressure, which is the best common means of getting rid of ganglions, in this instance, seems to act as a cause.

These tumours, when compressed, seem to possess considerable elasticity. They often occur unpreceded by any accident; frequently, they are the consequence of bruises, and violent sprains. They seldom attain a considerable size, and ordinarily are not painful, though every now and then there are instances to the contrary. When opened, they are found to be filled with a viscid transparent fluid, resembling white-of-egg. If they do not disappear of themselves, or are not cured, while recent, by surgical means, they, in some cases, become so large, that they cause great inconvenience, by obstructing the motion of the part, and rendering it painful.

Discutient applications sometimes succeed in curing ganglions, and, in this country, friction with the oleum origani is a very common method. I have often seen such tumours very much lessened by this plan of treatment, but seldom cured, and, no sooner has the friction been discontinued, than the fluid in the cyst has in general accumulated again.

Compression is usually more effectual, than discutient liniments. Persons with ganglions have been recommended to rub them strongly with their thumb, several times a day. After this has been repeated very often, the tumour is said sometimes to have absolutely disappeared while the friction was employed. But, the best method is to make continual pressure on ganglions, by means of a piece of sheet-lead, bound upon the part with a bandage. There is no objection, however, to using once, or twice a day, in conjunction with this treatment, frictions with the oleum origani, or camphorated mercurial ointment, provided these measures do not seem likely to make the tumour inflame, an event, which should always be carefully avoided. Ganglions, when irritated too much, have been known to become most malignant diseases.

Setons have been recommended to be introduced through ganglions, with a view of curing them. This method, however, is not an eligible one, for it is by no means free from danger, as

the records of surgery fully shew. Cancerous diseases, and even the fungus hæmatodes (*Med. Journal, Vol. 5.*) have arisen from the irritation of a seton passed through a ganglion.

Frequently, when a ganglion inflames, and ulcerates, the cyst throws out a fungus, which is of a very malignant nature. Hence, on every account, the practitioner should avoid making such a tumour inflame, and whatever measures he may take, they should never act so as to produce this effect.

The caution just given, is the more necessary, as books mention instances, in which ganglions have been suddenly cured by pressure, of such force, as to rupture the cyst, and some authors have even recommended putting the hand affected upon a table, and then striking the ganglion several times with the fist, or a mallet. Let such imprudent practices never be imitated: a ganglion is a simple disease, by no means a serious one, while free from irritation, but, no sooner is it in an ulcerated state, and has its cyst formed a fungus, than it is a formidable case, and the sooner it is entirely cut away, the better.

In almost every instance, a ganglion may be cured by pressure and friction, and, if not actually cured, the disease may be rendered so bearable by these means, that few patients would choose to have the tumour cut out. Under this plan, the swelling becomes very much diminished, and, should it enlarge again, the mode of relief is so simple, and the case so little troublesome, that patients generally content themselves with every now and then wearing a piece of lead on the part.

But, when ganglions resist all attempts to disperse, or palliate them; when they become extremely inconvenient, either by obstructing the functions of a joint, or causing pain; these tumours should be carefully dissected out, by first making a longitudinal incision in the skin covering them, then separating the cyst on every side from the contiguous parts, and lastly cutting every particle of it off the subjacent tendon, or fascia. The greatest care must be taken, not to make any opening in the cyst, so as to let out its contents, and make it collapse; a circumstance, which would render the dissection of it entirely out much more difficult.

The operation being accomplished, the skin is to be brought together with sticking-plaster, and a compress placed over the situation of the tumour, with a view of healing the wound and the cavity by adhesion.

When the ganglion has burst, or is ulcerated, it is best to remove the diseased skin, together with the cyst, and of course the incision must be oval, or circular, as may seem most convenient. The grand object is not to allow any particle of the cyst to remain behind, as it would be very likely to throw out a fungus, and prevent a cure. In Warner's Cases of Surgery is an account of two considerable ganglions, which this gentleman thought it right to extirpate. These had become adherent to the tendons of the fingers. In the operation, he was obliged to cut the transverse ligament of the wrist, and the patients, who before could not shut their hands, nor close their fingers, perfectly regained the use of these parts. Mr. Gooch relates a case of the same kind, which had been occasioned by a violent bruise, three, or four, years before. The tumour reached from the wrist to the middle of the hand, and created a great deal of pain. Mr. Gooch extirpated it, and then restored the position of the hand, and free motion of the joint, by the use of emollient applications, and suitable pressure, made with a machine constructed for the purpose.

The ganglions, which occur just below the knee, I have seen cured by a little blister, applied over them, and kept open with the savin cerate.

For information relative to ganglions, consult *Warner's Cases in Surgery. Chirurgical Works of B. Gooch, Vol. 2, p. 376. Heister's Surgery. B. Bell's Surgery. Latta's System of Surgery. L'Encyclopédie Méthodique; Partie Chirurgicale. Richter's Anfangsgrunde der Wundarzneykunst; Band. 1.*

GANGRENE, (from γαινω, to feed upon.) *Gangrana.* An incipient mortification, so named from its eating away the flesh.

Authors have generally distinguished mortification into two stages; the first, or incipient one, they name *gangrene*, which is attended with a sudden diminution of pain in the place affected; a livid discoloration of the part, which, from being yellowish, becomes of a greenish hue; a detachment of the cu-

ticle, under which a turbid fluid is effused; lastly, the swelling, tension, and hardness, of the previous inflammation, subside, and, on touching the part, a crepitus is perceptible, owing to the generation of air in the gangrenous parts.

Such is the state to which the term *gangrene* is applied.

When the part has become quite cold, black, fibrous, incapable of moving, and destitute of all feeling, circulation, and life; this is the second stage of mortification, termed *sphacelus*. Gangrene, however, is frequently used synonymously with the word mortification. (*Mortification.*)

GASTRITIS, (from γαστηρ, the stomach.) An inflammation of the stomach.

GASTROCELE, (from γαστηρ, the stomach, and κηλη, a tumour.) A hernia of the stomach.

GASTRORAPHIA, (from γαστηρ, the belly, and ραφη, a suture.) *Gastroraphe.* A suture of the belly, or some of its contents.

Although the term *gastroraphe*, in strictness of etymology, signifies no more, than sewing up any wound of the belly, yet Mr. Samuel Sharp informs us, that in his time, the word implied, that the wound of the abdomen was complicated with another of the bowels.

The moderns, I think, seem to limit the meaning of the word to the operation of sewing up a wound of the parietes of the abdomen.

What was formerly meant by gastroraphe, could scarcely ever be practised, because the symptoms laid down for distinguishing when an intestine is wounded, do not with any certainty determine in what particular part it is wounded; which want of information, makes it absurd to open the abdomen in order to get at it. Hence, the operation of stitching the bowels can only take place, when they fall out of the abdomen, and when we can see where the wound is situated.

The circumstances, making the practice of sewing up a wounded intestine proper, are so rare, that Du Verney, who was the most eminent surgeon in the French army a great many years during the wars, and fashion of duelling, declared, he never had once had an opportunity of practising the gastroraphe, according to the former acceptation of that word.

Upon the supposition of the intestine being wounded in such a manner as to require the operation, Mr. Sharp advises taking a straight needle with a small thread, laying hold of the bowel with your left hand, and sewing up the wound with the glover's stitch, that is, by passing the needle through the lips of the wound from within outwards all the way, so as leave a length of thread at both ends, which are to hang out of the incision of the abdomen. He then directs you carefully to make the interrupted suture of the external wound, and to pull the bowel by the small threads into contact with the peritoneum, for the more readily uniting with it afterwards by adhesion; though he seems to think it would be more secure to pass the threads with the straight needle through the lower edges of the wound of the abdomen, which would more certainly hold the intestine in that situation. In about six days, the ligature of the intestine will be loose enough to be drawn away; in the interim, superficial dressings are to be applied, and the patient kept on low diet. (*Sharp.*)

On this operation, we have only to remark, that as the only use of a suture of the bowel is to keep the wound of it near the external wound, in case any extravasation should occur, this object can be as effectually accomplished by one fine stitch, as by sewing up all the breach in the intestine, and without being so likely to excite inflammation of the parts. We shall add no more concerning sutures of the bowels, to what is contained in the articles *Abdomen*, and *Hernia*.

Gastroraphe, or merely sewing up a wound of the parietes of the abdomen, may be done, as Mr. Sharp explains, with the common interrupted suture, (see *Suture*,) or with the quilled one, which is better, as follows:

A ligature, capable of splitting into two, has a needle attached to each end of it, The operator is to put the index finger of his left hand into the wound, under the lip furthest from him. This finger is in contact with the peritoneum, in order that it may with the thumb pinch up, and raise the whole thickness of the parietes. With the other hand, one of the needles is to be introduced into the abdomen, guiding its point on the index finger, in order to avoid wounding the omentum, or intestines. The lip of the wound is to be

pierced, from within outward, about an inch from its edge. The other needle is to be passed in the same way through the opposite lip. Then the two needles are to be cut off. As many such sutures must be made, as the extent of the wound may require.

The sides of the wound are next to be brought together, and we are to prepare to tie the ligature, not in a bow, in the way of the interrupted suture, because the continual action of the abdominal muscles might make the ligatures cut their way through the parts. It is better, to divide each end of the ligature into two portions, and to tie these over a piece of bougie laid along the line at which the ligatures emerge from the flesh. This is to be done to all the ligatures on one side first. Then the wound being closed, another piece of bougie is to be placed along the other lip of the wound, and the opposite ligatures tied over it, with sufficient tightness, to keep the sides of the wound in contact. This suture is certainly preferable to the interrupted one, because a great deal of its pressure is made on the two pieces of bougie, and of course it is less likely to cut its way out. Its operation is to be assisted with compresses laid over each side of the wound, and the uniting bandage. Every thing, that puts the abdominal muscles into action, drags the suture, irritates the wound, and creates a risk of the threads cutting their way through the part, in which they are introduced; consequently, it must be avoided. To prevent, as much as possible, the exertion of the muscles, the bowels should be kept open with clysters; and opium is the best thing for putting a stop to the vomiting, sometimes attendant on wounds of the abdomen, and producing very injurious effects, in regard to the wound.

In about a week, the sutures may generally be removed, and sticking plaster alone employed. As to what more relates to these particular cases, we must refer to *Abdomen, Wounds of.*

It is generally allowed, that sutures are violent means, to which we should only resort, when it is impossible to keep the lips of a wound in contact by the observance of a proper posture, and the aid of a methodical bandage. M. Pibrac believes such circumstances exceedingly uncommon, and in his excellent production, in the third volume of Memoirs of the Royal Academy of Surgery, relative to the abuse of sutures, cases are related, which fully prove, that wounds of the belly readily unite by means of a suitable posture and a proper bandage, without having recourse to gastroraphe. These, however, are less decisive and convincing, (if possible to be so,) than the relations of the Cæsarean operation, the extensive wound of which has oftentimes been healed by these simple means, after the failure of sutures. It is not only possible to dispense with gastroraphe in the treatment of wounds of the abdomen, it has even been manifested, that this operation has sometimes occasioned very bad symptoms.

Under certain circumstances, however, it may be essentially necessary to practise gastroraphe. For instance, were a large wound to be made across the parietes of the abdomen, a suture might become indispensably requisite, to prevent a protrusion of the bowels. Yet, even in this case, the sutures should be as few in number as possible.

A bandage of the eighteen-tailed kind, might prove very useful in a longitudinal wound of the abdomen, and do away all occasion for gastroraphe. (See *Sutures.*)

We shall conclude this article with a fact, perhaps, more curious, than instructive, related by Mr. Bordier, of Pondicherry, in the *Journal de Medicine*, vol. 26. 538. An Indian soldier, angry with his wife, killed her, and attempted to destroy himself by giving himself a wound with a broad kind of dagger in the abdomen, which caused a protrusion of the bowels. A doctor of the country, being sent for, dissected between the muscles and skin, and introduced there a thin piece of lead, which kept up the bowels. The wound soon healed up, the lead having produced no inconvenience. The man was afterwards hung, and M. Bordier, when the body was opened, assured himself more particularly of the fact. Indeed, numerous cases prove, that lead may lodge in the living body, without occasioning the inconvenience, which results from the presence of almost any other kind of extraneous body.

See *Le Dran's Opérations de Chirurgie. Sharp's Treatise on the Operations of Surgery. L'Encyclopédie Métho-*

dique ; Partie Chirurgicale. La Médicine Opératoire par Sabatier, Tom. 1.

GASTROTOMIA, (from γαστηρ, the belly, and τεμνω, to cut.) The operation of opening the abdomen and uterus. The Cæsarean operation. It also signifies opening the abdomen for other purposes.

GLAUCOMA, (from γλαυκος, blue.) A disease of the eye, in which the crystalline lens becomes of a blue, or sea-green colour. The exact meaning of this ancient term, however, is very undetermined; some say it is a disease of the crystalline; others, that it is an affection of the vitreous humour. Galen in his book *de usu partium* imputes glaucoma to a morbid dryness of the crystalline; in which sentiment he has been followed by Ætius, and Maitre-Jan, at the commencement of the 18th century. Since, however, the cataract has been decidedly ascertained to depend upon a disease of the crystalline; the term glaucoma, has been reserved for an opacity of the vitreous humour, as we may learn from Heister, Platner, and all the oculists, who published about the middle of the last century. Lancisi mentions, that he once found the vitreous humour cartilaginous; and Morand has seen it converted into a stony substance. These instances, and some others, are in favour of the opinion, that glaucoma, may arise from an opacity of the vitreous humour. A glaucoma, even of a confirmed kind, cannot always be easily distinguished from a cataract, especially, while the latter is in an incipient state. It is said, however, that suspicions of the disease may be entertained, when the unnatural colour, which characterizes it, is reflected from a deep surface, behind the pupil; whereas the opacity of a cataract is more superficial, and nearer to the margin of the uvea.

Glaucoma is certainly an exceedingly uncommon disease. Authors recommend applying blisters, and giving internally the extract of cicuta, calomel, and soap, *Encyclopédie Méthodique ; Partie Chir.)* The topical use of æther may also be tried, which we have mentioned, as one of Mr. Ware's remedies for promoting the absorption of cataracts.

From our present knowledge of the power of the absorbents to remove opaque substances in the eye, when such are detached and loose, as they actually become after being disturbed with a couching needle, there can be no doubt that, if an opacity of a part of the vitreous humour were to present itself in practice, and not yield to the above means, it would be justifiable conduct, on the part of the surgeon, to endeavour to move such opacity out of the axis of sight, and, at all events, to disturb it so freely with a couching needle, as to afford a chance of its being absorbed.

GLAUCOSIS, same as *Glaucoma.*

GLEET. By the term *gleet*, we commonly understand a continued running, or discharge, after the inflammatory symptoms of a clap for some time have ceased, being unattended with pain, scalding in making water, &c. Mr. Hunter remarks, that it differs from a gonorrhœa in being uninfectious, and in the discharge consisting of globular bodies, contained in a slimy mucus, instead of serum. He says, that a gleet seems to take its rise from a habit of action, which the parts have contracted. The disease, however, sometimes stops of itself, even after every method has been ineffectually tried. This probably depends upon accidental changes in the constitution, and not at all upon the nature of the disease itself. Mr. Hunter suspected some gleets were connected with scrophula. The sea-bath cures more gleets, than the common cold bath, or any other mode of bathing. An injection of diluted sea-water cures some gleets, though it is not always effectual.

Gleets are always attended with a relaxed constitution. They also sometimes arise from other affections of the urethra, besides gonorrhœas. A stricture is almost always attended with a gleet; so sometimes is disease of the prostate gland.

When a gleet, observes Mr. Hunter, does not arise from any evident cause, nor can be supposed to be a return of a former gleet, in consequence of a gonorrhœa, either a stricture or diseased prostate gland is to be suspected; and inquiry should be made whether the stream of urine is smaller than common, whether there be any difficulty in voiding it, and whether the calls to make it are frequent. If there should be such symptom, a bougie, rather under the common size, should be introduced; and, if it passes on to the bladder with tolerable ease, the disease is probably in the prostate gland, which should next be examined. (See *Ureth-*

na, Strictures of; and Prostate Gland, Diseased.)

Balsams, turpentines, and cantharides, given internally, are of use, especially in slight cases; and when they are useful, prove so almost immediately. Hence, if they neither lessen nor remove the gleet in five or six days, Mr. Hunter never continued them longer. As the discharge, when removed, is also apt to recur, such medicines should be continued for some time after the symptoms have disappeared.

The cold bath, sea-bath, bark, and steel, may be given when the whole constitution is weak. The astringent gums, and salt of steel, given as internal astringents, have little power.

With regard to local applications, the astringents commonly used are, the decoction of bark, white vitriol, alum, and preparations of lead. The aqua vitriolica cærulea, of the London Dispensatory, diluted with eight times its quantity of water, makes a very good injection.

Irritating applications are, either injections, or bougies, simple or medicated with irritating medicines. Violent exercise may be considered as having the same effect. Such applications should never be used till the other methods have been fully tried, and found unsuccessful. They at first increase the discharge. Two grains of the hydrargyrus muriatus, in eight ounces of water, are a very good irritating injection. In irritable habits, such an application may do great harm, and the capability of the parts to bear its employment, should first be made out, if possible.

Bougies sometimes act violently, and are more efficacious than injections. A simple unmedicated one is generally sufficient, and must be used a month or six weeks, before the cure can be depended upon. Those medicated with camphor, or turpentine, need not be used so long. The size of the bougie should be under the common.

Mr. Hunter has known a gleet disappear on the breaking out of two chancres on the glans. Gleets have also been cured by a blister on the underside of the urethra; and, by electricity.

In every plan of cure, rest, or quietness, is generally of great consequence; but, after the failure of the usual modes, riding on horseback has immediately effected a cure.

Regularity and moderation in diet are to be observed.

Intercourse with women often causes a return, or increase of gleet; and, in such cases, it gives suspicion of a fresh infection; but the difference between this and a fresh infection is, that here the return is almost immediately after the connexion.

Gleets in women, are cured like those of men. Turpentines, however, have no specific effect on the vagina. The astringent injections may also be stronger, than those for men.

See *A Treatise on the Venereal Disease, by John Hunter. Also, Swediaur's Practical Observations on Venereal Complaints.*

GLOSSOCA'TOCHUS, (from γλῶσσα, the tongue; and κατέχω, to depress.) An instrument for pressing down the tongue; a spatula. The ancient glossocatochus was a sort of forceps, one of the blades of which served to depress the tongue, while the other was applied under the chin.

GLOSSOCOMION, (from γλῶσσα, the tongue; and κομέω, to guard.) By this was formerly meant a case for the tongue of a hautboy; but the old surgeons, by metaphor, used the term to signify a case for a broken limb.

GOITRE. See *Bronchocele.*

GONORRHŒA, from γονὴ, the semen; and ῥέω, to flow.) Etymologically, an involuntary discharge of the semen; but always, according to modern surgery, a discharge of a purulent infectious matter, from the urethra in the male, and from the vagina and surfaces of the labia, nymphæ, clitoris, &c. in the female subject.

The disease occurs, in Latin authors, under the different denominations of *gonorrhœa, G. Virulenta, Fluor albus malignus.* Dr. Swediaur, after censuring the etymological import, as conveying an erroneous idea, says, if a Greek name is to be retained, he would call it blennorrhagia, from βλεννα, mucus, and ῥέω, to flow. However, as most moderns consider the discharge as pus, not mucus, the etymological import of blennorrhœa is as objectionable as that of gonorrhœa. In English, the disease is commonly called a *clap*, from the old French word *clapises*, which were public shops, kept and inhabited by single prostitutes, and generally confined to a particular quarter of the town, as is even now the case in several of the

great towns of Italy. In German, the disorder is named a *tripper*, from dripping; and in French, a *chaudepisse*, from the heat and scalding in making water. (*Swediaur.*)

We shall first present the reader with some of Mr. Hunter's opinions, concerning the nature of gonorrhœa, its symptoms, and treatment; and, lastly, take notice of what some other writers have said.

When an irritating matter of any kind is applied to a secreting surface, it increases that secretion, and changes it from its natural state to some other. In the present instance, it is changed from mucus to pus.

Till about the year 1753, it was generally supposed, that the matter from the urethra, in a gonorrhœa, arose from ulcers in the passage; but it was then clearly ascertained, that pus could be secreted without a breach of substance. It was first accidentally proved, by dissection, that pus could be formed in the bag of the pleura, without ulceration; and, Mr. Hunter afterwards examined the urethra of malefactors and others, who were executed, or died, while known to be affected with gonorrhœa, and demonstrated that the canal was entirely free from every appearance of ulcer.

The time, when a gonorrhœa first appears, after infection, is very various. It generally comes on sooner, than a chancre. Mr. Hunter has had reason to believe, that, in some instances, the disease has begun in a few hours, while, in others, six weeks have previously elapsed; but he has known it begin at all the intermediate periods. About six, eight, ten, or twelve days, however, after infection, is the most common period.

The surface of the urethra is subject to inflammation and suppuration, from various other causes besides the venereal poison; and sometimes discharges happen spontaneously, when no immediate cause can be assigned. Such may be called *simple* gonorrhœa, having nothing of the venereal infection in them.

Mr. Hunter has known the urethra sympathize with the cutting of a tooth, and produce all the symptoms of a gonorrhœa. This happened several times to the same patient. The urethra is known to be sometimes the seat of the gout; Mr. Hunter has known it to be the seat of rheumatism.

When a secreting surface has once received the inflammatory action, its secretions are increased and visibly altered. Also, when the irritation has produced inflammation, and an ulcer in the solid parts, a secretion of matter takes place, the intention of which, in both, seems to be to wash away the irritating matter. But, in inflammations, arising from specific, or morbid poisons, the irritation cannot be thus got rid of; for, although the first irritating matter be washed away, yet, the new matter formed has the same quality as the original had; and, therefore, upon the same principle, it would produce a perpetual source of irritations, even if the venereal inflammation, like many other specific diseases, were not what it really is, kept up by the specific quality of the inflammation itself. This inflammation seems, however, to be only capable of lasting a limited time, the symptoms peculiar to it vanishing of themselves, by the parts becoming less and less susceptible of irritation. The consequent venereal matter can have no power of continuing the original irritation, otherwise there would be no end to the disease. The time, which the susceptibility of the irritation lasts, must depend upon the difference in the constitution, and not upon any difference in the poison itself.

The venereal disease only ceases spontaneously, when it attacks a secreting surface, and produces a mere secretion of pus, without ulceration.

SYMPTOMS OF GONORRHŒA.

The first symptom is generally an itching at the orifice of the urethra, sometimes extending over the whole glans. A little fulness of the lips of the urethra, the effect of inflammation, is next observable, and soon afterwards a running appears. The itching changes into pain, more particularly at the time of voiding the urine. There is often no pain till some time after the appearance of the discharge, and other symptoms; and in many gonorrhœas, there is hardly any pain at all, even when the discharge is very considerable. At other times, a great degree of soreness occurs long before any discharge appears. There is generally, at this time, a particular fulness in the penis, and more especially in the glans. The glans has also a kind of transpa-

rency, especially, near the beginning of the urethra, where the skin, being distended, smooth, and red, resembles a ripe cherry. The mouth of the urethra is, in many instances, evidently excoriated. The surface of the glans itself is often in a half excoriated state, consequently very tender; and it secretes a sort of discharge. The canal of the urethra becomes narrower, which is known by the stream of urine being smaller than common. This proceeds from the fulness of the penis in general, and from the lining of the urethra being swollen, and in a spasmodic state. The fear of the patient, while voiding his urine, also disposes the urethra to contract. The stream of urine is generally much scattered and broken, as soon as it leaves the passage. There is frequently some degree of hemorrhage from the urethra, perhaps, from the distention of the vessels, more especially when there is a chordee, or a tendency to one. Small swellings often occur, along the lower surface of the penis, in the course of the urethra. These, Mr. Hunter suspected to be enlarged glands of the passage. They occasionally suppurate, and burst outwardly, but now and then in the urethra itself. Mr. Hunter has also suspected such tumours to be ducts, or lacunæ of the glands of the urethra distended with mucus, in consequence of the mouth of the duct being closed, in a manner similar to what happens to the duct leading from the lachrymal sac to the nose, and so as to induce inflammation, suppuration, and ulceration. Hardness and swelling have also occurred in the situation of Cowper's glands, and ended in considerable abscesses in the perineum. The latter tumours break either internally or externally, and sometimes in both ways, so as to produce fistulæ in perinæo.

A soreness is often felt all along the under side of the penis, frequently extending as far as the anus. The pain is particularly great in erections; but the case differs from chordee, the penis remaining straight.—Erections are frequent in most gonorrhœas, and even sometimes threaten to bring on mortification. As opium is of great service, Mr. Hunter thinks there is reason to suppose them of a spasmodic nature.

The natural slimy discharge from the glands of the urethra is first changed, from a fine transparent ropy secretion, to a watery whitish fluid; and the lubricating fluid, which the passage naturally exhales, becomes less transparent; both these secretions becoming gradually thicker, assume more and more the qualities of common pus.

The matter of gonorrhœa often changes its colour and consistence, sometimes from a white to a yellow, and often to a greenish colour. These changes depend on the increase and decrease of the inflammation, and not on the poisonous quality of the matter itself; for, any irritation on these parts, equal to that produced in a gonorrhœa, will produce the same appearances.

The discharge is produced from the membrane lining the urethra, and from the lacunæ, but, in general, only for about two or three inches* from the external orifice. Whenever Mr. Hunter had an opportunity of examining the urethra affected with gonorrhœa, he always found the lacunæ loaded with matter, and more visible than in the natural state. Before the time of this celebrated man, it was commonly supposed, that the discharge arose from the whole surface of the urethra, and even from Cowper's glands, the prostate and vesiculæ seminales.

But, if the matter were secreted from all these parts, the pus would collect in the bulb, as the semen does, and thence be emitted in jerks; for, nothing can be in the bulbous part of the urethra, without stimulating it to action, especially, when in a state of irritation and inflammation.

When the inflammation is violent, some of the vessels of the urethra often burst, and a discharge of blood ensues. Sometimes such blood is only just enough to give the matter a tinge. The erections often stretch the part so much as to cause an extravasation.

When the inflammation goes more deeply than the membranous lining, and affects the reticular membrane of the urethra, it produces in it an extravasation of coagulable lymph, the consequence of which is a chordee. (See *Chordee.*)

Mr. Hunter suspected, that the disease is communicated or creeps along

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* P. 50. Mr. Hunter says, seldom further than an inch and a half, or two inches at most. This he terms the specific extent of the inflammation.

from the glans to the urethra, or, at least, from the lips of the urethra to its inner surface, as it is impossible, that the infectious matter can, during coition, get as far as the disease extends. He mentions an instance, in which a gentleman, who had not cohabited with any woman for many weeks, to all appearances caught a gonorrhœa from a piece of plaster, which had adhered to his glans penis, in a necessary abroad, and which is accounted for by supposing that some person, with a clap, had previously been to this place, and had left behind some of the discharge, and that the above gentleman had allowed his penis to remain in contact with the matter, till it had dried.

Many symptoms, depending on the sympathy of other parts with the urethra, sometimes accompany a gonorrhœa. An uneasiness, partaking of soreness and pain, and a kind of weariness, are every where felt about the pelvis. The scrotum, testicles, perinæum, anus, and hips, become disagreeably sensible to the patient, and the testicles often require being suspended. So irritable, indeed, are they in such cases, that the least accident, or even exercise, which would have no such effect at another time, will make them swell. The glands of the groin are often affected sympathetically, and even swell a little, but do not suppurate, as they generally do when they inflame from the absorption of matter. Mr. Hunter has seen the irritation of a gonorrhœa so extensive as to affect with real pain the thighs, buttocks, and abdominal muscles. He knew one gentleman, who had never had a gonorrhœa without being immediately seized with universal rheumatic pains.

When the gonorrhœa, exclusive of the affections arising from sympathy, is not more violent than has been described, it may be called a *common*, or *simple venereal one;* but, if the patient is very susceptible of such irritation, or of any other mode of action which may accompany the venereal, then the symptoms are in proportion more violent. In such circumstances, we sometimes find the irritation and inflammation exceed the specific distance, and extend through the whole urethra. There is often a considerable degree of pain in the perinæum; and a frequent, though not a constant symptom, is a spasmodic contraction of the acceleratores urinæ, and erectores muscles. The inflammation, in these cases, is sometimes considerable, and goes deeply into the cellular membrane, without producing any effect, however, except swelling. In other instances, it goes on to suppuration, often becoming one of the causes of fistulæ in perinæo. Cowper's glands may hence suppurate, and the irritation is often extended even to the bladder itself.

When the bladder is affected, it bebomes more susceptible of every kind of irritation. It will not bear the usual distention, and, therefore, the patient cannot retain his water the ordinary time, and the moment the desire of making water takes place, he is obliged instantly to make it, with violent pain in the bladder, and still more in the glans penis, exactly similar to what happens in a fit of the stone. If the bladder be not allowed to discharge its contents immediately, the pain becomes almost intolerable; and even when the water is evacuated, there remains, for some time, a considerable pain, both in the bladder and glans.

The ureters, and even the kidneys, sometimes, though rarely, sympathize, when the bladder is much affected. Mr. Hunter had reason to suspect, that the irritation may be communicated to the peritonæum, by means of the vas deferens.

Mr. Hunter mentions a case in which, when the inflammatory symptoms of a gonorrhœa were abating, an incontinence of urine came on; but, in time, got spontaneously well.

A very common symptom, attending a gonorrhœa, is a swelling of the testicle. See *Hernia Humoralis.*

Another occasional consequence of a gonorrhœa, is a sympathetic swelling of the inguinal glands. (See *Bubo.*) A hard chord is sometimes observed, leading from the prepuce along the back of the penis, and often directing its course to one of the groins, and affecting the glands. There is most commonly a swelling in the prepuce, at the part where the chord takes its rise. This sometimes happens when there are an excoriation and a discharge from the prepuce, or glans penis.

From the above account, the symptoms of gonorrhœa, in different cases, seem to be subject to infinite variety. The discharge often appears without any pain; and the coming on of the pain is not at any stated time after the appearance of the discharge. There is

often no pain at all, although the discharge is in considerable quantity, and of a bad appearance. The pain often goes off, while the discharge continues, and will return again. An itching, in some cases, is felt for a considerable time, which is sometimes succeeded by pain; though, in many cases, it continues to the end of the disease. On the other hand, the pain is often troublesome, and considerable, even when there is little or no discharge. In general, the inflammation in the urethra does not extend beyond an inch or two from the orifice; sometimes it runs all along the urethra to the bladder, and even to the kidneys, and in some cases, spreads into the substance of the urethra, producing a chordee. The glands of the urethra inflame, and often suppurate; and Mr. Hunter suspected that Cowper's glands sometimes do the same. The neighbouring parts sympathize, as the glands of the groin, the testicle, the loins, and pubes, with the upper parts of the thighs, and abdominal muscles. Sometimes the disease appears a few hours after the application of the poison; sometimes six weeks elapse first. It is often not possible to determine whether it is venereal or only an accidental discharge, arising from some unknown cause.

GONORRHŒA IN WOMEN.

The disease is not so easily ascertained in them as in men, because they are subject to a disorder called *fluor albus*, which resembles gonorrhœa. A discharge simply from women, is less a proof of the existence of a gonorrhœa, than even a discharge without pain in men. The kind of matter does not enable us to distinguish a gonorrhœa from a fluor albus; for the discharge in the latter affection often puts on all the appearance of venereal matter. Pain is not necessarily present, and therefore forms no line of distinction. The appearance of the parts often gives us but little information; for, continues Hunter, I have frequently examined the parts of those who confessed all the symptoms, such as increase of discharge, pain in making water, soreness in walking, or when the parts were touched, yet I could see no difference between these and sound parts. I know of no other way of judging, in cases where there are no symptoms sensible to the person herself, or where the patient has a mind to deny any uncommon symptoms, but from the circumstances preceding the discharge; such as her having been connected with men supposed to be unsound, or her being able to give the disorder to others; which last circumstance being derived from the testimony of another person, is not always to be trusted to, for obvious reasons.

From the manner, in which the disease is contracted, it must principally attack the vagina, a part not endowed with much sensation. In many cases, however, it produces a considerable soreness on the inside of the labia, nymphæ, clitoris, carunculæ myrtiformes, meatus urinarius. Those parts are so sore, in some cases, as not to bear being touched; the person can hardly walk; the urine gives pain in its passage through the urethra, and when it comes into contact with the above mentioned parts.

The bladder sometimes sympathizes, and even the kidneys. The mucous glands, on the inside of the labia, often swell, and sometime suppurate, forming small abscesses, which open near the orifice of the vagina.

Mr. Hunter states, that the venereal matter from the vagina sometimes runs down the perinæum to the anus, and produces a gonorrhæa, or chancre, in that situation. The disease in women may probably wear itself out, as in men; but it may exist in the vagina for years, if the testimony of patients can be relied on.

TREATMENT OF GONORRHŒA.

As every form of the venereal disease arises from the same cause, and as we have a specific for some forms, we might expect that this would be a certain cure for every one; and, therefore, that it must be no difficult task to cure the disease, when in the form of inflammation and suppuration in the urethra. Experience, however, teaches us, that the gonorrhœa is the most variable in its symptoms, while under a cure; and the most uncertain, with respect to its cure, of any forms of the venereal disease; many cases terminating in a week, while others continue for months, under the same treatment.

The only curative object is, to destroy the disposition and specific mode of action in the solids of the parts, and as they become changed, the poison

ous quality of the matter produced will also be destroyed. This effects the cure of the disease, but not always of the consequences.

This form of the disease is not capable of being continued beyond a certain time in any constitution; and when it is violent, or of long duration, it is owing to the part being very susceptible of such irritation, and readily retaining it. As we have no specific remedy for the gonorrhœa, it is fortunate that time alone will effect a cure. It is worthy of consideration, however, whether medicine can be of any service. Mr. Hunter is inclined not to think it of the least use, perhaps, once in ten cases. But even this would be of some consequence, if the cases capable of being benefited could be distinguished.

The means of cure, generally adopted, are of two kinds, internal remedies, and local applications; but, whatever plan is pursued, we are always to attend more to the nature of the constitution, or to any attending disease in the parts themselves, or parts connected with them, than to the gonorrhœa itself.

When the symptoms are violent, but of the common inflammatory kind, known from the extent of the inflammation not exceeding the specific distance, the local treatment may be either irritating or soothing.

Irritating applications, in these cases, are less dangerous, than when there exists irritable inflammation, and they may alter the specific action; but, to produce this effect, their irritation must be greater, than that of the original injury. The parts will afterwards recover of themselves, as from any other common inflammation.

Mr. Hunter believes, however, that the soothing plan is the best at the beginning. If the inflammation be great, and of the irritable kind, no violence is to be used, for it would only increase the symptoms; nothing should be done that may tend to stop the discharge, as doing so would not put a stop to the inflammation. The constitution is to be altered, if possible, by remedies adapted to each disposition, with a view of altering the actions of the parts arising from such disposition, and reducing the disease to its simple form. If the constitution cannot be altered, nothing is to be done, and the action is to be allowed to wear itself out.

When the inflammation has abated, the cure may be attempted by internal remedies, or local applications, not operating violently, which might reproduce the irritation. Gentle astringents may be applied

But, if the disease has begun mildly, an irritating injection may be used, in order quickly to get rid of the specific mode of action. This application will increase the symptoms for a time; but, when it is left off, they will often abate, or wholly disappear. In such a state of parts, astringents may be used, the discharge being now the only thing to be removed.

When itching, pain, and other uncommon sensations are felt for some time before the discharge appears, Mr. Hunter diffidently expresses his inclination to recommend the soothing plan, instead of the irritating one, in order to bring on the discharge, which is a step towards the resolution of the irritation; and he adds, that to use astringents would be bad practice, as by retarding the discharge, they would protract the cure. When there are strictures, or swelled testicles, astringents should not be used; for, while there is a discharge, such complaints are relieved.

Mr. Hunter thus expresses himself in regard to the effect of mercury in gonorrhœa: "I doubt very much of mercury having any specific virtue in this species of the disease; for I find that it is as soon cured without mercury as with it, &c. So little effect, indeed, has this medicine upon a gonorrhœa, that I have known a gonorrhœa take place while (the patient was) under a course of mercury, sufficient for the cure of a chancre. Men have also been known to contract a gonorrhœa when loaded with mercury for the cure of a lues venerea; the gonorrhœa, nevertheless, has been as difficult of cure as in ordinary cases."

Mr. Hunter does not say much in favour of evacuants, diuretics, and astringents, given internally. He allows, however, that astringents which act specifically on the parts, as the balsams, conjoined with any other medicine, which may be thought right, may help to lessen the discharge, in proportion as the inflammation abates.

Local applications may be either internal to the urethra, external to the penis, or both. Those which are applied to the urethra seem to promise

most efficacy, because they come into immediate contact with the diseased parts. They may be either in a solid or fluid form. A fluid is only a very temporary application. The solid ones, or bougies, may remain a long while, but in general irritate immediately, from their solidity alone; and, Mr. Hunter says, the less bougies are used, when the parts are in an inflamed state, the better, though he never saw any bad effects from them, when applied with caution.

The fluid applications, or injections, in use, are innumerable; and as gonorrhœas frequently get well with so many of various kinds, we may infer, that such complaints would, in time, get well of themselves. Injections, however, certainly often have an immediate effect on the symptoms, and hence must have power; though the one which possesses the greatest specific power is unknown. As injections are only temporary applications, they must be used often, especially when found useful, and they are not of an irritating kind.

Mr. Hunter divides injections into four kinds, the *irritating*, *sedative*, *emollient*, and *astringent*.

Irritating injections, of whatever kind, act in this disease upon the same principle; that is, by producing an irritation of another kind, which ought to be greater than the venereal; by which means the venereal is destroyed and lost, and the disease cured, although the pain and discharge may still be kept up by the injection. Those effects, however, will soon go off, when the injection is laid aside. In this way bougies also perform a cure. Most of the irritating injections have an astringent effect, and prove simply astringent when mild.

Irritating injections should never be used when there is already much inflammation; especially, in constitutions, which are known to be incapable of bearing much irritation; nor should they be used when the inflammation has spread beyond the specific distance; nor when the testicles are tender; nor when, upon the discharge ceasing quickly, these parts have become sore; nor when the perinæum is very susceptible of inflammation, and especially if it formerly should have suppurated; nor when there is a tendency in the bladder to irritation, known by the frequency of making water.

In mild cases, and in constitutions which are not irritable, such injections often succeed, and remove the disease almost immediately. The practice, however, ought to be attempted with caution, and not, perhaps, till milder methods have failed. Two grains of the hydrargyrus muriatus, dissolved in eight ounces of distilled water, form a very good irritating injection; but, an injection of only half this strength may be used, when it is not intended to attempt a cure so quickly. If, however, the injection, even in that proportion, gives considerable pain in its application, or occasions a great increase of pain in making water, it should be diluted.

Sedative injections will always be of service, when the inflammation is considerable, and they are very useful in relieving the pain. Perhaps, the best sedative is opium, as well when given by the mouth, or anus, as when applied to the part affected, in the form of an injection. But, even opium will not act as a sedative in all constitutions, and parts; but, on the contrary, often has opposite effects, producing great irritability. Lead may be reckoned a sedative, so far as it abates inflammation, while, at the same time, it may act as a gentle astringent. Fourteen grains of saccharum saturni, in ℥viij of distilled water, make a good sedative astringent injection.

Drinking freely of diluting waters may, perhaps, have a sedative effect, as it in part removes some of the causes of irritation, by rendering the urine less stimulating to the bladder, when the irritation is there, and to the urethra in its passage through it. Diluting drinks may possibly lessen the susceptibility of irritation. The vegetable mucilages of certain seeds and plants, and the emollient gums are recommended.—Mr. Hunter does not entertain much opinion of their efficacy, though some of his patients told him they experienced less uneasiness in making water, when their drink was impregnated with mucilaginous substances.

Emollient injections are the most proper, when the inflammation is very great; and they probably act by first simply washing away the matter, and then leaving a soft application to the part, so as to be singularly serviceable, by lessening the irritating effects of the urine. Indeed, practice proves

this; for a solution of gum-arabic, milk and water, or sweet oil, will often lessen the pain, and other symptoms, when the more active injections have done nothing, or seemed to do harm.

The irritation at the orifice of the urethra, is frequently so great, that the point of the syringe cannot be suffered to enter. In this case, no injection should be used till the inflammation has abated; but, in the mean while, fomentations may be employed.

Astringent injections act by lessening the discharge. They should only be used towards the latter end of the disease, when it has become mild. But, if the disease should begin mildly, they may be used at the very beginning; for, by gradually lessening the discharge, without increasing the inflammation, we complete the cure, and prevent a continuance of the discharge called *gleet*. They will have an irritating quality, if used strong, and hence increase the discharge, instead of lessening it. Mr. Hunter's experience did not teach him, that one astringent was much better than another. The astringent gums, as dragon's blood, the balsams, and the turpentines, dissolved in water; the juices of many vegetables, as oak bark, Peruvian bark, tormentil root, and, perhaps, all the metallic salts, as green, blue, and white vitriols; the salts of mercury, and also alum; probably all act much in the same way; though the mere changing of an injection is often efficacious. The external applications are poultices and fomentations, which can only be useful when the prepuce, glans, and orifice of the urethra are inflamed.

Since Mr. Hunter's time, many surgeons have been in the habit of keeping the penis, in the incipient inflammatory stage of gonorrhœa, covered with linen, kept continually wet with the saturnine lotion; a practice which is certainly both rational and beneficial. Mr. Abernethy, in his Lectures on Surgery, speaks in favour of this method.

When the glands of the urethra are enlarged, mercurial ointment may be rubbed on the part; and this will probably be of more service after the inflammation has subsided.

TREATMENT OF GONORRHŒA IN WOMEN.

This is nearly the same as that of the disease in men, but is more simple. When the disorder is in the vagina, injections are best; and after them, the parts may be smeared with mercurial ointment, and the external parts washed with the injection. It is almost impossible for the patient to throw an injection into the urethra, when it is affected. The same injections are proper as for men; but they may be made doubly strong. When the glands of the vagina are enlarged, mercurial ointment should be freely applied; and when they form abscesses, these should be opened and dressed.

CONSTITUTIONAL TREATMENT OF GONORRHŒA.

In many strong plethoric constitutions, the symptoms are violent, and there is a great tendency to inflammatory fever. In such instances, opiate clysters, though at first productive of relief, sometimes occasion in the end fever, and consequently aggravate all the symptoms. The balsam capivi, sometimes, in such cases, increases the inflammatory symptoms. The treatment of this kind of constitution, consists chiefly in evacuations, the best of which are bleeding and gentle purging. To live sparingly, and, above all, to use little exercise, is necessary.

In the weak and irritable constitution, the symptoms are frequently very violent, the inflammation extending beyond the specific distance, running along the urethra, and even affecting the bladder. The indication, in this instance, is to strengthen; and bark alone has been known to effect a cure. All evacuations are hurtful.

The fever has been known to stop the discharge, relieve the pain in making water, and finally cure the disease. On other occasions, Mr. Hunter has seen all the symptoms of gonorrhœa cease on the accession of a fever, and return when the fever was subdued. In other examples, a gonorrhœa mild at first, has been rendered severe by the coming on of a fever, and, on this ceasing, the gonorrhœa has ceased. Although a fever does not always cure a gonorrhœa, yet, as it may do so, nothing should be done while it lasts. If the local complaint should continue after the fever is gone, it is to be treated according to symptoms.

A gonorrhœa may be considerably affected by the patient's manner of living, and by other diseases attacking

the constitution. Most things which hurry or increase the circulation, aggravate the symptoms; such as violent exercise, drinking strong liquors, eating strong indigestible food, some kinds of which act specifically on these parts, so as to increase the symptoms more than simply heating the body would do; such as peppers, spices, and spirits.

In cases which have begun mildly, in which the inflammation is only slight, or in others, in which the violent symptoms have subsided, such medicines as have a tendency to lessen the discharge, may be given, together with the local remedies before mentioned. Turpentines are the most efficacious. Cantharides, the salts of lead and copper, and alum, have also been recommended.

Mr. Hunter advises small doses of mercury, in consequence of the possibility of absorption, and with a view of preventing lues venerea.

TREATMENT OF OCCASIONAL SYMPTOMS OF GONORRHŒA.

Bleeding from the urethra is sometimes relieved by the balsam. capivi. Mr. Hunter did not find astringent injections of use.

Painful erections are greatly prevented by taking twenty drops of tinctura opii at bed-time. Cicuta has also some power in this way.

Chordee. See this word.

Bladder affected. Opiate clysters, the warm bath, and bleeding, if the patient is of full habit, are proper. Leeches may be applied to the perinæum. When this affection lasts a considerable time, and is not mitigated by common methods, Mr. Hunter advises trying an opiate plaster on the pubes, or the loins, where the nerves of the bladder originate; or a small blister on the perinæum. In another place, he mentions bark, cicuta, sea air, and sea bathing, among the proper means.

Swelled testicle. See *Hernia Humoralis.*

For a more full account of Gonorrhœa, according to the above doctrines, see a *Treatise on the Venereal Disease, by John Hunter*, from page 29 to 90.

ON THE QUESTION, WHETHER GONORRHŒA IS REALLY A FORM OF THE VENEREAL DISEASE?

The foregoing remarks, and other ones in Mr. Hunter's work, would lead one to believe, that the poison of gonorrhœa and the venereal virus are the same. Here it is our duty impartially to state the arguments which have been urged for, and against, this important doctrine.

Mr. Hunter assures us, that he has seen all the symptoms of lues venerea originating from gonorrhœa alone; that he had even produced venereal chancres by inoculating with the matter of gonorrhœa; and that he afterwards repeated these experiments in a manner in which he could not be deceived. P. 294, *& seq.*

Mr. Hunter's experiments, it is true, have been repeated with a different result; but, as an eminent modern writer remarks, can we wonder at this, when we consider from how many causes gonorrhœa may arise, and how impossible it is to distinguish the venereal from any other? (*Observations on Morbid Poisons, by J. Adams, M. D. p.* 91. *edit.* 2.)

Another argument adduced by Hunter, in favour of the poisons of gonorrhœa and chancres being the same, is the probability, that the Otaheiteans had the venereal disease propagated to them by European sailors, who were affected with gonorrhœa; for these can hardly be supposed to have had a chancre, during a voyage of five months, without the penis being destroyed.

It is impossible, however, to say what time may elapse, between the application of venereal poison to the penis, and the commencement of ulceration. Therefore, Bougainville's sailors, alluded to by Mr. Hunter, might have contracted the infection at Rio-de-la-Plata; but actual ulcers on the penis might not have formed till about five months afterwards, when the ship arrived at Otaheite. (See *First Lines of the Practice of Surgery, p.* 411.)

In attempting to explain why a gonorrhœa and a chancre do not equally produce lues venerea, and why the medicine which almost universally

cures chancre, has less effect on gonorrhœa, a modern advocate for Mr. Hunter's doctrine, says, that we must take into consideration, that the seat of the two diseases is different; that the same cause may produce different effects upon different parts; that the same poison, when mixed with different fluids, may be more or less violent in its operation; and that there may be greater or less attraction of certain fluids to a part, according to its nature and composition. (*Inquiry into some Effects of the Venereal Poison, by S. Sawrey*, 1802, *p.* 4.) Mr. Sawrey very truly remarks, p. 6, that if gonorrhœal matter has clearly and decidedly produced chancre, or contaminated the system, *in any one instance*, the question is determined. It could in no instance produce these effects, unless it had the power of doing so. This writer brings forward some cases to shew, that the poison of gonorrhœa may produce gonorrhœa, or chancre; but, the limits of this work only afford room to observe, that these instances are by no means decisive of the point, as some objections may be urged against them, as, indeed, Mr. Sawrey himself allows. That Mr. Hunter's cases are inconclusive, I have endeavoured to explain in the *First Lines of the Practice of Surgery*, to which I must refer my readers.

Why does not gonorrhœa commonly produce ulceration in the urethra? Mr. Sawrey tries to solve this question, by saying, that the product of the venereal inflammation, the diseased contents of the small arteries of the urethra, are thrown out of these open-mouthed vessels into this canal, without any breach in the texture, which otherwise would be a necessary consequence.

Why does not gonorrhœa equally contaminate the system as chancre? In gonorrhœa, says Mr. Sawrey, the discharge is very plentiful; it is not, in general, attended with ulceration; the poison is much more diluted, and mixed with a mucous and puriform fluid. It is deposited in the urethra, and its lacunæ, where little or no pressure is applied, and it finds easy egress out of the canal. In chancre there is a breach of substance, the poison is not much diluted, &c.

Why does not chancre generally, in the same person, produce gonorrhœa, and gonorrhœa chancre? Mr. Sawrey, in answer, expresses his belief, that these incidents are not very unfrequent. He says, he has known persons having a chancre, which continued for months, become affected, after that time, with a clap, without any further exposure. His opinion is, that the matter of a chancre had insinuated itself into the urethra, and produced the disease; though, he confesses, many would explain the circumstance, by supposing that the chancre and gonorrhœa were both communicated at the same time by two different poisons.

Mr. Hunter remarks, that the presence of one disease renders the adjacent parts less susceptible of its influence.

Mr. Sawrey concludes his second chap. with inclining to the idea, that the matter of gonorrhœa is not strictly pus, but of a more mucous nature than that of a chancre. However, when he mentions chemical attractions, as drawing the poison from mucus to the urethra, and from pus to the dry parts, in order to explain the last of the above questions, every sober reader must feel sorry, that a work, which contains some really sensible observations, should comprehend this most unfortunate one.

Mr. Whately has also written, in support of the opinion, that the matter of gonorrhœa and that of chancre, are the same. (See *Whately on Gonorrhœa Virulenta.*)

Another defender of this side of the question is Dr. Swediaur, who endeavours to prove the fallacy of the following positions: 1. *That the poison which produces the clap, does never, like that of chancres, produce any venereal symptoms in the mass or lues itself.* 2. *That the poison of the clap never produces chancres, and that the poison of chancres never produces a clap.* 3. *That mercury never contributes to, nor accelerates the cure of a clap; but that, on the contrary, every blennorrhagia may be certainly cured without mercury, and without any danger of leaving a lues behind.*

His arguments run thus:—the reason why claps do not, like chancres, constantly produce the lues, is, that the most of them excite only a superficial inflammation in the membrane of the urethra, without any ulceration. Hence absorption cannot easily take place, the poison being out of the course of the circulation. But he has seen claps, with an ulcer in the urethra, followed by the most unequivocal symptoms of lues itself. He mentions the urethra

being defended with a large quantity of mucus, as the thing impeding the common formation of ulcers, which do occasionally occur when the mucus is not secreted as usual, or is washed away. He asserts, that in many cases, where he had occasion to examine both parties, he was convinced that chancres were communicated by a person affected with a simple gonorrhœa; and, *vice versa*, that a virulent clap had been the consequence of an infection from a person having merely chancres. He says, that if a patient, with a venereal running, does not take care to keep the prepuce and glans perfectly clean, chancres will very often be produced. He owns a great many claps are cured without mercury; yet, repeated experience has shewn him, a cure cannot always be thus accomplished. Mild cases, without ulcer or excoriation in the urethra, may certainly be radically cured without a grain of mercury; and though mercury should be given, it would not have the least effect: not because the disease does not proceed from a venereal poison, but because out of the course of the circulation. He contends, that the topical use of mercury in injections, acts usefully even in these cases. But, when a clap is joined with ulceration in the urethra, it is always cured more safely and expeditiously with mercury, and is frequently incurable without it. A lues also follows cases attended with ulcers in the urethra. He allows that all claps are not venereal. (See *Practical Observations on Venereal Complaints, by J. Swediaur.*)

One argument urged against the identity of gonorrhœal and chancrous virus, is, that gonorrhœa was not described as a symptom, till nearly half a century after the other symptoms of the venereal disease were known. Fallopius is among the first who observed gonorrhœa as a symptom of the venereal disease. "If, however," says Dr. Adams, "venereal gonorrhœa was unnoticed till ubout fifty years after the other forms of the disease were described, what does this prove, but that contagious genorrhœa was so common, as to be disregarded as a symptom of the new complaiut? Can there be a doubt, from the caution given by Moses, that gonorrhœa was considered as contagious in his days? During the classical age, we find inconveniences of the urinary passages, were imputed to incontinence; and the police of several states, before the siege of Naples, made laws for preserving the health of such as would content themselves with public stews, instead of disturbing the peace of families. This is enough to lessen our surprise, that gonorrhœa should be unnoticed for some time after the appearance of the veneral disease. But, so far is it from proving the two contagions are different, that the fairest inference we can draw is in favour of their identity. For, if by this time the venereal disease began to be so far understood, that secondary symptoms were found the consequence of primary ones in the genitals, it is most probable that the first suspicion of venereal gonorrhœa arose from the occurrence of such secondary appearances, where no other primary symptoms could be traced." (*Adams on Morbid Poisons, p. 95. edit. 2.*)

In relating the arguments maintained by the best modern writers, to repel the attacks made on the doctrine, that gonorrhœa and chancre arise from the same poison, we have been compelled to disclose the chief grounds, on which the assailants venture to entertain a contrary theory.

Mr. B. Bell is the principal author who has written against the opinions maintained by Hunter, Sawrey, Swediaur, Adams, &c. Our limits will only allow us just to enumerate a few of his leading arguments.

If the matter of gonorrhœa, and that of chancre, were of the same nature, we must admit that a person with a chancre only, can communicate to another, not only every symptom of pox, but of gonorrhœa; and that another, with gonorrhœa only, can give to all, with whom he may have connexion, chancres, with their various consequences. This ought, indeed, to be a very frequent occurrence; whereas, all allow that it is even in appearance very rare.

On the supposition of the matter of gonorrhœa and lues venerea being the same, the latter ought to be a much more frequent occurrence than the former, from the greater ease with which the matter of infection must, in every instance, be applied to those parts on which it can produce chancres, than to the urethra, where, instead of chancre or ulceration, it almost always excites gonorrhœa. It is difficult to conceive how the matter, by which the disease

is communicated, should find access into the urethra; while all the external parts of the penis, particularly the glans, must be easily and universally exposed to it; and yet gonorrhœa is a much more frequent disease than pox. Cases of gonorrhœa are in proportion to those of chancre, according to Mr. B. Bell's experience, as three to one. It is obvious that the very reverse should happen, if the two diseases were produced by the same kind of matter.

I need not adduce other arguments, as the reader must be already acquainted with any worth knowing, from what is said in the previous part of the present article.

The grand practical consideration, depending on the possibility of the venereal disease arising from gonorrhœa, is, whether mercurials should not be exhibited, in all cases, with a view of preventing such a consequence.

Waving, on my own part, all attempts to decide the point, whether the matter of a chancre, and that of gonorrhœa, are of the same nature, I shall merely content myself with stating, that, as far as my observation and inquiries extend, the majority of the best practitioners of the present day consider the exhibition of mercury unnecessary, and, consequently, improper in cases of gonorrhœa. This fact almost amounts to a proof, that if venereal symptoms do ever follow a clap, they are so excessively rare, and, I may add, always so imputable to other causes, that the employment of mercury, as a prevention, would, upon the whole, do more injury than benefit to mankind; and this even admitting (what, in my mind, has never been unequivocally proved) that the matter of gonorrhœa is really capable, in a very few instances, of giving rise to the venereal disease.

The reader must weigh the different arguments himself. Some of Mr. B. Bell's reasoning is certainly untenable, as Sawrey has clearly shewn; but the latter, also, is not invulnerable in many points, which he strives to defend.

The reader is referred, for further information, to *A Treatise on the Venereal Disease, by John Hunter;* 1788. *Whately on the Gonorrhœa Virulenta;* 1801. *Practical Observations on Venereal Complaints, by F. Swediaur, M. D. edit.* 3. *An Inquiry into some of the Effects of the Venereal Poison, by S. Sawrey;* 1802. *Observations on Morbid Poisons, by J. Adams, M. D. edit.* 2. 1807.

GRANULATIONS, (from *granum*, a grain.) The little grain-like, fleshy bodies, which form on the surfaces of ulcers, and suppurating wounds, and serve both for filling up the cavities, and bringing nearer together and uniting their sides.

Nature, in bringing parts as nearly as possible to their original state, whose disposition, action, and structure have been altered by accident, or disease; and after having, in her operations for this purpose, formed pus, she immediately sets about forming new matter, upon surfaces in which there has been a breach of continuity. This process is called *granulating*, or *incarnation;* and the substance formed is called *granulations*.

Granulations are an accretion of animal matter upon the wounded, or exposed surface; they are formed by an exudation of the coagulating lymph from the vessels; into which new substance, both the old vessels probably extend, and in which new ones are formed. Hence granulations are very vascular; indeed, more so than almost any other animal substance. The vessels in granulations pass from the original parts to their basis, and thence towards their external surface, in tolerably regular parallel lines. The surface of this new substance has the same disposition to secrete pus, as the parts which produced it. The surfaces of granulations are very convex, the reverse of ulceration, having a great many small points, or eminences, so as to appear rough. The smaller such points are, the more healthy the granulations. The colour of healthy granulations, is a deep florid red. When livid, they are unhealthy, and have only a languid circulation. Healthy granulations, on an exposed or flat surface, rise nearly even with the surface of the surrounding skin, and often a little higher; but, when they exceed this, and take on a growing disposition, they are unhealthy, become soft, spongy, and without any disposition to form skin. Healthy granulations are always prone to unite to each other, so as to be the means of uniting parts.

Granulations are not easily formed on the side of an abscess, nearest the surface of the body.

They are not endowed with the same powers as parts originally formed. Hence they more readily ulcerate, and mortify. The curious mode in which granulations contract, when sores are healing, and even for some time after they are healed, we have explained in the article *Cicatrization*. (See *A Treatise on the Blood, Inflammation, &c. by John Hunter, p. 473, et seq.* 1794.)

GUAIACUM, (from an Indian word.) Many writers of the sixteenth century, contended that guaiacum was a true specific for the venereal disease; and the celebrated Boerhaave, in the eighteenth, maintained the same opinion. Mr. Pearson mentions, that when he was first intrusted with the care of the Lock Hospital, in 1781, Mr. Bromfield and Mr. Williams were in the habit of reposing great confidence in the efficacy of a decoction of guaiacum wood. This was administered to such patients as had already employed the usual quantity of mercury; but who complained of nocturnal pains, or had gummata, nodes, ozæna, and such other effects of the venereal virus, connected with secondary symptoms, as did not yield to a course of mercurial frictions. The diet consisted of raisins, and hard biscuit; from two to four pints of the decoction were taken every day; the hot bath was used twice a week; and a dose of antimonial wine and laudanum, or Dover's powder, was commonly taken every evening. Constant confinement to bed was not deemed necessary; neither was exposure to the vapour of burning spirit, with a view of exciting perspiration, often practised; as only a moist state of the skin was desired. This treatment was, sometimes, of singular advantage to those whose health had sustained injury from the disease, long confinement, and mercury. The strength increased; bad ulcers healed; exfoliations were completed; and these anomalous symptoms, which would have been exasperated by mercury, soon yielded to guaiacum.

Besides such cases, in which the good effects of guaiacum made it be erroneously regarded, as a specific for the lues venerea, the medicine was also formerly given, by some, on the first attack of the venereal disease. The disorder being thus benefited, a radical cure was considered to be accomplished; and, though frequent relapses followed, yet, as these partly yielded to the same remedy, its reputation was still kept up. Many diseases, also, which got well, were probably not really venereal cases. Mr. Pearson seems to allow, that, in syphilitic affections, it may, indeed, operate like a true antidote, suspending, for a time, the progress of certain venereal symptoms, and removing other appearances altogether; but, he observes, that experience has evinced, that the unsubdued virus yet remains active in the constitution.

Mr. Pearson has found guaiacum of little use in pains of the bones, except when it proved sudorific; but, that it was then inferior to antimony, or volatile alkali. When the constitution has been impaired by mercury, and long confinement, a thickened state of the ligaments, or periosteum, or foul ulcers, still remaining, Mr. Pearson says, these effects will often subside, during the exhibition of the decoction. He says, it will often suspend, for a short time, the progress of certain secondary symptoms of the lues venerea; for instance, ulcers of the tonsils, venereal eruptions, and even nodes. Mr. Pearson, however, never knew one instance in which guaiacum eradicated the virus; and he contends, that, its being conjoined with mercury, neither increases the virtue of this mineral, lessens its bad effects, nor diminishes the necessity of giving a certain quantity of it. Mr. Pearson remarks, that he has seen guaiacum produce good effects in many patients having cutaneous diseases, the ozæna, and scrofulous affections of the membranes and ligaments. (See *Pearson on the Effects of Various Articles in the Cure of Lues Venerea. edit.* 2. 1807.)

GUMMA, a soft tumour, so named from the resemblance of its contents to gums.

GUN-SHOT WOUNDS are made by the projection of hard obtuse bodies from cannons, muskets, &c.; but the latter fire-arm occasions by far the greatest number. These wounds are the most considerable of the contused kind; and what is to be said of them, will apply, more or less, to all contused wounds, according to the degree of contusion. It is said, that a ball may injure parts of the body in two ways, namely, by actually striking them, and by passing near them, without touching them at all. The latter case is

thought to be occasioned by the violent commotion produced in the air, by the rapid motion of the ball; and consists of a contused, and even crushed state of the soft and hard parts, situated under the skin, which itself continues entire.

Injuries, probably, never arise from such a cause. The air does not move with the same rapidity as the ball; but its motion is less in proportion as it is a more subtile matter, and must be too feeble to account for such a violent degree of injury. The air, to which the ball must really communicate the greatest motion, is what is directly before it; and this never bruises the part untouched by the ball itself. It is only the air situated laterally to the shot, that is imagined to do injury, and it cannot be greatly agitated. The violent consequences of sudden explosions, and effects produced on the organs of hearing, by strong commotions of the air, prove nothing relative to the point in question. Lastly, experience does not confirm the reality of such wind contusions, for cannon-balls often tear off whole members, without the adjacent parts being in the least injured. (See *Le Vacher, in Mem. de l' Acad. de Chirurgie, tom.* 4. *p.* 22.)

Neither can this kind of accident be attributed to an electrical shock on the parts, in consequence of the ball being rendered electrical by friction in the calibre of the gun, and giving off the electricity as it passes by. (Vide *Plenk's Sammlungen,* 1 *Theil. p.* 99.) Metals never acquire this property from friction.

The mischief, imputed to the air, is occasioned by the ball itself. Its producing a violent contusion, without tearing the skin, and entering the limb, is to be ascribed to the oblique direction in which it strikes the part. Daily observation evinces, that balls, which obliquely strike a surface, do not penetrate, but are reflected; though they may be impelled with the greatest force, and the body struck may be as soft and yielding as water. This alteration in the course of the ball, not only happens on the surface of the human body, but also in the substance of a limb which it has entered. A bone, a tendon, &c. may change the direction of a ball which touches them at all obliquely. Hence it is manifest how it happens, that the track of a gun-shot wound is not always straight, and how balls sometimes run under the integuments nearly all round the body, or a limb.

A ball, when it strikes a part of the body, may cause four kinds of injury. 1. It may only occasion a contusion, without penetrating the part, on account of its being too much spent, or of the oblique way in which it strikes the surface of the body. 2. It may enter and lodge in the surface of a part; in which case, the track of the wound has only one aperture. 3. It may pierce through and through; and then there are two openings, one at the entrance, the other at the exit of the ball. The circumference of the aperture, where the shot entered, is usually depressed; that of the opening, from which it came out, elevated. At the entrance, there is commonly more contusion than at the exit of the ball. The former is generally narrower; the latter wider, and more irregular, especially when the round smooth figure of the ball has been changed by its having struck a bone. 4. A cannon-ball may tear off a whole limb. (*Richter.*)

Gun-shot wounds differ very much, according to the kind of body projected, its velocity, and the nature and peculiarities of the parts injured. The projected bodies are mostly bullets, sometimes cannon-balls, sometimes pieces of broken shells, and very often, on board of ship, splinters of wood. From the contusion, which the parts suffer, on the violent passage of the ball through them, there is most commonly a part of the solids surrounding the wound deadened, which is afterwards thrown off in the form of a slough, and which prevents such wounds from healing by the first intention, and makes most of them necessarily suppurate. This does not take place equally in every gun-shot wound, nor in every part of the same wound; and the difference commonly arises from the variety in the velocity of the body projected; for, where the ball has passed with little velocity, which is sometimes the case at their entrance, but, still more frequently at the part last wounded, the injury may often be healed by the first intention. (*J. Hunter, p.* 523.)

Foreign bodies are more frequently met with in gun-shot wounds than any others, and are commonly of three kinds. 1. Pieces of clothing, or other things, which the ball forced before it

into the limb. 2. The ball itself. 3. Loose splinters of bone. It is only when the ball strikes a naked part, touches no bone, and goes through and through, that the wound can be free from extraneous matter. Foreign bodies are the cause of numerous unfavourable symptoms, by irritating sensible parts, and exciting pain, inflammation, convulsions, hemorrhage, long suppurations, &c. They are constantly more productive of such evils, the more uneven, pointed, and hard they are. Hence spiculæ of bone are always the most to be dreaded. (*Richter.*)

When a ball strikes a bone, the concussion produced is another occasion of bad symptoms, to be added to those already mentioned. When slight, its effects are confined to the injured limb. Sometimes they extend to the neighbouring joints, in which they produce inflammation and abscesses.

It is commonly stated, in surgical books, that when a cannon-ball tears off a limb, it produces a most violent concussion of the whole body, and a general derangement of all its functions. This, however, is by no means true. I have lately seen, in London, a young sailor, whose arm was completely torn off at the shoulder, by a cannon-ball from one of the forts at Guadaloupe, in March 1808; he suffered no dreadful concussion of his body, nor were his senses at all impaired. This case was very remarkable, as the scapula was so shattered, that Mr. Cummings, of Antigua, was under the necessity of removing the whole of it. The patient recovered in two months. From the account I heard, I do not believe the axillary artery bled immediately after the accident. This young man was lately shewn to the gentlemen of St. Bartholomew's Hospital, quite well.

There is one curious effect which occasionally follows gun-shot wounds; but, I do not pretend to understand the rationale of it: viz. inflammation and suppuration of some internal viscus afterwards, especially of the liver. Several such cases are related in the *Mem. de l'Acad. de Chirurgie.*

From the circumstance of the inner surface of gun-shot wounds being more or less deadened, they are late in inflaming. But when a ball has fractured a bone, which fracture has occasioned great injury of the soft parts, independently of that caused immediately by the ball itself, the inflammation will come on as quickly, as in cases of compound fracture; because the deadened part bears no proportion to the laceration or wound in general. (*J. Hunter*, p. 524.)

From the same circumstance of a part being often deadened, gun-shot wounds frequently cannot be completely understood in the first instance, for, in many cases, it is at first impossible to know what parts are killed, whether bone, tendon, or soft part. Nor can this be ascertained till the slough separates, which often makes the wound much more complicated than was previously imagined. For, very often, some viscus, or a part of some viscus, or a part of some large artery, or even a bone, has been killed by the violence. If a piece of intestine has been killed, the contents of the bowel will begin to come through the wound when the slough separates. If a portion of a large blood-vessel be killed, a profuse, and even fatal hemorrhage may come on when the slough is detached, although not a drop of blood may have been previously lost. (See *Hunter, p. 525.*)

When the ball moves with little velocity, the mischief is generally less; the bones are not so likely to be fractured; the parts are less deadened, &c. However, when the velocity is just great enough to splinter a bone, which is touched, the splintering is generally more extensive, than if the impetus of the ball had been much greater, in which case, it would rather have taken a piece out. When the ball moves slowly, it is more likely to be turned by any resistance it may encounter in its passage through parts, and hence the wound is more likely to take a winding course.

When a ball enters a part with great velocity, but is almost spent, when it comes out again in consequence of the resistance it has met with, there may be a good deal of sloughing about the entrance, and little or none about the exit, owing to the different degrees of celerity with which the ball traversed the parts. (See *Hunter.*)

As the ends of the torn vessels are contused and compressed, gun-shot wounds have little propensity to bleed much, and, unless very considerable vessels are lacerated, they do not bleed at all; sometimes not in this case. The greatest danger of bleeding is always

when the dead parts are detached, eight or ten days after the injury. Angular uneven bodies, such as pieces of iron, cut lead, &c. always occasion far more dangerous wounds, than round even bodies, like leaden bullets. Wounds occasioned by a small shot, are frequently more perilous, than others produced by larger balls; because their track is so narrow, that it cannot be traced, nor consequently the extraneous body itself extracted. Such a shot oftentimes injures a viscus, when there is not the smallest external symptom of such an occurrence. Sometimes a great part of the danger, also, arises from the number of shots which have entered.

TREATMENT OF GUN-SHOT WOUNDS.

The first thing in the treatment of a gun-shot wound is to determine, whether it is most advisable to amputate the limb immediately, or to undertake the cure of the wound. When a bone, especially at a joint, is very much shattered; when the fleshy parts, particularly the great blood-vessels and nerves, are lacerated; when the whole limb has suffered a violent concussion, and is cold and senseless; there is no hope of preserving it. In this case, it is the surgeon's duty to amputate at once, and not to delay till mortification commences. But, besides this violent degree of injury, in which the propriety of amputation is obvious, there are several lower degrees, in which it is often a difficult thing to decide whether amputation is necessary or not. Here the surgeon must look not only to the injury, but also to the patient's constitution, and even to external circumstances, such as the possibility or impossibility of procuring good accommodation, rest, attendance and pure air. But it is impossible to determine the necessity of amputation by general rules. In every individual case, the surgeon must consider maturely the particular circumstances, before he ventures to decide. The grounds against the operation are; the pain which it causes at a period when the whole system is disordered by a terrible injury; the privation of a limb; and frequent examples, in which nature, aided by judicious surgery, repairs the most horrible wounds. The following are the reasons in favour of the operation. By it the patient gets rid of a dreadful contused wound, which threatens the greatest peril, and which is exchanged, as it were, for a simple incised one. The pain of amputation is not of more moment than the pain which the requisite incisions, and the extraction of foreign bodies, would cause in case the operation is abandoned. The wound of amputation is not so much to be apprehended, as experience shews, that incisions, in cases of gun-shot wounds, are not only exempt from particular danger, but are often useful. The loss of the limb cannot be taken into the account; for, the surgeon only undertakes the operation where he designs to save the patient's life by that privation, and anticipates that the part itself cannot be preserved. Even, if he should deprive the patient of a limb, that, perhaps, might have been preserved, there is this atonement, that he can furnish him with an artificial leg, which often proves far more serviceable, than the lost limb would have proved, had it been preserved. Should the operation be fixed on, it is to be immediately performed above the wound. *(Richter.)*

When amputation is deemed unnecessary, the surgeon, according to customary precepts, is to enlarge the wound by incisions. Such a dilatation has been said to have numerous advantages; to facilitate the extraction of foreign bodies; to occasion a topical bleeding, and afford an outlet for the extravasated fluid in the circumference of the wound; to convert the fistulous form of the track of the ball into an open wound; and, lastly, to divide ligamentous aponeuroses, which otherwise might give rise to spasmodic and other untoward symptoms.

More modern experience, however, shews (*Hunter, p.* 529.) that the utility of such incisions has been overrated; that they generally increase the inflammation, which, in these cases, is so much to be apprehended; that wounds which are not dilated, commonly heal more speedily, than others which are; and, that there are only a few cases in which incisions are beneficial.

The cases of gun-shot wounds are various. Sometimes the track of the ball lies superficially under the skin, and only has one opening. When it lies in soft parts, and the ball has neither touched a bone, nor a considerable blood-vessel, all incisions are useless, let the wound have one or two apertures. Though dilating the wound has

been practised with a view of giving vent to matter, eschars, and foreign bodies, and even its whole track has been laid open, when superficial; yet, experience proves the inutility of such steps. As in the skin there is a real loss of substance, arising from a portion being driven inward before the ball, it follows, that the opening of a gun-shot wound must be more capacious than that of a punctured one. By the separation of sloughs, the wound becomes still more dilated, so that not only matter, but foreign bodies which approach the skin, may easily find an exit. Besides, incisions commonly close again very soon, and in a few days the wound falls into the same state, as if no dilatation at all had been made.

When a cannon-ball has torn off a limb, some advise the amputation of the stump, to procure the patient an even smooth incision, instead of an irregular, jagged, and highly dangerous wound. As the limb has commonly suffered a violent concussion, is almost bereft of sense, and power of motion, and the bone frequently has a fissure extending some way upward, the amputation is also recommended to be done, if possible, above the nearest joint. Others condemn the operation in this instance, asserting, that such wounds may sometimes be healed, and that the constitution, immediately after such violence, is not in a favourable state for submitting to such a painful measure. But, as when the operation is not done, this kind of injury requires large and free incisions, for the extraction of foreign bodies, the shortening of projecting muscles and tendons, the discharge of extravasated fluids and abscesses; and, as these incisions are likely to occasion at least as much irritation as amputation itself, without being productive of equal good, the last objection is not very weighty. The operation may, also, in many cases, be delayed until the immediate irritation of the injury on the system is over. The occasional healing of such wounds only proves, that it is not altogether impossible, in every instance, to effect a cure without amputation. The surgeon can the more readily make up his mind to amputate in this case, as it does not occasion the loss of a limb. However, it is very credible, that the injury may sometimes be so conditioned, and the circumstances in which the patient finds himself such, that there are good grounds for deeming the operation unnecessary, and even pernicious. No one would be justified in amputating above the knee, when the limb is injured at the foot or ankle.

In gun-shot wounds, ligamentous fibres and fasciæ, are often found going quite across them. It is advised to divide such parts completely, lest, when the wound inflames, they should cause violent spasms and nervous symptoms, and afterwards impede the discharge of matter and foreign bodies. No doubt this counsel is judicious. However, it is frequently difficult, at first, to discover and divide such parts, and then it is better to defer the incision until one can easily get at them without irritating the wound, and it is manifested, that their remaining undivided is the cause of inconvenience. These remarks are, also, applicable to membranous expansions perceptible at the sides of the wound, and to entire fasciæ, stretched over the inflamed muscles.

The extraction of foreign bodies ranks as one of the most urgent motives for the dilatation of the wound, and, no doubt, it is right to remove, at first, as many of them as possible. Their lodgment irritates the wound, causes violent nervous and inflammatory symptoms, and copious suppuration; circumstances which the timely extraction of them may prevent. Yet, let it be remembered, that the extraction of foreign bodies is frequently attended with immense irritation, and that, while they lie too firmly fixed in parts, it is often a matter of impossibility. After the sloughs have separated, and the wound has become widened, suppuration frequently does not prevail long before the extraneous substances become loose, spontaneously approach the skin, and easily admit of removal without any dilatation. In cases, where from necessity, foreign bodies have not been removed at first, no disadvantages have occasionally resulted from their continuance.

Hence, it is prudent, at first, to extract only such foreign bodies as are near the external opening, quite loose, and removeable without much irritation; or such as press on parts of importance, and, thereby excite dangerous symptoms. The surgeon should avoid interfering with those which are deeply and firmly lodged in the wound He should await suppuration, and the

detachment of sloughs, and when the foreign bodies become moveable and apparent, he should extract them, with or without an incision, as circumstances may demand. The examination of the wound ought to be made as much as possible with the finger, which irritates less, and feels more distinctly, than a probe. Hand-screws, gimblets, bullet-drawers, &c. ought not be used to extract foreign bodies, but only the fingers, or, at most, a fine pair of forceps, which is to be guided on the finger.

The event of such treatment is various. Extraneous substances remaining in the wound, either loosen gradually, and come into view so as to be easily removeable; or they continue concealed, prevent the cure, and give birth to a fistulous ulcer. In some instances, the wound closes, and the foreign bodies remain in the limb during life, without inconvenience; and, in other cases, after a time, they bring on a renewal of inflammation and suppuration. Sometimes a foreign body varies its situation, sinking down, and afterwards making its appearance at a different part, where it may excite inflammation and suppuration.

When the ball lodges in the wound, it is usually difficult to trace it, as the parts collapse after its passage. The ball does not regularly take a straight direction through the injured part, but, oftentimes, a very tortuous one. The latter circumstance is more apt to occur, as the ball is more spent. In every case, in which it is not easily discoverable, all painful examinations should be abandoned, and the foreign body left in its situation, where it rarely creates any trouble.

Sometimes, the ball may be both easily found and extracted. At other times it lodges on the opposite side of the limb, closely under the skin. If the integuments, under which the ball is lodged, should be so contused that they will probably slough, they are to be considered as already dead, and an opening is to be made in them for the extraction of the ball. But when the ball lies so remotely from the skin that it can only just be felt, and the skin itself is quite uninjured, no counter-opening ought to be made. The wound heals better when the ball is left in, and far less inflammation takes place in the vicinity of this extraneous body, than about the orifice of the wound. A counter-opening always renders the inflammation at the bottom of the wound, as great as its orifice. It is better to let the wound heal up, and extract the ball afterwards. (See *Hunter, p.* 541.)

Sometimes the ball penetrates the spongy part of a bone, and lodges firmly in it. When it has only entered superficially, it may sometimes be loosened and extracted, by means of an elevator with a thin and somewhat curved extremity. Should the attempt fail, hope may still be entertained, that, when suppuration takes place, it will become loose, and admit of extraction. In case nothing of this kind should occur, some advise the employment of a trepan to remove the ball from its situation. As this cannot be done without great irritation, and experience proves that a ball may lie in a bone during life, without occasioning unpleasant symptoms, it is obviously preferable to allow it to remain. *Richter's Anfangsgr. der Wundarzn. Band.* 1.

Besides these principal circumstances, there are various contingent ones, which often demand a particular mode in making the incisions, and in the subsequent management. To explain them all here is impossible. Hemorrhage from a torn blood-vessel of considerable magnitude, for which a ligature is necessary, may require incisions to get at it.

As soon as the requisite incisions are made, and foreign bodies extracted, the prime objects in the treatment of gun-shot wounds are then accomplished, and the rest is, in reality, not different from the surgery of other wounds.

With regard to probing gun-shot wounds; when it is evident that the shot has passed out, and no particular object can be fulfilled by introducing an instrument, it is often better to dispense with such examinations, at least till suppuration has come on. Introducing any instrument is generally productive both of pain and irritation. But when the ball, or any other extraneous substance, has lodged in the wound, and its situation is not immediately evident, it will often be adviseable to search for it at once, that it may, if its situation will allow, be extracted before inflammation begins. The surgeon, therefore, considering all the circumstances which can assist him in forming a reasonable conjecture of the course of the wound, must give to a probe that curvature, or form, which he thinks most likely to pass readily along it, and must then proceed to make the examination. But, when this

is very painful, and the course of the wound obscure, it will often be better to desist, and renew the search when suppuration has taken place, when it can be undertaken with more ease, and a greater prospect of success. When gun-shot wounds are inflamed, the tenderness and swelling of the parts are peculiarly strong reasons against probings, or efforts to extract foreign bodies, as long as this state lasts. (See *Chevalier's Treatise on Gun-shot Wounds, p.* 67—68. *Edit.* 3.)

There is no fact in the practice of surgery better established, than that the cramming of narrow stabs and gun-shot wounds with lint is particularly hurtful. The only possible reason for doing so in the latter cases must be to keep the orifice of the wound from healing up, and confining extraneous bodies, matter, &c. The apprehension of this happening at first is quite unfounded; for the inside of the mouth of the injured part is lined with a slough or eschar, which must necessarily be detached before the parts can heal. The first dressings, therefore, should be quite superficial, and of a mild unirritating nature. Hunter used to employ fomentations, pledgets of simple ointments, and, frequently, over the latter an emollient poultice. In the suppurative stage of gun-shot wounds, poultices are also the best applications, and a little piece of lint may be gently introduced into the mouth of the wound in order to preserve an outlet for the matter, extraneous bodies, and sloughs, which are making their way outward.

Possessing these ideas, I cannot altogether approve the following directions, though they are certainly better than are given in many surgical books. "A small bit of soft lint may be placed lightly between the lips of the wound, *in order to keep it from closing*. In some instances, it should be introduced a little beyond the lips, *in order to conduct off the fluids effused, and to prevent irregular adhesions from forming near the surface during the inflammatory stage;* as these would impede the direct exit of the discharge. But the wound is not to be filled with lint, much less crammed with it. A pledget of some simple ointment being then laid on, with tow or cloths to receive the discharge, and these prevented from coming off by a bandage loosely applied, the patient may be put to bed, and so placed, if possible, as to keep the orifice of the wound dependent." (*Chevalier, p.* 125—126.) The reasons for what I consider objectionable, namely, introducing lint on first dressing the wound, are too frivolous to need comment.

When the track of the ball has two apertures, some advise a seton to be drawn through it, with a view of preventing a premature closure of the wound, and introducing proper applications. A seton is, also, imagined to give free vent to pus, and to promote the evacuation of foreign bodies. But a gun-shot wound is little inclined to close prematurely, and a seton rather obstructs the exit of pus, and may as easily push foreign bodies deeper into the limb as out of it. There are preferable modes of applying the necessary remedies, and, as a seton is an extraneous substance itself, its employment must be deemed pernicious.

Gun-shot wounds require, in general, the employment of antiphlogistic means, just as other cases attended with equal inflammation do. When they are in the inflamed state, the application of leeches is highly proper.

Bleeding is recommended in these cases, and in such a manner, as if it were of more service in them than wounds in general. But the necessity for the practice is really not greater than in other wounds which have done the same degree of mischief, and from which the same quantity of inflammation and other consequences are expected. Bleeding is certainly proper here, just as it is in all considerable wounds attended with a strong full habit, and great chance of extensive inflammation, and much symptomatic fever. In every instance, however, the practitioner must take particular care not to be too bold in the practice of bleeding; for when the patient is reduced below a certain degree, his strength is inadequate to support the large and long-continued suppurations which often cannot be avoided. (See *Hunter, p.* 563, 564.)

As the orifices of the vessels torn by the ball, are compressed, and, as it were obliterated, considerable hemorrhage is seldom remarked at first. But, after some days, and frequently at a very late period, when the sloughs separate, very copious hemorrhages are

apt to occur, which are the more dangerous as they come on unexpectedly, and, oftentimes, when the suppuration has already induced great debility. A sense of heaviness, throbbing, and plethora, at the wounded part, often announces the approach of such an event. The surgeon himself may occasion the bleeding, by removing the dressings carelessly. Hence, in every case, where there is reason to apprehend from the situation of the wound, that a considerable vessel is injured, the patient must be constantly and attentively watched, and every thing necessary for the immediate stoppage of the hemorrhage must be provided.

Another kind of hemorrhage, still more dangerous than the former, particularly occurs in such gun-shot wounds as have long been in a state of copious suppuration. The blood does not issue from one individual vessel, but from the whole surface of the wound, as from a sponge, and is so thin as to resemble blood and water. This hemorrhage is very dangerous, because it is very apt to completely exhaust the patient, who is already extremely debilitated, and its causes are difficult of removal. The case demands the exhibition of bark, alum, and diluted sulphuric acid. Decoctions of bark, and muriatic acid, may, at the same time, be applied to the wound. (*Richter.*)

Sometimes, in gun-shot wounds, the inflammation lasts very long, and there is no appearance of suppuration. In other instances, fresh inflammation comes on suddenly, during the suppurative stage, without any evident cause, and puts a stop to the secretion of matter. Sometimes the wound suppurates to an extraordinary degree, without any perceptible reason. All these circumstances often depend on splinters of bone remaining behind, which should be extracted as soon as it is practicable. (*Richter.*)

For the first days, the matter seldom assumes a healthy appearance; but as soon as the sloughs separate, it then becomes of a proper quality, and the wound is to be treated as a simple abscess.

Sometimes the healing process does not commence, after suppuration has prevailed for a considerable time. On the contrary, notwithstanding the exhibition of tonics, and a generous diet, the suppuration ceases to proceed vigorously, and the wound becomes unhealthy, and the matter thin. The bones shew no disposition to unite, and the patient, reduced by hectic symptoms, is rapidly advancing to dissolution. In this state, life may sometimes be preserved by amputation; the *anceps*, but *unicum remedium*. We ought never to be deterred from undertaking the operation by the fever and weakness, which frequently soon disappear when the local cause is removed.

GUTTA SERENA. A term, said to have been first applied by Actuarius to amaurosis, or the species of blindness arising from an insensible state of the retina, or optic nerve. (See *Amaurosis.*)

H

HÆMATOCELE, from αιμα, blood, and κηλη, a tumour.) This is a swelling of the scrotum, or spermatic cord, proceeding from, or caused by, blood.

A distinction of the different kinds of hæmatocele, though not usually made, is absolutely necessary toward rightly understanding the disease; the general idea, or conception of which, appears to Mr. Pott to be somewhat erroneous, and to have produced a prognostic which is ill founded, and hasty. According to this eminent surgeon, "the disease, properly called hæmatocele, is of four kinds; two of which have their seat within the tunica vaginalis testis; one within the albuginea; and the fourth in the tunica communis, or common cellular membrane, investing the spermatic vessels.

"In passing an instrument, in order to let out the water from an hydrocele of the vaginal coat, a vessel is sometimes wounded, which is of such size, as to tinge the fluid pretty deeply at the time of its running out: the orifice becoming close, when the water is all discharged, and a plaster being applied, the blood ceases to flow from thence, but insinuates itself partly into the cavity of the vaginal coat, and partly into the cells of the dartos; making, sometimes, in the space of a few hours, a tumour nearly equal in size to the original hydrocele. This is one species.

"It sometimes happens, in tapping an hydrocele, that although the fluid discharged by that operation be perfectly clear and limpid, yet, in a very short space of time, (sometimes in a few hours,) the scrotum becomes as large as it was before, and palpably as full of a fluid. If a new puncture be now made, the discharge, instead of being limpid (as before) is now either pure blood, or very bloody. This is another species: but, like the preceding, confined to the tunica vaginalis.

"The whole vascular compages of the testicle is sometimes very much enlarged, and at the same time rendered so lax and loose, that the tumour produced thereby has, to the fingers of an examiner, very much the appearance of a swelling composed of a mere fluid, supposed to be somewhat thick or viscid. This is in some measure a deception; but not totally so: the greater part of the tumefaction is caused by the loosened texture of the testis; but there is very frequently a quantity of extravasated blood also.

"If this be supposed to be an hydrocele, and pierced, the discharge will be mere blood. This is a third kind of hæmatocele; and very different, in all its circumstances, from the two preceding: the fluid is shed from the vessels of the glandular part of the testicle, and contained within the tunica albuginea.

"The fourth consists in a rupture of, and an effusion of blood from, a branch of the spermatic vein, in its passage from the groin to the testicle. In which case, the extravasation is made into the tunica communis, or cellular membrane investing the spermatic vessels."

Each of these four, Mr. Pott says, he has seen so distinctly, and perfectly, that he has not the smallest doubt concerning their existence, and of their difference from each other.

"The tunica vaginalis testis, (he continues,) in a natural and healthy state, is a membrane, which, although firm, is of no great thickness; it is white, or rather of a reddish white colour; and its blood-vessels are (in a healthy state) no more apparent to the eye, than are those of the tunica albuginea: but when it has been long or much distended, it thereby becomes thick, and tough; and the vessels (especially those of its inner surface) are sometimes so large, as to be very visible, and even varicous. If one of these lies in the way of the instrument, wherewith the palliative cure is performed, it is sometimes wounded; in which case, as I have already observed, the first part of the serum which is discharged, is pretty deeply tinged with blood.

"Upon the collapsion of the membranes, and of the empty bag, this

kind of hemorrhage generally ceases, and nothing more comes of it. But is sometimes happens, either from the toughness of the tunic, or from the varicous state of the vessel, that the wound (especially if made by a lancet) does not immediately unite; but continues to discharge blood into the cavity of the said tunic, thereby producing a new tumour, and a fresh necessity of operation."

This is what Mr. Pott calls the first species of hæmatocele, which evidently consists in a wound of a vessel of the vaginal tunic.

"Upon the sudden discharge of the fluid, from the bag of an over-stretched hydrocele, and thereby removing all counter-pressure against the sides of the vessels, some of which are become varicous, one of them will, sometimes, without having been wounded, burst. If the quantity of blood, shed from the vessel so burst, be small, it is soon absorbed again; and, creating no trouble, the thing is not known.* But if the quantity be considerable, it, like the preceding, occasions a new tumour, and calls for a repetition of the operation." This, Mr. Pott calls the second species: "which, like the first, belongs entirely to the vaginal coat, and has no concern either with the testicle, or with the spermatic vessels. In both, the bag which was full of water, becomes in a short space of time distended with blood; which blood, if not carried off by absorption, must be discharged by opening the containing cyst: but in neither of these can castration (though said to be the only remedy) be ever necessary: the mere division of the sacculus, and the application of dry lint to its inside, will, in general, if not always, restrain the hemorrhage, and answer every purpose, for which so severe a remedy has been prescribed. The other two are indeed of more consequence; they interest either the testicle itself, or the vessels by which it is supplied with blood, and rendered capable of executing its office; and are sometimes not curable, but by removal of the part.

"One of these is seated within the tunica albuginea of the testicle; the other in the tunica communis of its vessels: they are neither of them very frequent; but when they do happen, they call for all our attention.

"If blood be extravasated within the tunica albuginea, or proper coat of the testicle, in consequence of a great relaxation, and (as it were) dissolution of part of the vascular compages of that gland, and the quantity be considerable, it will afford or produce a fluctuation, to the hand of an examiner, very like to that of an hydrocele of the tunica vaginalis; allowing something for the different density of the different fluids, and the greater depth of the former from the surface.

"If this be mistaken for a simple hydrocele, and an opening be made, the discharge will be blood, not fluid, or very thin; not like to blood circulating through its proper vessels; but dark, and dusky in colour, and nearly of the consistence of thin chocolate (like to what is most frequently found in the imperforate vagina.) The quantity discharged will be much smaller than was expected from the size of the tumour; which size will not be considerably diminished. When this small quantity of blood has been so drawn off, the testicle will, upon examination, be found to be much larger than it ought to be; as well as much more loose and flabby; instead of that roundness and resistance arising from an healthy state of the gland, within its firm strong coat; it is soft, and capable of being compressed almost flat, and that generally without any of that pain and uneasiness, which always attend the compression of a sound testicle. If the bleeding ceases upon the withdrawing the cannula (supposing a trochar to have been used) and the puncture closes, a fresh accumulation of the same kind of fluid is soon made, and the same degree of tumefaction is produced, as before the operation: if the orifice does not close, the hemorrhage continues, and very soon becomes alarming.

"In the two preceding species, the blood comes from the tunica vaginalis, the testis itself being safe, and unconcerned; and the remedy is found, by opening the cavity of the said tunic; but in this, the hemorrhage comes from the substance of the testicle; from the convolutions of the spermatic artery, within the tunica albuginea: the division of

* Hence, the last running of the water from an hydrocele, is bloody.

the vaginal coat can here do no good; and an incision made into the albuginea can only increase the mischief: the testicle is spoiled or rendered useless, by that kind of alteration made in it, previous to the extravasation; and castration is the only cure, which a patient in such circumstances can depend upon.

"The last species of this disease arises from a bursting of a branch of the spermatic vein, between the groin and scrotum, in what is generally known by the name of the spermatic process. This, which is generally produced by great or sudden exertions of strength, feats of agility, &c. may happen to persons in the best health, whose blood and juices are in the best order, and whose genital parts are free from blemish, or disease.

"The effusion, or extravasation, is made into the cellular membrane, which invests and envelopes the spermatic vessels, and has something the appearance of a true hernia. When the case is clear, and the extravasated blood does not give way to discutient applications, the only remedy is to lay the tumour fairly open, through its whole length. If the vessel or breach be small, the hemorrhage may be restrained by mere compression with dry lint, or by the use of styptics; but if it be large, and these means do not succeed, the ligature must be made use of." *(Pott's Chirurgical Works, Vol. II.)*

The bleeding point should be tied singly. It can never be warrantable to tie the whole spermatic chord, and then perform castration, in a case like this, notwithstanding Mr. Pott advises this plan, in case the bleeding branch cannot be tied singly. Discutient applications, and an occasional purge will almost always disperse the swelling; and if not, opening it, taking out the blood, filling the cavity with lint, and using compression, one may say, will always answer.

The best of the old writers on Hæmatocele, are Celsus and Ægineta; Pott has excelled every modern one.

HÆMORRHAGIA. (See *Hemorrhage.*)

HÆMORRHOIDES. (See *Hemorrhoids.*)

HARE-LIP. *Labia Leporina.* A fissure, or longitudinal division of one or both lips.

Children are frequently born with this kind of malformation, particularly of the upper lip. Sometimes the portions of the lip, which ought to be united, have a considerable interspace between them; in other instances, they are not much apart. The cleft is occasionally double, there being a little lobe, or small portion of the lip, situated between the two fissures. Every species of the deformity has the same appellation of *hare-lip*, in consequence of the imagined resemblance which the part has to the upper lip of a hare.

The fissure commonly affects only the lip itself. In many cases, however, it extends along the bones of the palate, even as far as the uvula. Sometimes these bones are totally wanting; sometimes, they are only divided by a fissure.

Such a malformation is always peculiarly afflicting. In its least degree it constantly occasions considerable deformity; and when it is more marked, it frequently hinders infants from sucking, and makes it indispensable to nourish them by other means. When the lower lip alone is affected, which is not most frequently the case, the child can neither retain its saliva, nor learn to speak, except with the greatest impediment. But when the fissure pervades the palate, the patient not only never articulates but very imperfectly, but cannot masticate nor swallow, except with great difficulty, on account of the food readily getting up into the nose.

After these remarks, it is obviously very important to cure the malformation as soon as possible. But as this object cannot be accomplished without an operation, attended with some degree of pain, several practitioners, as Dionis, Garengeot, and others, have advised waiting till the child is four or five years old, on the supposition, that, at an earlier age, the child's agitations and cries would render the operation impracticable, or derange all the proceedings taken to ensure its success. It is plain, however, that such reasons are not exceedingly weighty. A child four or five years old, and, very often, even one eight or ten years of age, is more difficult to manage, in this circumstance, than an infant only a few months old. There is no child, though advanced to that age, which has not a thousand times more dread of the pain than of the deformity, or of the inconveniences of the complaint, to which he

is habituated; while an infant of tender years fears nothing, and only feels the pain of the moment.

A more rational objection is the liability of infants to convulsions after operations, and this has induced many excellent surgeons of the present day to advise postponing the cure of the hare-lip, till the child is about two years old. Perhaps the apprehension, however, does not vindicate the delay.

Mr. Sharp observes, "there are many lips, where the loss of substance is so great, that the edges of the fissure cannot be brought together, or, at best, where they can but just touch; in which case it need not be advised to forbear the attempt: it is likewise forbid in young children, and with reason, if they suck; but otherwise it may be undertaken with great safety, and even with more probability of success than in others that are older." (*Operations in Surgery, chap.* 34.)

Le Dran has performed the operation on children of all ages, even on those at the breast. B. Bell did it with success on an infant only three months old. Muys advises it to be undertaken as soon as the child is six months old. Roonhuysen operated on children ten weeks after their birth, and all his contemporaries have praised his singular dexterity and success. This latter surgeon advises, as a step essential to the success of the operation, to hinder children from sleeping a certain time before undertaking it, in order that they may fall asleep immediately afterwards. Opiates have also been recommended to ensure this occurrence. M. Louis is of opinion, that the operation done without any suture will succeed better on infants, than any other method. This subject, however, we shall treat of in due time.

All practitioners entertain the same sentiment with regard to the object of this operation, which consists in reducing the preternatural solution of continuity to the state of a simple wound, by cutting off the edges of the separated parts throughout their length, and then approximating these parts, so as to make them continue in contact until they have completely grown together. But although such principles are admitted by all surgeons, all are not of the same opinion with respect to the method, which it is best to follow in practice; some having recourse to sutures to keep the edges of the wound in contact; others disapproving of the plan, and believing that a perfect cure may always be accomplished by means of adhesive plaster and a uniting bandage, so as to save the patient a great deal of pain, which sutures always occasion.

M. Louis has been the chief advocate for the method, which proscribes sutures, and he has published on this subject two very interesting memoirs, which we shall presently quote, for the purpose of informing the reader of the reasons, on which this celebrated man founded his opinion on this matter, and of the means which he employed.

M. Louis thought that the use of sutures, in the operation for the hare-lip, originated from a false idea which prevailed, respecting the nature of the disease. The fissure in the lip having been improperly imputed to a loss of substance, it was thought impossible to keep the parts in contact, except by a suture.

"The separation of the edges of the fissure in the lip is only the effect of the retraction of the muscles, and is always proportioned to the extent of the cleft. Those who have hare-lips are capable of bringing the edges of the fissure together by muscular action, when they pucker up their mouths. On the other hand, the separation is considerably increased when such persons laugh, and the breach appears excessively large, after superficially paring off its edges on both sides. Hence, the interspace in the hare-lip must not be mistaken for a loss of substance. The truth of this is confirmed by the effects of sticking plaster, which has sometimes been applied to the hare-lip, as a preparatory measure before the operation, and which exceedingly lessens the separation of the parts.

"According to the confession of all who have written in favour of the twisted suture, it seems advisable only on the false idea, that the hare-lip is the effect of a greater or lesser loss of substance; and they say, positively, that we must not have recourse to it when there is only a simple division to be united. The twisted suture must then be proscribed from the operation for the natural hare-lip, since it is proved that this malformation is unattended with a loss of substance. But the loss of substance is but too real, after the extirpation of scirrhous and cancerous

tumours, to which the lips are very subject. Yet, even in these very cases, the extensibility of the lips allows an attempt to be made to reunite the double incision, by which the tumour has been removed, and it succeeds without the smallest deformity, when care has been taken to direct each incision obliquely, so that both of them form, where they meet, an acute angle, in the base of which the tumour is comprised. It is on this occasion, that the means to procure an union ought to be the more efficacious, because the difficulty of keeping the edges of the wound approximated is greater. M. Pibrac has already shewn, in his memoir on the abuse of sutures, when speaking of the hare-lip, that they are a badly conceived means, and more hurtful in proportion to the greater loss of substance, because the greater the interspace is between the two parts, the more fear is there of their efforts on the needles or pins left in the wound. Hence, care has always been taken to make the dressings aid the operation of the suture. After this consideration, judiciously made by the partisans of this plan, there was only one more step to be taken, according to M. Pibrac, in order to evince the necessity of proscribing it. The cap, or copper head-piece, described by Verduc and Nuck, for compressing the cheeks; the clasps of Heister; the strips of adhesive plaster, which no author has neglected expressly to recommend; all this has been invented in order to support the parts, and keep them from being disunited. When the suture failed, it was by these means, that the original deformity was corrected, together with that produced by the laceration, which would not have occurred without the suture. As, then, the dressings, when methodically applied, are capable of effectually rectifying the mischief of the suture, why should they be considered only as a resource in a mere accidental case? Why should they not be made the chief and primary means of reuniting the lips, even when there is a loss of substance?

"Nothing can be opposed to the proofs adduced upon this point. They are even drawn from the practice of those, who have employed sutures without success. Such persons themselves have furnished the arguments in favour of the bandage being capable of repairing the mischief resulting from the twisted suture. Practitioners can only be vindicated in employing this suture by confessing, that the true principles of the art have not been established concerning this subject."

M. Louis, with a view of perfecting our notions on this matter, lays it down as a fact, that, the retraction of the muscles being the cause of the separation of the edges of the fissure, it is not to these edges we are to apply the force which is to unite them; but that it should be applied further to the very parts, whose action (the cause of the separation) is to be impeded, and whose contraction is thus to be prevented. A great many means for supporting the wound, only irritate the muscles and excite them to action, and it is this action which we should endeavour to overcome. The means for promoting a union can only be methodical, when directly employed to prevent such action, by an immediate application on the point where it is to be resisted. The facility, with which the parts may be brought forward, so as to bring the two commissures of the lips into contact, by the mere pressure of the hands, shews what may be expected from a very simple apparatus, which will execute the same office without any efforts, in a firm and permanent manner, and which will render sutures unnecessary, the inconveniences of which are too well known.

M. Louis, after having explained the reasons of the theory, on which he founded his method, relates several cases, taken either from his own practice, or that of others, to illustrate its advantages. He details the history of twenty cases, in which his plan perfectly succeeded, both in accidental hare-lips, with considerable loss of substance, and in natural ones. In most of these instances, however, it was thought proper to assist the bandage with one stitch at the extremity of the fissure, close to the vermilion border of the lip, for the purpose of keeping the parts securely on a level.

Notwithstanding the operation, as performed with the twisted suture, is opposed by an authority of such weight as that of M. Louis, still it is the one most commonly practised. Few practitioners doubt that a hare-lip may be cured, by means of adhesive plaster, and uniting bandages, quite as perfectly as by a suture; and all readily allow, that the first of these methods, as being more simple and less painful, would be

preferable to the latter one, if it were equally sure of succeeding. But it is considered far more uncertain in its effect. To accomplish a complete cure, the parts to be united must be maintained in perfect contact, until they have contracted the necessary adhesion; and how can we always depend upon a bandage keeping them from being displaced? What other means, besides a suture, affords in this respect such perfect security?

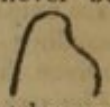
We shall not take upon us to decide which of these two methods is the best, contenting ourselves with explaining the mode of proceeding in both, and leaving it for surgeons to determine, by their own experience, and the evidence of facts, which one merits the preference. First, of the ancient plan.

Having placed the patient in a convenient situation, the first thing is to examine whether there is any adhesion of the lip to the gum; and, if there be one, to divide it with a knife. Some authors (*Sharp*) recommend always dividing the frænulum, which attaches the lip to the gum; but, when the hare-lip is at some distance from this part, and will not be in the way in the operation, there is no need of dividing it; but, when the frænulum is situated in the centre of the division, it is clear that, in operating, we must necessarily include it in the incision, and it must be divided beforehand, taking care not to encroach too much upon the gum, lest the alveolary process should be laid bare; nor too much upon the lip, because making it thinner would be unfavourable to its union.

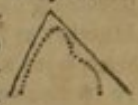
Sometimes one of the incisor teeth being opposite the fissure, and projecting forward, must be drawn, lest it should distend and irritate the parts, after they have been brought into contact.

Sometimes also, but particularly in cases in which there is a cleft in the bony part of the palate, a portion of the os maxillare superius forms such a projection, just in the situation of the fissure in the lip, that it would render the union very difficult, if not impracticable. In this circumstance, the only plan is to cut off the projecting angles of bone, which may easily be done with a strong pair of bone-nippers.

In the operation, the grand object is to make the wound as smooth and even a cut as possible, in order that it may more certainly unite by the first intention, and of such a shape, that the cicatrix may form only one narrow line. The edges of the fissure should, therefore, never be cut off with scissars, which always bruise the fibres which they divide, and a sharp knife is always to be preferred. The best plan is, either to place any flat instrument, such as a spatula, underneath one portion of the lip, and then holding the part stretched and supported on it, to cut away the whole of the callous edge; or else to hold the part with a pair of forceps, the under blade of which is much broader than the upper one: the first serves to support the lip; the other contributes also to this effect, and, at the same time, serves as a sort of rule in guiding the knife in an accurately straight line. When the forceps are preferred, the surgeon must of course leave on the side of the upper blade, just as much of the edge of the fissure as is to be removed, so that it can be cut off with one sweep of the knife. This is to be done on each side of the cleft, observing the rule, to make the new wound in straight lines, because the sides of it can never be made to correspond without this caution. For instance, if the hare-lip had this shape,



the incision of the edges must be continued in straight lines, till they meet in the manner here represented. In short, the two incisions are to be perfectly straight, and are to meet at



an angle above, in order that the whole track of the wound may be brought together, and united by the first intention.

Two silver pins, made with steel points, are next to be introduced through the edges of the wound, so as to keep them accurately in contact. A piece of thread is then to be repeatedly wound round the ends of the pins, from one side of the division to the other, first transversely, then obliquely, from the right or left end of one pin, above, to the opposite end of the lower one, &c. Thus the thread is made to cross as many points of the wound as possible, which greatly contributes to maintaining its edges in an even apposition. It is obvious, that a great deal of exactness is requisite in introducing the pins, in order that the edges of the incision may afterwards be precisely applied to each other. For this purpose, some previously place the sides

of the wound in the best position, and mark with a pen the points at which the pins should enter, and come out again. The pins ought never to extend more deeply than about two-thirds through the substance of the lip, and it would be a great improvement always to have them constructed a little curved, as this is the course which they naturally ought to take when introduced. The steel points should also admit of being easily taken off, when the pins have been applied; and, perhaps having them to screw off and on is the best mode, as removing them in this way is not so likely to be attended with any sudden jerk, which might be injurious to the wound, as if they were made to pull off. The pins may commonly be safely removed in about four days, after which the support of sticking-plaster will be quite sufficient.

The process we have just been describing, is what is well known by the name of the *twisted suture*.

It is worthy of attention, that this suture is applicable to other surgical cases, in which the grand object is to heal some fistula or opening, by the first intention. Mr. Sharp says, it is of great service in fistulæ of the urethra, remaining after the operation for the stone, in which case the callous edges may be cut off, and the lips of the wound held together by the above method.

What has hitherto been stated, refers to the most simple form of the hare-lip, viz. to that which presents only one fissure. When there are two clefts, the cure is accomplished on the same principles; but, it is more difficult of execution; indeed, so much so, that the old surgeons, until the time of Heister, have almost all regarded the operation for the double hare-lip, as impracticable, though they have described it, directing us to operate on each fissure, just as if there were only one. M. de la Faye, however, performed this operation with success, as may be learned in the *Mémoires de l'Acad. de Chirurgie, Tom.* 1. But, we are indebted to M. Louis for having obviated all the difficulties, by simply proposing to do the operation at two times, and to await the perfect cure of one of the fissures, before undertaking that of the other. Heister seems to have conceived a similar idea, about the same time, but he never put it in practice, nor did he even positively advise it.

In cutting off the edges of the fissure, the incision must be carried to the upper part of the lip; and even when the fissure does not reach wholly up the lip, the same thing should be done; for, in this manner the sides of the wound will admit of being applied together more uniformly, and the cicatrix will have a better appearance. We should also not be too sparing of the edges which are to be cut off. Practitioners, says M. Louis, persuaded that the hare-lip was a division with loss of substance, have invariably advised the removal of the *callous* edges. But, in the natural hare-lip there is no callosity: the margins of the fissure are composed, like those of the lip itself, of a pulpy, fresh-coloured, vermilion flesh, covered with an exceedingly delicate cuticle. The whole of the part having this appearance, must be taken away, even encroaching a little way on the true skin. At the lower part of the fissure, towards the nearest commissure, a rounded red substance is commonly situated, which it is absolutely necessary to include in the incision. Were this neglected, the union below would be unequal, and, through an injudicious economy, a degree of deformity would remain, which is always unpleasant, when it can be avoided. The grand object, however, is to make the two incisions diverge at an acute angle, so that the edges may be put into reciprocal contact their whole length, without the least inequality.

M. Louis used to operate as follows: the patient being seated in a good light, his head is to be supported on an assistant's breast, who, with the fingers of both hands, pushes the cheeks forward, in order to bring the edges of the fissure near to each other. These are to be laid on a piece of pasteboard, which is to be put between the jaw and lip, and be an inch and a half long, from twelve to fifteen lines broad, and at most one line thick. The upper end should be rounded, by flattening the corners. To facilitate the incision, the lip is to be stretched over the pasteboard, the operator holding one portion over the right with the thumb and index finger of the left hand, while the assistant does the same thing on the left side. Things being thus disposed, the edges of the hare-lip are to be cut off with two sweeps of the bistoury, in

two oblique lines, forming an acute angle above the fissure.

For a long while scissars were preferred to a knife, for cutting off the edges of the hare-lip; but, they are now very generally disused for this purpose. The pinching and bruising, which result from the action of the two blades, in overlapping each other, are deemed obstacles to the union of the sides of the wound; for, the bruised fibres must necessarily suppurate; and, slight as this may be, the cure is at least retarded by it. Let not practitioners be led by Mr. B. Bell's stating, that in one instance he cut off one side of the fissure with a knife, and the other with scissars? that the latter cut produced least pain, and that on this side there was no more swelling nor inflammation than on the opposite one.

The pins should be introduced at least two thirds of the way through the substance of the lip, lest a furrow should remain on the inside of the part, which might prove troublesome, by allowing pieces of food to lodge in it. There is, however, a stronger reason for attending to this circumstance, viz. the hemorrhage which may take place when it is neglected. The bleeding almost always ceases, as soon as the edges of the wound have been brought together by means of the suture, when the pins are properly placed; but, when they have not been introduced deeply enough, the posterior surfaces of the incisions not been applied to each other, the blood may continue to run into the mouth, and give the surgeon an immense deal of trouble. In the memoir written by Louis, there is the history of a case, in which the patient died in consequence of such an accident. Persons who had undergone the operation, were always advised to swallow their spittle, even though mixed with blood, in order to avoid disturbing the wound, by getting rid of it otherwise. In the case alluded to, the patient, who had been operated upon for a cancer which he had in the lip, swallowed the blood as he had been directed to do, and he bled so profusely as to die. On the examination of the body, the stomach, and small intestines were found full of blood. "This deplorable case," says the illustrious author who relates it, "deserves to be recorded for public instruction, for the purpose of keeping alive the attention of surgeons on all occasions, where, in consequence of any operation whatsoever, there is reason to fear any bleeding in the cavity of the mouth. Platner is the only writer, who, as far as I know, foresaw this kind of danger. The bleeding from the edges of the wound stops of itself, (says he) as soon as they have been brought into contact, and stitched together; but, care must be taken that the patient does not swallow the blood, which might make him vomit, or else suffocate him. Hence his head should be elevated, that the blood may escape externally, a precaution more particularly necessary in regard to young children."

Having described the mode of operating for the hare-lip, as approved of by the generality of practitioners, and detailed every thing which seemed material, we have now only to describe the method which M. Louis adopted. His sentiments respecting several particular points of the operation, have been already stated; and an account of the means which he employed, in lieu of the twisted suture, for uniting the edges of the wound, is all we have to offer farther on the present subject.

Different authors, as already mentioned, have devised bandages for supporting the two portions of the divided lip, and lessening the pressure which they make against the pins designed for uniting them. Franco and Quesnay, in particular, have described two kinds, which have been considered very well calculated for this object; and these means were not only employed as auxiliary, but even sometimes as curative ones, when it was impossible to use needles. To such bandages, too complicated and too uncertain, in their effect, M. Louis prefers a simple linen roller, one inch wide, three ells long, and rolled up into two unequal heads. He begins with applying the body of this bandage to the middle of the forehead: he unrolls the two heads, from before backward, above the ears, between the upper part of the cartilage, and the cranium, in order to make them cross on the nape of the neck, and then be carried forward again. The assistant, who supports the head, and pushes forward the cheeks, must lift up the ends of his fingers, in the place of which, on each side, a thick compress is to be put. This being covered, and pushed from behind forward, by the roller, will constantly perform the office of the assistant's

fingers, who is to continue to support the apparatus, until it is all completely applied. The longest of the two heads of the roller, being slit in two places near the lip, presents two parallel openings; the remnant of the shortest one is divided into two parts, as far as its end. The two little narrow bands, in which it terminates, must be passed through the openings of the former, and made to cross upon the middle of the lip. The ends of the roller being carried from before backward, are then to be made to cross again on the nape of the neck, where the shortest is to end. The remainder of the long one is to be employed in making turns round the head. This bandage may be rendered much more stable, by a piece of tape, which is to pass the forehead, over the sagittal suture, and be pinned at each end to the circumvolutions of the roller; while a second piece of tape is to cross the first one at the top of the head, and also to be attached, at its extremities, to the uniting bandage, and the compresses, placed under the zygomatic arches, for the purpose of pushing forward the cheeks.

This bandage is extremely simple, and would promise great advantages, even if its success had not been already proved by the cases which it has effected under the hands of its inventor, and several other surgeons, who have employed it, in consequence of his recommendation. Perhaps, if it has not been equally successful with others, this is rather owing to the defective manner of applying it, than to any fault in the plan itself. Howsoever it may be, it is much to be wished that this means were sufficiently certain in its effect, to become more generally adopted, so that the suture might be relinquished.

All that we have said concerning the operation for the hare-lip, is equally applicable, not only to the treatment of cancer of the lip, but also to that of accidental cuts, or lacerations, of this part, from any cause whatsoever. We shall only remark that, in a recent wound, all the duty of the surgeon is to have recourse immediately, either to the twisted suture, or the uniting bandage.

In cases, in which the fissures affects the bones forming the roof of the mouth, after the soft parts have been united in the manner above related, the bones, and other separated parts, are ordinarily observed to become approximated, and nature thus corrects, more or less, this kind of deformity. But this does not always happen, and when these parts remain so considerably separated, as to obstruct speech and deglutition, or cause any other inconvenience, a plate of gold or silver, exactly adapted to the arch of the palate, and steadied by means of a piece of sponge, fixed to its convex side, and introduced into the cleft, may sometimes be usefully employed. When the sponge is of suitable size, and very dry, before being used, it will be swelled by the moisture of the adjacent parts, which alone will be sufficient, in many cases, to keep it in its situation, so as greatly to facilitate speaking and swallowing. Sometimes, however, the fissure is so shaped, that the sponge cannot be fixed in it: this principally happens when the opening widens very much, as it approaches externally. In such cases it has been proposed to fix a plate of gold, by means of springs, made of the same metal, so constructed as to fit the cavity; but, no contrivance seems yet to have answered.

On the subject of the hare-lip, consult *B. Bell's Surgery, Vol.* 4. *Heister's Surgery. Le Dran's Operations; Sharp's Operations; Latta's Surgery, Vol.* 2; *L'Encyclopédie Méthodique, Partie Chirurgicale, Art. Bec. de Lievre. The Observations of M. Louis, in Mém. de l'Acad. de Chirurgie. De la Medicine Opératoire, par Sabatier, Tom.* 3. *Œuvres Chirurgicales de Desault, par Bichat, Tom.* 2. *Traité des Opérations de Chirurgie, par A. Bertrandi. Chap.* 19.

HEAD, Injuries of.

1. *Wounds of the Scalp.*

Mr. Pott remarks, that, though the scalp be called the common tegument of the head, yet, from the variety of parts of which it is composed, from their structure, connexions, and uses, injuries done to it by external violence, become of much more consequence, than the same kind of ills can prove, when inflicted on the common teguments of the rest of the body.

Passing over incised wounds, which have no particularity, Mr. Pott proceeds immediately to those which, (though the mischief is originally confined to the mere scalp) yet are frequently very terrible to behold, are

often attended with alarming symptoms, and sometimes with danger. Lacerated and punctured wounds, are those referred to. "The former may be reduced to two kinds, viz. those in which the scalp, though torn, or unequally divided, still keeps its natural situation, and is not stript nor separated from the cranium, to any considerable distance beyond the breadth of the wound; and those, in which it is considerably detached from the parts it ought to cover.

"The first of these, if simple, and not combined with the symptoms, or appearance of any other mischief, do not require any particular or different treatment, from what the same kind of wounds require on any other parts; but the latter, (those in which the scalp is separated and detached from the parts it ought to cover,) are not only, by the different methods in which they may be treated, frequently capable of being cured with a considerable deal more or less ease and expedition, but are also sometimes a matter of great consequence to the health and well-being of the patient.

Mr. Pott makes no scruple of declaring it as his opinion, that the preservation of the scalp ought always to be attempted, *unless it be so torn as to be absolutely spoiled, or there are manifest present symptoms of other mischief.* This kind of wound is sometimes terrible to look at, and they who have not been accustomed to see it, may be inclined to think there is no remedy but incision; but, Mr. Pott says, he has so often made the experiment of endeavouring to preserve the torn piece, and so often succeeded, that he would recommend it as a thing always to be attempted, even though a part of the cranium should be perfectly bare. The removal of it necessarily produces a larger sore, which must require a good deal of time to heal, and must leave a considerable deformity: the preservation of it prevents both.

Here we may remark, that all practitioners now invariably avoid cutting away the scalp, even in the circumstances, in which such practice was allowed by Pott. By *spoiled* this eminent writer must mean so injured as necessarily to slough afterwards. However, as no harm results from taking the chance of its not sloughing, which never can be with certainty foretold; and as the excision of the part is painful, and productive of no benefit, even if sloughing must follow, such operation is, in every point of view, quite wrong. With respect to other mischief, as a reason, the examination of the cranium, and even trephining, never require any of the scalp to be cut away. See *Trephine*

Let the surgeon, therefore, always make the torn piece clean from all dirt, or foreign bodies, and restore it as quickly, and as perfectly as he can, to its natural situation.

Notwithstanding Mr. Pott assents to the employment of sutures, for uniting certain lacerated wounds of the scalp, we may state, that the best practitioners of the present day only employ sticking-plaster. Sometimes, the loosened scalp will unite with the parts from which it was torn and separated, and there will be no other sore than what arises from the impracticability of bringing the lips of the wound into smooth and immediate contact, the scar of which sore must be small in proportion. Sometimes such perfect reunion is not to be obtained; in which case, matter will be formed and collected in those places where the parts do not coalesce; but this does not necessarily make any difference, either in the general intention, or in the event: this matter may easily be discharged, by one or two small openings made with a lancet; the head will still preserve its natural covering; and the cure will be very little retarded by a few small abscesses

In some cases (as Pott proceeds to describe) the whole separated piece will unite perfectly, and give little or no trouble, especially in young and healthy persons. In some, the union will take place in some parts and not in others; and, consequently, matter will be formed, and require to be discharged, perhaps at several different points; and, in some particular cases, circumstances, and habits, there will be no union at all, the torn cellular membrane, or the naked aponeurosis, will inflame, and become sloughy, a considerable quantity of matter will be collected, and, perhaps, the cranium will be denuded. But, even in this state of things, which does not very often happen, where care has been taken, and is almost the worst which can happen, in the case of mere simple laceration and detachment, if the surgeon will not be too soon, nor too much

alarmed, nor in a hurry to cut, he will often find the cure much more feasible than he may at first imagine: let him take care to keep the inflammation under by proper means, let him have patience till the matter is fairly and fully formed, and the sloughs perfectly separated, and when this is accomplished, let him make a proper number of dependent openings for the discharge of them, and let him by bandage, and other proper management, keep the parts in constant contact with each other, and he will often find, that although he was foiled in his first intention of procuring immediate union, yet he will frequently succeed in this his second; he will still save the scalp, shorten the cure, and prevent the great deformity arising, (particularly to women) not only from the scar, but from the total loss of hair.

This union may often be procured, even though the cranium should have been perfectly denuded by the accident: and, it is true, not only though it should have been stripped of its pericranium at first, but even if that pericranium should have become sloughy and cast, as Mr. Pott has often seen.

"Exfoliation from a cranium laid bare by external violence, and to which no other injury has been done, than merely stripping it of its covering, is a circumstance (says Pott) which would not so often happen, if it was not taken for granted that it must be, and the bone treated according to such expectation. The soft open texture of the bones of children and young people, will frequently furnish an incarnation, which will cover their surface, and render exfoliation quite unnecessary; and even in those of mature age, and, in whom the bones are still harder, exfoliation is full as often the effect of art as the intention of nature, and produced by a method of dressing, calculated to accomplish such end, under a supposition of its being necessary. Sometimes, indeed, it happens that a small scale will necessarily separate, and the sore cannot be perfectly healed till such separation has been made; but this kind of exfoliation will be very small and thin, in proportion to that produced by art, that is, that produced by dressing the surface of the bare bone with spirituous tinctures, &c. and when a wound on the head, with a sound uninjured bone, denuded by accident, shews a disposition to heal without exfoliation, it never can be right to counteract nature, and oblige her to do what she is not inclined to, and which she would accomplish her purpose better without doing.

"Small wounds, that is, such as are made by instruments, or bodies which pierce, or puncture, rather than cut, are in general more apt to become inflamed, and to give trouble, than those which are larger, and in this part particularly, are sometimes attended with so high inflammation, and with such symptoms as alarm both patient and surgeon."

The parts capable of being hurt by such kind of wound, are the skin, the cellular membrane, the expanded tendons of the muscles of the scalp, and the pericranium.

"If the wound affects the cellular membrane only, and has not reached the aponeurosis or pericranium, the inflammation and tumour affect the whole head and face, the skin of which wears a yellowish cast, and is sometimes thick set with small blisters, containing the same-coloured serum; it receives the impression of the fingers, and becomes pale for a moment, but returns immediately to its inflamed colour; it is not very painful to the touch, and the eyelids and ears are always comprehended in the tumefaction, the former of which are sometimes so distended, as to be closed; a feverish heat and thirst generally accompany it; the patient is restless, has a quick pulse, and most commonly a nausea, and inclination to vomit.

"This accident generally happens to persons of bilious habit, and is indeed an inflammation of the erysipelatous kind; it is somewhat alarming to look at, but is not often attended with danger. The wound does indeed neither look well, nor yield a kindly discharge, while the fever continues, but still it has nothing threatening in its appearance, none of that look which bespeaks internal mischief; the scalp continues to adhere firmly to the skull, and the patient does not complain of that tensive pain, nor is afflicted with that fatiguing restlessness which generally attends mischief underneath the cranium.

"Phlebotomy, lenient purges, and the use of the common febrifuge medicines, particularly those of the neutral kind, generally remove it in a short time. When the inflammation is gone

off, it leaves on the skin a yellowish tint, and a dry scurf, which continue until perspiration carries them away, and upon the disappearance of the disease, the wound immediately recovers a healthy aspect, and soon heals without any further trouble.

"Wounds and contusions of the head, which affect the brain and its membranes, are also subject to an erysipelatous kind of swelling and inflammation; but it is very different, both in its character and consequences, from the preceding.

"In this (which is one of the effects of inflammation of the meninges,) the febrile symptoms are much higher, the pulse harder and more frequent, the anxiety and restlessness extremely fatiguing, the pain in the head intense; and as this kind of appearance is, in these circumstances, most frequently the immediate precursor of matter forming between the skull and dura mater, it is generally attended with irregular shiverings, which are not followed by a critical sweat, nor afford any relief to the patient. To which it may be added, that in the former case the erysipelas generally appears within the first three or four days; whereas in the latter, it seldom comes on till several days after the accident, when the symptomatic fever is got to some height. In the simple erysipelas, although the wound be crude and undigested, yet it has no other mark of mischief; the pericranium adheres firmly to the skull, and upon the cessation of the fever, all appearances become immediately favourable. In that which accompanies injury done to the parts underneath, the wound not only has a spongy, glassy, unhealthy aspect, but the pericranium in its neighbourhood separates spontaneously from the bone, and quits all cohesion with it. In short, one is an accident, proceeding from a bilious habit, and not indicating any mischief beyond itself; the other is a symptom, or a part of a disease, which is occasioned by injury done to the membranes of the brain; one portends little or no ill to the patient, and almost always ends well; the other implies great hazard, and most commonly ends fatally. It is therefore hardly necessary to say, that it behoves every practitioner to be careful in distinguishing them from each other.

"If the wound be a small one, and has passed through the cellular membrane to the aponeurosis, and pericranium, it is sometimes attended with very disagreeable, and sometimes very alarming symptoms, but which arise from a different cause, and are very distinguishable from what has been yet mentioned.

"In this, the inflamed scalp does not rise into that degree of tumefaction, as in the erysipelas, neither does it pit, or retain the impression of the fingers of an examiner; it is of a deep red colour, unmixt with the yellow tint of the erysipelas; it appears tense, and is extremely painful to the touch; as it is not an affection of the cellular membrane, and as the ears and the eye lids are not covered by the parts in which the wound is inflicted, they are seldom, if ever, comprehended in the tumour, though they may partake of the general inflammation of the skin; it is generally attended with acute pain in the head, and such a degree of fever as prevents sleep, and sometimes brings on a delirium.

"A patient in these circumstances, will admit more free evacuations by phlebotomy, than one labouring under an erysipelas: the use of warm fomentation is required in both, in order to keep the skin clean and perspirable, but an emollient cataplasm, which is generally forbid in the former, may in this latter case be used to great advantage.

"When the symptoms are not very pressing, nor the habit very inflammable, this method will prove sufficient: but it sometimes happens, that the scalp is so tense, the pain so great, and the symptomatic fever so high, that by waiting for the slow effect of such means, the patient runs a risk from the continuance of the fever, or else the injured aponeurosis and pericranium becoming sloughy, produce an abscess, and render the case both tedious and troublesome. A division of the wounded part by a simple incision down to the bone, about half an inch or an inch in length, will most commonly remove all the bad symptoms, and if it be done in time, will render every thing else unnecessary." *(Pott.)*

The injuries, to which the scalp is liable from contusion, or the appearances produced in it by such general cause, may be divided into those in which the mischief is confined merely to the scalp; and those in which other parts are interested.

The former, which only comes under our present consideration, is not indeed of importance, considered abstractedly. The tumour attending it is either very easily dissipated, or the extravasated blood causing it, is easily got rid of by a small opening. Mr. Pott particularly notices this case on account of an accidental circumstance, which sometimes attends it, and renders it liable to be very much mistaken.

"When the scalp receives a very smart blow, it often happens that a quantity of extravasated blood immediately forms a tumour, easily distinguishable from all others, and generally very easily cured. But it also sometimes happens, that this kind of tumour produces to the fingers of an unadvised or inattentive examiner, a sensation, so like to that of a fracture, with depression of the cranium, as may be easily mistaken." Now, if, upon such supposition, a surgeon immediately makes an incision into the tumid scalp, he may give his patient a great deal of unnecessary pain, and for that reason runs some risk of his own character.

"The touch is, in this case, so liable to deception, that recourse should always be had to other circumstances and symptoms, before an opinion be given.

"If a person, with such tumour occasioned by a blow, and attended with such appearances, and feel, has any complaint, which seems to be the effect of pressure made on the brain and nerves, or of any mischief done to the parts within the cranium, the division, or removal of the scalp in order to inquire into the state of the skull, is right and necessary; but if there are no such general symptoms, and the patient is in every respect perfectly well, the mere feel of something like a fracture will not authorize or vindicate such operation, since it will often be found, that such sensation is a deception, and that when the extravasated fluid is removed, or dissipated, the cranium is perfectly sound and uninjured.

"The second kind of tumour attending the contused scalp, viz. that which arises from injury done to the cranium, and parts within, does so absolutely proceed from, and depend upon such injury, as not to fall under our consideration in this place at all, but will be considered at large when we come to speak of the mischiefs done to the skull and brain by collision, or contusion.

"From what has been said it appears, that the scalp, taken in a general sense, is, when wounded or bruised, liable to be affected with four kinds of tumour, each of which has a distinct cause, and requires, or permits, a different method of treatment.

"The first does not imply any injury done to the parts within the skull, requires no operation, and almost always is cured by general remedies.

"The second, or that which is caused by the spontaneous separation of the pericranium from the skull, in consequence of internal mischief, is not at first attended with very pressing symptoms; but whoever has observed their progress, and attended to their event, must know what fatal and frequently irresistible evil it is the forerunner of, nothing less than the inflammation and putrefaction of the membranes of the brain, and the formation of matter between them and the skull; and that is a case which, of all others, will least admit delay.

"The third, though it sometimes gives way to free evacuation, and lenient external applications, yet is sometimes also attended with symptoms which are too pressing to wait the effect of such remedies, and is capable of being immediately relieved by a division of the inflamed and irritated parts: whereas the same incision, made into the first kind of tumefaction, would most probably exasperate the disease, and heighten the symptoms.

"The fourth, consisting of extravasated blood, seldom requires any chirurgic operation; time, and the use of the common discutient applications, (of which the *lotio salis ammoniaci* is best,) almost always dissipate it; and it only becomes of consequence, by the possibility of its being misunderstood and mistreated."—*Pott on Injuries of the Head.*

2. *Effects of Contusion on the Dura Mater, and Parts within the Skull.*

Mr. Pott remarks, "that in order to understand rightly, and to have a clear idea of this kind of injury, it is necessary to recollect, that the vessels of the pericranium, those of the diploe, or medullary substance between the two tables of some parts of the crani-

um, and those of the dura mater within it, do all constantly and freely communicate with each other; and that this communication is carried on by means of innumerable foramina, found in all parts of both surfaces of the skull, as well as at the sutures; that upon the freedom of this communication depends the healthy and sound state of all the parts concerned in it; and that from the interruption or destruction of this, proceed most of the symptoms attending violent contusions of the head, extravasations of fluid between the cranium and dura mater, inflammation of the said membrane, and simple undepressed fracture of the skull.

"The pericranium is so firmly attached to the outer surface of the skull, as not to be separable from it without considerable violence; and when such violent separation is made in a living subject, (especially if young,) the cranium is always seen to bleed freely, from an infinite number of small foramina. The dura mater, which is a firm strong membrane, is almost as intimately attached to the inside of the skull, as the pericranium is to the outside, and by the same means, viz. by vessels; and by these means a constant circulation and communication are preserved and maintained between the two membranes and the bones dividing them. This, all the appearances which attend the scalping a living person, or the separation of the skull from the dura mater of a dead one, (especially if such person died apoplectic, or was hanged,) prove beyond all doubt: in the former, the blood will be seen issuing from every point of the surface of the cranium; in the latter, not only a considerable degree of force will be found necessary to detach the sawed bone from the subjacent membrane, but when it is removed, a great number of bloody points will be seen all over the surface of the latter; which points, if wiped clean, do immediately become bloody again, being only the extremities of broken vessels. These vessels are largest at, and about the sutures, at which places the adhesion is the strongest, and the hemorrhage upon separation the greatest.

"It has been thought by many, that the dura mater was attached to the skull, only at the sutures; that in all other parts it was loose and unconnected with it; and that it constantly enjoyed or performed an oscillatory kind of motion, and was alternately elevated and depressed. This idea and opinion were borrowed from the appearance which the dura mater makes in a living subject after a portion of the skull has been removed: but although it has been inculcated by writers of great eminence, yet it has no foundation in truth or nature, and has misled many practitioners in their opinions, not only of the structure and disposition of this membrane, but in their ideas of its diseases.

"The dura mater does on the internal surface of the bones of the cranium, the office of periosteum, in the same manner as the pericranium does on the external; (at least they have no other:) to this it is so firmly, and so generally attached, as to be incapable of any, even the smallest degree of motion. The alternate elevation and subsidence of it, which are observable when any portion of it is laid bare, are owing to a very different cause from any power in itself; neither is, nor can ever be performed, until a piece of the cranium has been forcibly taken away; and consequently cannot possibly be natural, or necessary.

"By blows, falls, and other shocks, some of the larger of those vessels which carry on this communication between the dura mater and the skull are broken, and a quantity of blood is shed upon the surface of that membrane. This is one species of bloody extravasation, and indeed the only one which can be formed between the skull and dura mater. If the broken vessels be few, and the quantity of blood which is shed be small, the symptoms are generally slight, and by proper treatment disappear. If they are large, or numerous, or the quantity of extravasated fluid considerable, the symptoms are generally urgent in proportion; but whether they be slight, or considerable, whether immediately alarming or not, they are always, and uniformly, such as indicate pressure made on the brain and nerves, viz. stupidity, drowsiness, diminution or loss of sense, speech, and voluntary motion.

"This every practitioner knows to be one frequent consequence of blows on the head. But it also often happens, from the same kind of violence, that some of the small vessels, which carry on the circulation between the pericranium, skull, and dura mater,

are so damaged, as not to be able properly to execute that office, although there are none so broken as to cause an actual effusion of blood.

"Smart and severe strokes on the middle part of the bones, at a distance from the sutures, are most frequently followed by this kind of mischief; the coats of the small vessels, which sustain the injury, inflame and become sloughy, and, in consequence of such alteration in them, the pericranium separates from the outside of that part of the bone, which received the blow, and the dura mater from the inside, the latter of which membranes, soon after such inflammation, becomes sloughy also, and furnishes matter, which matter being collected between the said membrane and the cranium, and having no natural outlet, whereby to escape, or be discharged, brings on a train of very terrible symptoms, and is a very frequent cause of destruction. The effect of this kind of violence is frequently confined to the vessels connecting the dura mater to the cranium, in which case the matter is external to the said membrane; but it sometimes happens, that by the force either of the stroke or of the concussion, the vessels which pass between and connect the two meninges are injured in the same manner; in which case, the matter formed in consequence of such violence is found on the surface of the brain, or between the pia and dura mater, as well as on the surface of the latter; or perhaps in all these three situations at the same time.

"The difference of this kind of disease, from either an extravasation of blood, or a commotion of the medullary parts of the brain, is great and obvious. All the complaints produced by extravasation, are, such as proceed from pressure, made on the brain and nerves, and obstruction to the circulation of the blood through the former; stupidity, loss of sense and voluntary motion, laborious and obstructed pulse and respiration, &c. and (which is of importance to remark) if the effusion be at all considerable, these symptoms appear immediately, or very soon after the accident.

"The symptoms attending an inflamed or sloughy state of the membranes, in consequence of external violence, are very different; they are all of the febrile kind, and never, at first, imply any such unnatural pressure; such are, pain in the head, restlessness, want of sleep, frequent and hard pulse, hot and dry skin, flushed countenance, inflamed eyes; nausea, vomiting, rigor; and toward the end, convulsion, and delirium. And none of these appear at first, that is, immediately after the accident; seldom until some days are past.

"One set or class of symptoms is produced by an extravasated fluid, making such pressure on the brain and origin of the nerves, as to impair or abolish voluntary motion and the senses; the other is caused by the inflamed or putrid state of the membranes covering the brain, and seldom affects the organs of sense, until the latter end of the disease, that is, until a considerable quantity of matter is formed, which matter must press like any other fluid."

Mr. Pott next refutes the generally-received opinion, that blood shed from its vessels, and remaining confined in one place, will become pus; and that the matter found on the surface of the dura mater, toward the end of these cases, was originally extravasated blood. Both these positions are false. That pure blood shed from its vessels, by means of external violence, and kept from the air, will not turn to, or become matter, is proved incontestably by every day's experience, in many instances, in aneurisms by puncture, in retained menses by imperforate vaginæ, and in all ecchymoses. True pus cannot be made from blood merely, as may be known from the manner in which all abscesses are formed, and from every circumstance attending suppuration; and that the matter found on the surface of the dura mater, after great contusions of the head, never was mere blood, Mr. Pott is as certain, as observation and experience can make him.

"If there be neither fissure nor fracture of the skull, nor extravasation, nor commotion underneath it, and the scalp be neither considerably bruised, nor wounded, the mischief is seldom discovered or attended to for some few days. The first attack is generally by pain in the part which received the blow. This pain, though beginning in that point, is soon extended all over the head, and is attended with a languor, or dejection of strength and spirits, which are soon followed by a nausea, and inclination to vomit, a vertigo or giddiness, a quick and hard

pulse, and an incapacity of sleeping, at least quietly. A day or two after this attack, if no means preventive of inflammation are used, the part stricken generally swells, and becomes puffy, and tender, but not painful; neither does the tumour rise to any considerable height, or spread to any great extent: if this tumid part of the scalp be now divided, the pericranium will be found of a darkish hue; and either quite detached, or very easily separable from the skull, between which and it will be found a small quantity of a dark-coloured ichor.

"If the disorder has made such progress, that the pericranium is quite separated and detached from the skull, the latter will even now be found to be somewhat altered in colour from a sound healthy bone. Of this alteration it is not very easy to convey an idea by words, but it is a very visible one, and what some very able writers have noticed.

"From this time the symptoms generally advance more hastily and more apparently; the fever increases, the skin becomes hotter, the pulse quicker and harder, the sleep more disturbed, the anxiety and restlessness more fatiguing; and to these are generally added irregular rigors, which are not followed by any critical sweat, and which, instead of relieving the patient, add considerably to his sufferings. If the scalp has not been divided or removed, until the symptoms are thus far advanced, the alteration of the colour of the bone will be found to be more remarkable; it will be found to be whiter and more dry than a healthy one; or, as Fallopius has very justly observed, it will be found to be more like a dead bone: the sanies, or fluid, between it and the pericranium will also, in this state, be found to be more in quantity, and the said membrane will have a more livid diseased aspect.

"In this state of matters, if the dura mater be denuded, it will be found to be detached from the inside of the cranium, to have lost its bright silver hue, and to be, as it were, smeared over with a kind of mucus, or with matter, but not with blood. Every hour after this period, all the symptoms are exasperated, and advance with hasty strides: the head-ach and thirst become more intense, the strength decreases, the rigors are more frequent, and at last convulsive motions, attended in some with delirium; in others with paralysis, or comatose stupidity, finish the tragedy.

"If the scalp has not been divided till this point of time, and it be done now, a very offensive discoloured kind of fluid will be found lying on the bare cranium, whose appearance will be still more unlike to the healthy natural one; if the bone be now perforated, matter will be found between it and the dura mater, generally in considerable quantity, but different in different cases and circumstances. Sometimes it will be in great abundance, and diffused over a very large part of the membrane; and sometimes the quantity will be less, and consequently the space which it occupies smaller. Sometimes it lies only on the exterior surface of the dura mater; and sometimes it is between it and the pia mater, or also even on the surface of the brain, or within the substance of it.

"The primary and original cause of all this, is the stroke upon the skull: by this the vessels which should carry on the circulation between the scalp, pericranium, skull, and meninges, are injured, and no means being used to prevent the impending mischief, or such as have been made use of proving ineffectual, the necessary and mutual communication between all these parts ceases, the pericranium is detached from the skull, by means of a sanies discharged from the ruptured vessels, the bone being deprived of its due nourishment and circulation loses its healthy appearance, the dura mater (its attaching vessels being destroyed, or rendered unfit for their office) separates from the inside of the cranium, inflames and suppurates.

"Whoever will attend to the appearances which the parts concerned make in every stage of the disease, to the nature of the symptoms, the time of their access, their progress, and most frequent event, will find them all easily and fairly deducible from the one cause, which has just been assigned, viz. the contusion. As the inflammation and separation of the dura mater, is not an *immediate* consequence of the violence, so neither are the symptoms immediate, seldom until some days have passed; the fever at first is slight, but increases gradually; as the membrane becomes more and more diseased, all the febrile symptoms are heightened; the formation of matter occasions rigors,

frequent and irregular, until such a quantity is collected, as brings on delirium, spasm, and death.

Hitherto Mr. Pott has been describing this disease as unaccompanied by any other, not even by any external mark of injury, except perhaps a trifling bruise of the scalp; "Let us now, (says this eminent surgeon,) suppose the scalp to be wounded at the time of the accident, by whatever gave the contusion; or let us suppose, that the immediate symptoms having been alarming, a wound had been made, in order to examine the skull.

"In this case, the wound will for some little time have the same appearance as a mere simple wound of this part, unattended with other mischief, would have; it will, like that, at first discharge a thin sanies, or gleet, and then begin to suppurate; it will digest, begin to incarn, and look perfectly well; but, after a few days, all these favourable appearances will vanish; the sore will lose its florid complexion, and granulated surface; will become pale, glassy, and flabby; instead of good matter, it will discharge only a thin discoloured sanies; the lint with which it is dressed, instead of coming off easily (as in a kindly suppurating sore) will stick to all parts of it; and the pericranium, instead of adhering firmly to the bone, will separate from it, all round, to some distance from the edges.

"This alteration in the face and circumstances of the sore, is produced merely by the diseased state of the parts underneath the skull; which is a circumstance of great importance, in support of the doctrine advanced; and is demonstrably proved, by observing that this diseased aspect of the sore, and this spontaneous separation of the pericranium, are always confined to that part which covers the altered or injured portion of the dura mater, and do not at all affect the rest of the scalp; nay, if it has by accident been wounded in any other part, or a portion has been removed from any part where no injury has been done to the dura mater, no such separation will happen, the detachment above will always correspond to that below, and be found no where else.

"The first appearance of alteration in the wound immediately succeeds the febrile attack; and as the febrile symptoms increase, the sore becomes worse and worse, that is, degenerates more and more from a healthy, kindly aspect.

"Through the whole time, from the first attack of the fever, to the last and fatal period, an attentive observer will remark the gradual alteration of the colour of the bone, if it be bare. At first it will be found to be whiter, and more dry, than the natural one; and as the symptoms increase, and either matter is collected, or the dura mater becomes sloughy, the bone inclines more and more to a kind of purulent hue, or whitish yellow; and it may also be worth while in this place to remark, that if the blow was on or very near to a suture, and the subject young, the said suture will often separate in such manner as to let through it a loose, painful, ill-natured fungus; at which time also it is no uncommon thing for the patient's head and face to be attacked with an erysipelas."

"In those cases, in which the scalp is very little injured by the bruise, and in which there is no wound, nor any immediately alarming symptoms or appearances, the patient feels little or no inconvenience, and seldom makes any complaint, until some few days are past. At the end of this uncertain time, he is generally attacked by the symptoms already recited; these are not pressing at first, but they soon increase to such a degree, as to baffle all our art: from whence it will appear, that when this is the case, the patient frequently suffers from what seems at first to indicate his safety, and prevents such attempts being made, and such care from being taken of them, as might prove preventive of mischief.

"But if the integuments are so injured as to excite or claim our early regard, very useful information may from thence be collected; for whether the scalp be considerably bruised, or whether it be found necessary to divide it for the discharge of extravasated blood, or on account of worse appearances, or more urgent symptoms, the state of the pericranium may be thereby sooner and more certainly known; if in the place of such bruise, the pericranium be found spontaneously detached from the skull, having a quantity of discoloured sanies between them under the tumid part, in the manner already mentioned, it may be regarded as a pretty certain indication, either that the dura mater is beginning to separate in the

same manner, or that, if some preventive means be not immediately used, it will soon suffer; that is, it will inflame, separate from the skull, and give room for a collection of matter between them. And with regard to the wound itself, whether it was made at the time of the accident, or afterward artificially, it is the same thing; if the alteration of its appearance be as related, if the edges of it spontaneously quit their adhesion to the bone, and the febrile symptoms are at the same time making their attack, these circumstances will serve to convey the same information, and to prove the same thing.

"This particular effect of contusion is frequently found to attend on fissures, and undepressed fractures of the cranium, as well as on extravasations of fluid, in cases where the bone is entire; and, on the other hand, all these do often happen without the concurrence of this individual mischief. All this is matter of accident; but let the other circumstances be what they may, the spontaneous separation of the altered pericranium, in consequence of a severe blow, is almost always followed by a suppuration between the cranium and dura mater; a circumstance extremely well worth attending to in fissures and undepressed fractures of the skull, because it is from this circumstance principally, that the bad symptoms, and the hazard, in such cases arise.

"It is no very uncommon thing for a smart blow on the head to produce some immediate and bad symptoms, which after a short space of time disappear, and leave the patient perfectly well. A slight pain in the head, a little acceleration of pulse, a vertigo and sickness, sometimes immediately follow such accident, but do not continue many hours, especially, if any evacuation has been used. These are not improbably owing to a slight commotion of the brain, which having suffered no material injury thereby, soon cease. But if, after an interval of some time, the same symptoms are renewed; if the patient, having been well, becomes again feverish, and restless, and that without any new cause; if he complains of being languid and uneasy, sleeps disturbedly, loses his appetite, has a hot skin, a hard quick pulse, and a flushed, heated countenance; and neither irregularity of diet, nor accidental cold, have been productive of these; mischief is most certainly impending, and that most probably under the skull.

"If the symptoms of pressure, such as stupidity, loss of sense, voluntary motion, &c. appear some few days after the head has suffered injury from external mischief, they do most probably imply an effusion of a fluid somewhere: this effusion may be in the substance of the brain, in its ventricles, between its membranes, or on the surface of the dura mater; and which of these is the real situation of such extravasation, is a matter of great uncertainty, none of them being attended with any peculiar mark or sign, that can be depended upon, as pointing it out precisely; but the inflammation of the dura mater, and the formation of matter between it and the skull, in consequence of contusion, is generally indicated and preceded by one which Mr. Pott has hardly ever known to fail; a puffy, circumscribed, indolent tumour of the scalp, and a spontaneous separation of the pericranium from the skull under such tumour.

"These appearances, therefore, following a smart blow on the head, and attended with languor, pain, restlessness, watching, quick pulse, head-ach, and slight irregular shiverings, do almost infallibly indicate an inflamed dura mater, and pus, either forming or formed, between it and the cranium."

By detachment of the pericranium, is not meant every separation of it from the bone which it should cover. It may be, and often is cut, torn, or scraped off, without any such consequence; but these separations are violent, whereas that which Mr. Pott means is spontaneous, and is produced by the destruction of those vessels by which it was connected with the skull, and by which the communication between it and the internal parts was carried on; and therefore it is to be observed, that it is not the mere removal of that membrane which causes the bad symptoms, but it is the inflammation of the dura mater; of which inflammation, this spontaneous secession of the pericranium is an almost certain indication.

Sometimes the scalp is so wounded at the time of the accident, or so torn away, as to leave the bone perfectly bare; and yet the violence has not been such as to produce the evil just now spoken of. In this case, if the pericranium be only turned back, along with

the detached portion of the scalp, there may be probability of its reunion: and it should therefore be immediately made clean and replaced, for the purpose of such experiment; which, if it succeeds, will save time, and prevent considerable deformity. Should the attempt fail, it can only be in consequence of the detached part sloughing. Hence, removing it with a knife, though allowed by Pott, is now never practised. Frequently, when the scalp does not adhere at once, it becomes attached to the cranium afterwards by a granulating process. When the detached piece sloughs, the worst that can happen, is an exfoliation from the bare skull.

Sometimes, the force which detaches, or removes the scalp, also occasions the mischief in question; but, the integuments being wounded or removed, we cannot have the criterion of the tumour of the scalp for the direction of our judgment. Our whole attention must be directed to the wound and general symptoms. The edges of the former will digest as well, and look as kindly, for a few days, as if no mischief was done underneath. But, after some little space of time, when the patient begins to be restless, and hot, and to complain of pain in the head, these edges will lose their vermilion hue, and become pale and flabby. Instead of matter, they will discharge a thin gleet, and the pericranium will loosen from the skull, to some distance from the said edges. Immediately after this, all the general symptoms are increased and exasperated; and as the inflammation of the membrane is heightened, or extended, they become daily worse and worse, until a quantity of matter is formed, and collected, and brings on that fatal period, which, though uncertain as to date, very seldom fails to arrive.

"The method of attempting the relief of this kind of injury consists in two points, viz. to endeavour to prevent the inflammation of the dura mater; or, that being neglected, or found impracticable, to give discharge to the fluid collected within the cranium, in consequence of such inflammation.

"Of all the remedies in the power of art, for inflammations of membranous parts, there is none equal to phlebotomy. To this truth many diseases bear testimony; pleurisies, ophthalmies, strangulated hernias, &c. and if any thing can particularly contribute to the prevention of the ills likely to follow severe contusions of the head, it is this kind of evacuation; but then it must be made use of in such a manner as to become truly a preventive; that is, it must be made use of immediately, and freely."

This eminent surgeon says, he is very sensible that it will in general be found very difficult to persuade a person, who has had what may be called only a knock on the pate, to submit to such discipline, especially if he finds himself tolerably well: yet, in many instances, the timely use, or the neglect of this single remedy, makes all the difference between safety and fatality.

"It may be said, that as the force of the blow, the height of the fall, the weight of the instrument, &c. can never precisely, or certainly determine the effect, nor inform us, whether mischief is done under the bone, or not, a large quantity of blood may be drawn off unnecessarily, in order to prevent an imaginary evil. This is in some degree true; and if the advice just given was universally followed, many people would be largely bled without necessity; but then, on the other hand, many a very valuable life would be preserved, which, for want of this kind of assistance, is lost. *Nihil interest, præsidium an satis tutum sit, quod unicum est*, is an incontested maxim in medicine; and if it be allowed to use such means as may be in themselves hazardous, surely it cannot be wrong to employ one which is not so; at least, if it be considered in a general sense, whatever it may accidentally prove to some few particular individuals."

Acceleration, or hardness of pulse, restlessness, anxiety, and any degree of fever, after a smart blow on the head, are always to be suspected and attended to. Immediate, plentiful, and repeated evacuations by bleeding, have, in many instances, removed these, in persons to whom, Mr. Pott verily believes, very terrible mischief would have happened, had not such precaution been used. In this, as well as some other parts of practice, we neither have, nor can have any other method of judging, than by comparing together cases apparently similar. Mr. Pott has more than once or twice seen that

increased velocity and hardness of pulse, and that oppressive languor, which most frequently precede mischief under the bone, removed by free and repeated blood-letting; and has often, much too often, seen cases end fatally, whose beginnings were full as slight, but in which such evacuation had been either neglected, or not complied with. This judicious writer, "would by no means be thought to infer from hence, that early bleeding will always prove a certain preservative; and that they only die, to whom it has not been applied: this, like all other human means, is fallible; and, perhaps, there are more cases out of its reach, than within it; but, where preventive means can take place, this is certainly the best, and the most frequently successful.

"The second intention, viz. the discharge of matter, collected under the cranium, can be answered only by the perforation of it.

"When, from the symptoms and appearances already described, there is just reason for supposing matter to be formed under the skull, the operation of perforation cannot be performed too soon; it seldom happens, that it is done soon enough.

"The propriety, or impropriety, of applying the trephine, in cases where there is neither fissure, fracture, nor symptom of extravasation, is a point which has been much litigated, and remains still unsettled either by writers or practitioners.

"When there is no reason for suspecting any of those injuries, either from the symptoms, or from the appearances; and the pericranium, whether the scalp be wounded or not, remains firmly attached in all parts to the skull; there certainly is not (let the general symptoms be what they may) any indication where to apply the instrument, and consequently no sufficient authority for using it all: but whenever that membrane, after the head has received an external violence, separates, or is detached spontaneously from the bone underneath it, and such separation is attended with the collection of a small quantity of thin, brown ichor, an alteration of colour in the separated pericranium, and an unnatural dryness of the bone, Mr. Pott cannot help thinking, that there is as good reason for trepanning, as in the case of fracture; he believes experience would vindicate him, if he said, better reason; since it is by no means infrequent for the former kind of case to do well without such operation; whereas suppuration under the skull never can.

"The spontaneous separation of the pericranium, if attended with general disorder of the patient, with chilliness, horripilatio, languor, and some degree of fever, appears to Mr. Pott, from all the observation he has been capable of making, to be so sure and certain an indication of mischief underneath, either in present, or impending, that he should never hesitate about perforating the bone in such circumstances.

"When the skull has been once perforated, and the dura mater thereby laid bare, the state of the matter must principally determine the surgeon's future conduct. In some cases, one opening will prove sufficient for all necessary purposes; in others, several may be necessary. This variation will depend on the space of detached dura mater, and the quantity of collected matter. The repetition of the operation is warranted, both by the nature of the case, and by the best authorities; there being no comparison to be made between the possible inconvenience arising from largely denuding the dura mater, and the certain, as well as terrible evils which must follow the formation and confinement of matter between it and the skull.

"It can hardly be necessary to observe, that notwithstanding the operation of perforation be absolutely and unavoidably necessary, yet the repetition of blood-letting, of cooling laxative medicines, the use of antiphlogistic remedies, and a most strict observance of a low diet and regimen, are as indispensably requisite after such operation as before; the perforation sets the membrane free from pressure, and gives vent to collected matter, but nothing more; the inflamed state of the parts under the skull, and the necessary consequences of such inflammation, call for all our attention, full as much afterwards as before; and although the patient must have perished without the use of the trephine, yet, the merely having used it, will not preserve him, without every other caution and care."

Both tables of the skull sometimes exfoliate in consequence of external violence. The dead bone must be removed, as soon as loose; and, if neces-

sary, the scalp divided for the purpose.

3. *Fissures and Fractures of the Cranium, without Depression.*

"Fractures of the cranium, (says Mr. Pott) were, by the ancient writers, divided into many different sorts, each of which was distinguished by an appellation of Greek etymology, borrowed either from the figure of the fracture, or the disposition of the broken pieces. These are to be found in most of the old books; but as they merely load the memory, without informing the understanding, or assisting the practitioner, modern authors have generally laid them aside.

"This kind of injury is divisible into two general heads, viz. those in which the broken parts keep their proper level, or equality of surface, with the rest of the skull, and those in which they do not; or, in other words, fractures without depression, and fractures with.

"These two distinctions are all which are really necessary to be made, and will be found to comprehend every violent division of the parts of the skull (not made by a cutting-instrument) from the finest capillary fissure, up to the most complicated fracture: for, fissures and fractures differing from each other only in the width of the breach, or in the distance of the separated parts, and the disposition of broken pieces, in large fractures, being subject to an almost infinite variety, distinctions and appellations, drawn and made from these circumstances, might be multiplied to even three times the old number, without imparting the smallest degree of useful knowledge to the man, who should be at the pains to get them by heart.

"What are the symptoms of a fractured cranium? is often asked; and there is hardly any one who does not, from the authority of writers, both ancient and modern, answer, Vomiting, giddiness, loss of sense, speech, and voluntary motion, bleeding at the ears, nose, mouth, &c. This is the doctrine of Celsus, which has been most invariably copied by almost all succeeding authors, and implicitly believed by almost all readers.

"The symptoms just mentioned do indeed very frequently accompany a broken skull, but they are not produced by the breach made in the bone, nor do they indicate such breach to have been made. They proceed from an affection of the brain, or from injury done to some of the parts within the cranium, independent of any ill which the bones composing it may have sustained. They are occasioned by violence offered to the contents of the head in general; are quite independent of the mere breach made in the bone; and either do, or do not accompany fracture, as such fracture may happen to be, or not to be, complicated with such other ills.

"They are frequently produced by extravasations of blood, or serum, upon, or between the membranes of the brain; or by shocks, or concussions of its substance, in cases where the skull is perfectly intire and unhurt. On the other hand, the bones of the skull are sometimes cracked, broken, nay even depressed, and the patient suffers none of these symptoms. In short, as the breach made in the bone is not, nor can be the cause of such complaints, they ought not to be attributed to it; and that for reasons, which are by no means merely speculative. For the practitioner, who supposes that such symptoms do necessarily and certainly imply that the cranium is fractured, must regulate his conduct by such supposition, and remove the scalp, very often without either necessity or benefit; that is, without discovering what he looks for: and, on the other hand, if he does not find the skull to be broken, believing all these complaints to be caused by, and deducible from the fracture, he will most probably pay his whole attention to that supposed cause, and may think, that when he has done what the rules of his art prescribe for such case, he has done all that is in his power:—an opinion not infrequently embraced; and which has been the destruction of many a patient. For, as on the one hand, the loss of sense, speech, and voluntary motion, as well as the hemorrhage from the nose, ears, &c. are sometimes totally removed by, or at least disappear, during the use of free and frequent evacuation, without any operation on the scalp or skull; so, on the other, as these symptoms and appearances are not produced by the solution of continuity of the bone, they cannot be remedied by such chirurgic treatment as the mere fracture may require.

"If any one doubts the truth of this doctrine, (continues Mr. Pott,) I would desire him to consider the nature, as well as most generally successful method of treating these symptoms; and, at the same time, to reflect seriously on the operation of the trepan, as practised in simple, undepressed fractures of the skull.

"The sickness, giddiness, vomiting, and loss of sense and motion, can only be the consequence of an affection of the brain, as the common sensorium. They may be produced by its having been violently shaken, by a derangement of its medullary structure, or by unnatural pressure made by a fluid extravasated on its surface, or within its ventricles; but never can be caused by the mere division of the bone, (considered abstractedly); which division, in a simple fracture, can neither press on, nor derange, the structure of the parts within the cranium.

"If the solution of continuity in the bone be either produced by such a degree of violence, as hath caused a considerable disturbance in the medullary parts of the brain, or has disturbed any of the functions of the nerves going off from it; or has occasioned a breach of any vessel, or vessels, whether sanguine or lymphatic, and that hath been followed by an extravasation, or lodgment of fluid; the symptoms necessarily consequent upon such derangement, or such pressure, will follow: but they do not follow, because the bone is broken; their causes are superadded to the fracture, and although produced by the same external violence, are yet perfectly and absolutely independent of it: so much so, that they are frequently found where no fracture is.

"The operation of the trepan is frequently performed in the case of simple fractures, and that very judiciously and properly; but it is not performed, because the bone is broken, or cracked: a mere fracture, or fissure of the skull, can never require perforation, or that the dura mater under it be laid bare; the reason for doing this, springs from other causes than the fracture, and those really independent on it: they spring from the nature of the mischief which the parts within the cranium have sustained, and not from the accidental division of the bone. From these arise the threatening symptoms; from these all the hazard; and from these, the necessity, and vindication of performing the operation of the trepan.

"If a simple fracture of the cranium was unattended in present with any of the before-mentioned symptoms, and there was no reason for apprehending any other evil in future, that is, if the solution of continuity in the bone was the whole disease, it could not possibly indicate any other curative intention, but, the general one in all fractures, viz. union of the divided parts."

In many cases of simple undepressed fractures of the cranium, it is true, that trephining is necessary; but, the reasons for the operation, in these instances, are, first, the immediate relief of present symptoms arising from the pressure of extravasated fluid; and, secondly, the discharge of matter, formed between the skull and dura mater, in consequence of inflammation. The operation of trephining was also recommended by Pott, as a *preventive* of ill consequences; a practice, however, which is now never adopted by the most eminent surgeons; and many writers of the highest reputation, especially, Desault, Dease, Mr. John Bell, and Mr. Abernethy, urgently, and properly remonstrate against the method.

The latter remarks: "In the accounts, which we have of the former practice in France, it is related, that surgeons made numerous perforations along the whole track of a fracture of the cranium; and, as far as I am able to judge, without any clear design. Mr. Pott also advises such an operation, with a view to prevent the inflammation and suppuration of the dura mater, which he so much apprehended. But, many cases have occurred of late, where, even in fractures with depression, the patients have done well without an operation."

Mr. Abernethy next relates several cases of fracture of the cranium with depression, which terminated favourably, although no operation was performed. This judicious surgeon thinks, that these cases, as well as a great many others on record, prove, that a slight degree of pressure does not derange the functions of the brain, for a limited time after its application; and all those, whom he had an opportunity of knowing for any length of time after the accident, continued as well as if nothing of the kind had happened to them. In Mr. Hill's cases in surgery,

two instances of this sort are related, and Mr. Hill knew both the patients for many years afterwards; yet, no inconvenience arose. Indeed, it is not easy to conceive, that the pressure, which caused no ill effects at a time, when the contents of the cranium filled its cavity completely, should afterwards prove injurious, when they have adapted themselves to its altered size and shape. Severe illness, indeed, does often intervene between the receipt of the injury, and the time of its recovery; and many surgeons might be inclined to attribute this to pressure; but, it equally occurs when the depressed portion is elevated. If a surgeon, prepossessed with the opinion, that elevation of the bone is necessary in every instance of depressed cranium, should have acted upon this opinion, in several of the cases, which Mr. Abernethy has related, and afterwards have employed proper evacuations, his patients would probably have had no bad symptoms, and he would naturally have attributed their well-doing to the mode of treatment, which he pursued: yet, these cases did equally well without an operation. (*Abernethy on the Injuries of the Head.*)

Depressed fractures of the skull not being our immediate consideration, we need not expatiate upon them; but, it seemed right to make the preceding remarks to shew how unnecessary it must be to trephine a patient, merely because there is a fracture of the cranium, and with a view of *preventing* bad consequences. Even when the fracture is depressed, it is not necessary, unless there are evident signs, that the degree of pressure, thus produced on the brain, is the cause of existing bad symptoms.

The inflammation and suppuration of the parts, beneath the skull, which Mr. Pott wished so much to prevent by trephining early, do not arise from the occurrence of a breach in the cranium, but, are the consequence of the same violence, which was the occasion of the fracture. Hence, it is obvious, that removing a portion of the bone cannot in the least prevent the inflammation and suppuration, which must result from the external violence which was first applied to the head; but, on the contrary, such a removal being an additional violence, must have a tendency to increase the inevitable inflammatory mischief.

From what has been said, it is not to be inferred, however, that trephining is never proper, when there is a simple undepressed fracture of the skull. Such injury may be joined with an extravasation of blood on the dura mater; or it may be followed by the formation of matter between this membrane and the cranium; in both which circumstances, the operation is essential to the preservation of the patient, immediately, but not before, the symptoms indicative of the existence of dangerous pressure on the brain, begin to shew themselves. (See *Trephine.*)

A fracture of the skull, unattended with urgent symptoms, and not brought into the surgeon's view by any accidental wound of the integuments, often remains for ever undiscovered; and as no benefit could arise from laying it bare by an incision, such practice should never be adopted. The surgeon ought only to be officious in this way, when he can accomplish by it some better object, than the merely satisfying his own curiosity. And as we shall find from the perusal of this article, and the one entitled *Trephine*, that the removal of pressure off the surface of the brain is the only possible reason for ever perforating the cranium with this instrument; and as dividing the scalp is only a useful measure, when it is preparatory to such operation; neither the one, nor the other, should ever be practised, unless there exist unequivocal symptoms, that there is a dangerous degree of pressure operating on the brain, and caused either by matter, extravasated blood, or a depressed portion of the skull.

The true mode of *preventing* the bad effects, frequently following, but not arising from, simple fractures of the skull, is not to trephine, but, to put in practice all kinds of antiphlogistic means. For this purpose, let the patient be repeatedly and copiously bled, both from the arm and temporal arteries; let him be properly purged; give him antimonials; keep him on the lowest diet; let him remain in the most quiet situation possible; and if, notwithstanding such steps, the symptoms of inflammation of the brain continue to increase, let his head be shaved, and a large blister be applied to it. When, in spite of all these measures, matter forms under the cranium, attended with symptoms of pressure, a puffy tumour of the injured part of the scalp, or those

changes of the wound, if there is one, which Mr. Pott has so excellently described, and we have already related; not a moment should be lost in delaying to perforate the bone with the trephine, and giving vent to the matter beneath.

4. *Fractures of the Cranium with Depression.*

"Simple fractures of the skull, or those in which the parts of the broken bone are not depressed from their situation (observes Mr. Pott) differ from what are called fissures, only in the distance of the edges of the breach from each other. When the separation is considerable, it is called a fracture; when it is very fine and small, it is called a fissure. The chirurgical intention, and requisite treatment, are the same in each, viz. to procure a discharge for any fluid which may be extravasated in present, *(here we must understand supposing the pressure of such extravasation produces urgent symptoms)* and to guard against the formation, or confinement of matter." The prevention of suppuration will, as we have already remarked, be best accomplished, not by perforating the cranium, as Mr. Pott advised, but by copious bleeding, evacuations, blisters, and a rigorous antiphlogistic regimen. The confinement of matter, producing symptoms of pressure on the brain, certainly indicates the immediate use of the trephine.

"But, in fractures, attended with depression, (says Pott) the intentions are more. In these the depressed parts are to be elevated, and such as are so separated as to be incapable of reunion, or of being brought to lie properly, and without pressing on the brain, are to be totally removed. These circumstances are peculiar to a depressed fracture; but, although they are peculiar, they must not be considered as sole, but, as additional to those, which have been mentioned at large under the head of simple fracture: commotion, extravasation, inflammation, suppuration, and every ill, which can attend on, or be found in the latter, are to be met with in the former, and will require the same method of treatment." That loose splintered pieces of the cranium, when quite detached, and already in view, in consequence of the scalp being wounded, ought to be taken away, no one will be inclined to question. That they ought also to be exposed by an incision, even when the scalp is unwounded, and then taken away, whenever they cause symptoms of irritation, or pressure, I believe, will be universally allowed. But, the reader will already understand, from what has been said, in the preceding section, that several excellent surgeons do not coincide with Pott, in believing, that every depressed fracture of the skull necessarily demands the application of the trephine.

"There certainly are (says Mr. Abernethy) degrees of this injury, which it would be highly imprudent to treat in this manner. Whenever the patient retains his senses perfectly, I should think it improper to trephine him, unless symptoms arose, that indicated the necessity of it." P. 21.

Every surgeon, indeed, cannot be too fully impressed with the following truth, that existing symptoms of dangerous pressure on the brain, which symptoms will be presently related, can alone form a true reason for perforating the cranium. The mode of operating, in order to elevate depressed portions of the skull, is explained in the article *Trephine.*

5. *Extravasation under the Cranium; Symptoms of Pressure on the Brain, &c.*

Mr. Pott remarks, "the shock, which the head sometimes receives by falls from on high, or by strokes from ponderous bodies, does not infrequently cause a breach in some of the vessels, either of the brain, or its meninges; and, thereby, occasions extravasation of the fluid, which should circulate through them. This extravasation may be the only complaint produced by the accident; or it may be joined with, or added to, a fracture of the skull. But this is not all, for it may be produced not only when the cranium is unhurt by the blow, but even when no violence of any kind has been offered to, or received by the head."

When blood is extravasated beneath the skull, the violence which produces the rupture of the vessel, usually stuns the patient, from which state, provided the quantity and pressure of the blood, and the force of the concussion be not too great, he gradually recovers, and regains his senses. If the first extravasation be trivial, the patient, after regaining his senses, may only feel a

little drowsiness, and go to bed. The bleeding from the ruptured vessel continuing, and the pressure on the brain increasing, he becomes more and more insensible, and begins to breathe in a slow, interrupted, stertorous manner. In cases of compression, whether from blood, or a depressed portion of the skull, there is a general insensibility, the eyes are half open, the pupil dilated, and motionless even when a candle is brought near the eye; the retina is insensible; the limbs relaxed; the breathing stertorous; the pulse slow, and, according to Mr. Abernethy, less subject to intermission, than in cases of concussion. Nor is the patient ever sick, when the pressure on the brain, and the general insensibility, are considerable; for, the very action of vomiting betrays an irritability in the stomach and œsophagus. These symptoms are not peculiar to pressure from blood, but arise also from that of many depressed fractures of the skull, and of suppuration under this part. They are all attributable to the unnatural pressure made on the brain and nerves, and have too often been mistaken, as indications of a disease, which, considered abstractedly, can never cause them; we allude to a simple undepressed fracture of the cranium, which may be accompanied by them, but cannot cause them. They differ in degree, according to the quantity, kind, and situation, of the pressing fluid. The hemorrhage from the nose and ears, which often follows violence applied to the head, leads to no particular or useful inference: we cannot even calculate, by this sign, that the force has exceeded a certain degree; for, such bleedings take place, in many persons, from much slighter causes, than in others.

The preceding class of symptoms only informs us, that the brain is suffering compression; and, leaves us quite in the dark, respecting several other very important circumstances. "We not only have no certain infallible rule, whereby to distinguish, what the pressing fluid is, or where it is situated, but we are, in many instances, absolutely incapable of knowing, whether the symptoms be occasioned by any fluid at all; for, a fragment of bone, broken off from the internal table of the cranium, and making an equal degree of pressure, will produce exactly the same complaints." (*Pott.*) In detailing the symptoms of pressure from blood, I took particular notice of the patient being at first generally stunned by the blow, of his gradually regaining his senses, and of his afterwards relapsing into a state of insensibility again. *The interval of sense*, which thus occurs, is a circumstance, of the greatest consequence in making the surgeon understand the nature of the case.

"A concussion, and an extravasation (as Mr. Pott observes) are very distinct causes of mischief, though not always very distinguishable.

"M. Le Dran, and others of the modern French writers, have made a very sensible and just distinction between that kind and degree of loss of sense which arises from a mere commotion of the brain, and that which is caused by a mere extravasation, in those instances in which the time of the attack or appearance of such symptoms are different or distinct. The loss of sense, which immediately follows the violence, say they, is most probably owing to a commotion; but that which comes on after an interval of time has passed, is most probably caused by extravasation.

"This distinction is certainly just and good, as far as it will go. That degree of abolition or diminution of sense, which immediately attends or follows the blow or fall, and goes off again without the assistance of art, is in all probability occasioned by the sudden shake or temporary derangement of the contents of the head; and the same kind of symptoms recurring again some time after they had ceased, or not coming on till some time has passed from the receipt of the violence, do most probably proceed from the breach of a vessel within or upon the brain. But unluckily, we have it not very often in our power to make this exact distinction. An extravasation is often made so immediately, and so largely, at the instant of the accident, that all sense and motion are instantaneously lost, and never again return. And it also sometimes happens, that although an extravasation may possibly not have been made at the moment of the accident, and the first complaints may have been owing to commotion merely, yet a quantity of fluid having been shed from its proper vessels very soon after the accident, and producing its proper symptoms, before those caused

by the commotion have had time to go off, the similarity of the effects of each of these different causes is such, as to deprive us of all power of distinguishing between the one and the other, or of determining with any tolerable precision to which of them such symptoms as remain are really owing.

"When an extravasation of any kind is made, either upon or within the brain, if it be in such quantity, or so situated, as to disorder the economy of the animal, it always produces such disorder, by making an unnatural pressure on the parts where it lies. The nature and degree of the symptoms hereby produced are various and different in different persons, according to the kind, quantity, and situation of the pressing fluid. Sometimes it is mere fluid blood, sometimes blood in a state of coagulation, sometimes it is clear lymph, and at others blood and water are found mixed together; each of these is found either simple or mixed in different situations, that is, between the skull and dura mater, or in the natural cavities of the brain called its ventricles, and sometimes, in cases of great violence, they are found at the same time in all these different parts. Sometimes a considerable quantity is shed instantly, at the time of the accident: and sometimes the breach by which the effusion is made is so circumstanced, both as to nature and situation, that it is at first very small, and increases by faster or slower degrees. In the former, the symptoms are generally immediate and urgent, and the extravasation is of the bloody kind; in the latter, they are frequently slight at first, appear after some little interval of time, increase gradually till they become urgent or fatal, and are in such case generally occasioned by extravasated lymph. So that although the immediate appearance of bad symptoms does most certainly imply mischief of some kind or other, yet, on the other hand, no man ought to suppose his patient free from hazard, either because such symptoms do not shew themselves at first, or because they appear to be but slight: those which come on late, or appearing slight at first, increase gradually, being full as much to be dreaded as to consequence, as the more immediately alarming ones; with this material difference between them, that the one *may* be the consequence of a mere concussion of the brain, and may by means of quietude and evacuation go quite off; whereas, the other being most frequently owing to an extravasation of lymph, (though sometimes of blood also) within the substance of the brain, are very seldom removed by art." (*Pott.*)

The case of extravasation, between the cranium and dura mater, is almost the only one, which admits of relief from trephining. Mr. Abernethy informs us, that, in the cases, which he has seen, of blood extravasated, between the dura and pia mater, on a division of the former membrane being made for its discharge only the serous part of it could be evacuated: for, the coagulum was spread over the hemisphere of the brain, and had descended, as low as possible, towards its inferior part, so that very little relief was obtained by the operation. P. 32.

Fractures of the cranium, which take place across the lower and front angle of the parietal bone, and the rest of the track of the trunk, and large branches of the spinous artery of the dura mater, are cases very apt to be attended with a copious extravasation. This vessel, and others more deeply seated, however, may be ruptured, pour out a considerable quantity of blood, and induce urgent symptoms of pressure on the brain, not only without the coexistence of a fracture, but even of any external mark of violence on the scalp.

The effused blood is, more frequently, situated below the part, on which the violence has operated, and, hence, when such part is pointed out by a wound, or discoloration of the scalp, and the symptoms of pressure are considerable, there cannot be two opinions, respecting the propriety of immediately trephining, and the place, where to make the perforation. But, what is to be done, when dangerous symptoms of pressure prevail, without any external mark to denote, what part of the head received the blow, or whether any at all; for, a general concussion of the head may produce an effusion of blood within the cranium. Under these circumstances, Mr. Pott was against the operation, and says that "the only chance of relief is from phlebotomy, and an open belly; by which we may hope so to lessen the quantity of the circulating fluids as to assist nature in the dissipation or absorption of what has been extravasated. This is an effect which, although not highly im-

probable in itself, yet is not to be expected from a slight or trifling application of the means proposed. The use of them must be proportioned to the hazard of the case. Blood must be drawn off freely and repeatedly, and from different veins; the belly must be kept constantly open, the body quiet, and the strictest regularity of general regimen must be rigidly observed. By these means, very alarming symptoms have now and then been removed, and people in seemingly very hazardous circumstances have been recovered."

If the symptoms, however, were urgent, it certainly might be proper to perforate the cranium in the course of the spinous artery of the dura mater. If no blood should be found under one parietal bone: the operation might be done on the other. This situation, we know, is the chief one for copious extravasations between the cranium and dura mater, and, if the blood be more deeply effused, we have the consolation of knowing, that the patient had the chance of that benefit, which might have resulted from the operation, had the pressure originated from an extravasation in one of the most common places, between the dura mater and the skull.

This part of practice, however, is exceedingly doubtful and obscure. But, should the mode of judging, whether blood lies immediately under the skull, suggested by Mr. Abernethy, prove, invariably correct, our line of conduct may be hereafter more easily determined, respecting whether the trephine should be applied in such dubious cases, or not. Even when the injured scalp shews where the violence has operated, the criterion, we are about to notice, may inform us, whether we should perforate the bone, or not; for, though the extravasation is found immediately under the external mark, yet, it often is not so; but, is in a part distant from that mark, to which we have nothing to lead us, and to which, indeed, if we knew it, we could not reach. Mr. Abernethy has observed, "that unless one of the large arteries of the dura mater be wounded, the quantity of blood, poured out, will probably be inconsiderable; and the slight compression of the brain, which this occasions, may not be attended with any peculiar symptoms, or, perhaps, it may occasion, some stupor, or excite an irritation, disposing the subjacent parts to become inflamed. It is indeed highly probable, that, in many cases, which have done well without an operation, such an extravasation has existed. But, if there be so much blood on the dura mater, as materially to derange the functions of the brain, the bone, to a certain extent, will no longer receive blood from within, and by the operation, performed for its exposure, the pericranium must have been separated from its outside. I believe, that *a bone, so circumscribed, will not be found to bleed.*" In some cases, related by this gentleman, there was no hemorrhage; twice he was able, by attending to this circumstance, to tell how far the detachment of the dura mater extended; and often, when symptoms seemed to demand a perforation of the skull, he has seen the operation contra-indicated by the hemorrhage from the bone, and as the event shewed, with accuracy. P. 33.

Pott justly remarks, that "if the extravasation be of blood, and that blood be in a fluid state, small in quantity, and lying between the skull and dura mater, immediately under or near to the place perforated, it may happily be all discharged by such perforation, and the patient's life may thereby be saved; of which many instances are producible. But if the event does not prove so fortunate, if the extravasation be so large or so situated that the operation proves insufficient, yet the symptoms having been urgent, general evacuation having been used ineffectually, and a wound or bruise of the scalp having pointed out the part which most probably received the blow: although the removal of that part of the scalp should not detect any injury done to the bone, yet the symptoms still subsisting, I cannot help thinking, that perforation of the cranium is in these circumstances so fully warranted, that the omission of it may truly be called a neglect of having done that which might have proved serviceable, and, *rebus sic stantibus*, can do no harm. It is very true that no man can beforehand tell whether such operation will prove beneficial or not, because he cannot know the precise nature, degree, or situation of the mischief; but, this uncertainty properly considered, is so far from being a dissuasive from the attempt, that it is really a strong incitement to make it; it being fully as impossible to know, that the extravasated

fluid does *not* lie between the skull and dura mater, and that under the part stricken, as that it *does;* and if the latter should be the case, and the operation be not performed, one, and most probably the only means of relief, will have been omitted."

When there is no interval of sense, between the blow, and the coming on of perilous symptoms, it is frequently impossible to determine, whether the mischief be owing to the largeness and suddenness of the extravasation, to the violence of the shock, which the brain has received, or to both these causes at once, which, unfortunately, is too often the case. In this latter complication, indeed, trephining will frequently be of no avail, even though it serve for the entire removal of all pressure off the brain; for, the patient cannot recover from the violence of the concussion, and never regains his senses. This is no reason, however, why the chance of the operation doing good should not be taken, when there are evident symptoms of pressure. Let us in these darkened cases, call to mind the sentiments of Pott, who says; "No man, who is at all acquainted with this subject, will ever venture to pronounce or promise success from the use of the trephine, even in the most apparently slight cases; he knows that honestly he cannot; it is enough that it has often been successful where and when every other means have failed. The true and just consideration is this; does the operation of perforating the cranium in such case add at all to that degree of hazard which the patient is in before it is performed? Or can he in many instances do well without it? If it does add to thy patient's hazard, that is certainly a very good reason for laying it aside, or for using it very cautiously; but, if it does not, and the only objection made to it, is, that it frequently fails of being successful, surely it cannot be right to disuse that, which has often been, not only salutary, but the *causa sine qua non* of preservation, merely, because it is also often unsuccessful, that is, because it is not infallible."

Mr. Pott thought, that, whenever the dura was detached from the inner surface of the skull by blood, as well as matter, the pericranium covering the outer part of the same bone would generally become detached also, and this spontaneous separation of the latter membrane he very justly regards, as a positive indication for the operation. However, it is very certain, that if, in cases of extravasation, the surgeon were to wait for this criterion, the operation would be done too late, and, therefore, whenever unequivocal symptoms of pressure on the brain exist, trephining should never be delayed. Giving vent to the confined blood "may produce a cure, or it may prove only a temporary relief, according to the different circumstances of different cases. The disappearance, and even the alleviation of the most pressing symptoms is undoubtedly a favourable circumstance, but is not to be depended upon as absolutely portending a good event. Either a bloody, or limpid extravasation may be formed, or forming between the meninges, or upon, or within the brain, and may prove as certainly pernicious in future, as the more external effusion would have done, had it not been discharged; or the dura mater may have been so damaged by the violence of the blow as to inflame and suppurate, and thereby destroy the patient." *(Pott.)*

"If the disease (says the same eminent surgeon) lies between the dura and pia mater, mere perforation of the skull can do nothing; and, therefore, if the symptoms are pressing, there is no remedy but division of the outer of these membranes. The division of the dura mater is an operation, which I have several times seen done by others, and have often done myself; I have seen it, and found it now and then successful; and, from those instances of success, am satisfied of the propriety, and necessity of its being sometimes done." He next states, however, his sentiment, that wounding the dura mater is itself attended with dangerous consequences. Mr. Abernethy's opinion of such operation has already been given.

"Upon the removal of a piece of bone by means of the trephine; if the operation has been performed over the part where the disease is situated, and the extravasation be of the fluid kind, and between the cranium and dura mater; such fluid, whether it be blood, water, or both, is immediately seen, and is partly discharged by such opening; if, on the other hand, the extravasation be of blood in a coagulated or grumous state, it is either loose, or in some degree adherent to the dura ma-

ter; if the former of these be the case, it is either totally or partially discharged at the time of, or soon after, the operation, according to the quantity or extent of the mischief; if the latter, the perforation discovers, but does not immediately discharge it. In both instances, the conduct of the surgeon, with regard to repetition of the operation, must be determined by the particular circumstances of each individual case; a large extravasation must necessarily require a more free removal of bone than a small one; not only on account of freedom of discharge, but on account of larger detachment of dura mater; and a grumous or coagulated extravasation requires a still more free use of the instrument, not only because the blood in such state is discharged with difficulty, but because the whole surface of the dura mater so covered is always put under the necessity of suppurating, which suppuration has but one chance of a happy event, and that derivable from the free use of the perforator.

"When the extravasation is not between the cranium and dura mater, but either between the meninges, or in the ventricles of the brain, the appearances are not only different from the preceding state of the case, but from each other.

"When the extravasated fluid lies between the skull and dura mater; as soon as that extravasation is discharged, or the grumous blood has been wiped off, the dura mater appears flaccid, easily yields to or does not resist the impression of a finger, and (the discharge being made) enjoys that kind of motion, that elevation and depression, which our fathers supposed it to have naturally and always, but which is only the consequence of the circulation through the brain, and the artificial removal of the piece of bone. But when the extravasation is situated between the meninges, or on the surface of the brain, the appearance is not the same. In this case, there is no discharge upon removing the bone; and the dura mater, instead of being flaccid and readily obeying the motion of the blood, appears full and turgid, has little or no motion, and pressing hard against the edges of the perforation, rises into a kind of spheroidal form in the hole of the perforated bone. If the extravasation be of the limpid kind, the membrane retains its natural colour; but if it be either purely fluid blood, or blood coagulated, and the subject young, the colour of the membrane is so altered by what lies under it, that the nature of the case is always determinable from this circumstance.

"Be the extravasated fluid what it may, it has no natural outlet; absorption was the only chance the patient had whereby to get rid of it without an operation, and that we must now suppose to have failed; an artificial opening therefore must be made, by the division of the dura mater, and perhaps of the pia also. This operation, under the circumstances and appearances already mentioned, is absolutely necessary and has been successful; it is performed to give discharge to what cannot be got rid of by any other means, and consists in a division of the membrane or membranes, made in a crucial form with a point of a lancet. The operation in itself is extremely easy and simple, but the patient is thereby put into the state of one whose meninges have been wounded, with only this difference, that the wound made for this purpose is smooth and simple, and inflicted with the least possible violence: whereas an accidental wound of the same parts may be lacerated, contused, and attended with circumstances which must aggravate the evil, and may induce worse consequences." (*Pott.*)

All cases of pressure on the brain are attended with hazard of inflammation of this organ, and membranes. This danger must be averted as much as possible, by the antiphlogistic means recommended in speaking of fractures of the skull.

CONCUSSION, OR COMMOTION OF THE BRAIN.

"Very alarming symptoms, followed sometimes by the most fatal consequences, (Pott remarks,) are found to attend great violence offered to the head; and, upon the strictest examination both of the living and the dead, neither fissure, fracture, nor extravasation of any kind can be discovered. The same symptoms, and the same event, are met with, when the head has received no injury at all *ab externo*, but has only been violently shaken; nay, when only the body, or general frame, has seemed to have sustained the whole violence." And the same writer after-

wards accurately observes, that "the symptoms attending a concussion are generally in proportion to the degree of violence, which the brain itself has sustained, and which, indeed, is cognizable only by the symptoms. If the concussion be very great, all sense and power of motion are immediately abolished, and death follows soon: but, between this degree, and that slight confusion (or stunning, as it is called) which attends most violence, done to the head, there are many stages." I think Mr. Abernethy has particularly excelled other writers, in his description of the symptoms of concussion, which, he is of opinion, may be properly divided into three stages.

"The *first* is, that state of insensibility and derangement of the bodily powers, which immediately succeeds the accident. While it lasts, the patient scarcely feels any injury that may be inflicted on him. His breathing is difficult, but in general without stertor; his pulse intermitting, and his extremities cold. But such a state cannot last long; it goes off gradually, and is succeeded by another, which I consider as the *second* stage of concussion. In this, the pulse and respiration become better, and, though not regularly performed, are sufficient to maintain life, and to diffuse warmth over the extreme parts of the body. The feeling of the patient is now so far restored, that he is sensible if his skin be pinched; but he lies stupid, and inattentive to slight external impressions. As the effects of concussion diminish, he becomes capable of replying to questions put to him in a loud tone of voice, especially when they refer to his chief suffering at the time, as pain in the head, &c.; otherwise, he answers incoherently, and as if his attention was occupied by something else. As long as the stupor remains, the inflammation of the brain seems to be moderate; but as the former abates, the latter seldom fails to increase: and this constitutes the *third* stage, which is the most important of the series of effects proceeding from concussion.

"The several stages vary considerably in their degree and duration; but more or less of each will be found to take place in every instance where the brain has been violently shaken. Whether they bear any certain proportion to each other or not, I do not know. Indeed this will depeed upon such a variety of circumstances in the constitution, the injury, and the after-treatment, that it must be difficult to determine.

"With regard to the treatment of concussion, it would appear, that in the first stage very little can be done; and perhaps, what little is done, had better be omitted, as the brain and nerves are probably insensible to any stimulants that can be employed. From a loose, and, I think, fallacious analogy between the insensibility in fainting, and that which occurs in concussion, the more powerful stimulants, such as wine, brandy, and volatile alkali, are commonly had recourse to, as soon as the patient can be got to swallow. The same reasoning which led to the employment of these remedies in the *first* stage, in order to recall sensibility, has given a kind of sanction to their repetition in the *second*, with a view to continue and increase it.

"But here the practice becomes more pernicious, and less defensible. The circumstance of the brain having so far recovered its powers, as to carry on the animal functions in a degree sufficient to maintain life, is surely a strong argument that it will continue to do so, without the aid of means which probably tend to exhaust parts already weakened, by the violent action they induce.

"And it seems probable, that these stimulating liquors will aggravate that inflammation which must sooner or later ensue." (*Essay on Injuries of the Head, p. 59.*)

The following passage, extracted from a writer, who has already been of material assistance to us in this subject, cannot be too deeply impressed on the memory of every surgical practitioner:

"To distinguish between an extravasation and a commotion, by the symptoms only, is frequently a very difficult matter, sometimes an impossible one. The similarity of the effects in some cases, and the very small space of time which may intervene between the going off of the one and accession of the other, render this a very nice exercise of the judgment. The first stunning or deprivation of sense, whether total or partial, may be from either, and no man can tell from which; but when these first symptoms have been removed, or have spontaneously disappeared; if such patient is again op-

pressed with drowsiness, or stupidity, or total or partial loss of sense, it then becomes most probable, that the first complaints were from commotion, and that the latter are from extravasation; and the greater the distance of time between the two, the greater is the probability not only that an extravasation is the cause, but that the extravasation is of the limpid kind, made gradatim, and within the brain.

"Whoever seriously reflects on the nature of these two causes of evil within the cranium, and considers them as liable to frequent combination in the same subject, and at the same time considers, that in many instances no degree of information can be obtained from the only person capable of giving it (the patient,) will immediately be sensible, how very difficult a part a practitioner has to act in many of these cases, and how very unjust it must be to call that ignorance, which is only a just diffidence arising from the obscurity of the subject, and the impossibility of attaining materials to form a clear judgment.

"When there is no reason to apprehend any other injury, and commotion seems to be the sole disease, plentiful evacuation by phlebotomy and lenient cathartics, a dark room, the most perfect quietude, and a very low regimen, are the only means in our power; and are sometimes successful." *(Pott.)*

The reader, who wishes to acquire the most accurate information, concerning injuries of the head, may consult, with advantage, various dissertations in the *Mem. de l' Acad. de Chirurgie; Traité des Opérations de Chirurgie par Le Dran; Dease on Wounds of the Head; Pott on Injuries of the Head from External Violence; Hill's Cases in Surgery; O'Halloran on the different Disorders arising from External Injuries of the Head; Some Cases in Desault's Parisian Chirurgical Journal; Mémoire sur les Plaies de Tête, in Œuvres Chirurgicales de Desault, par Bichat, tom. 2; and Latta's System of Surgery, vol. 2.*

HECTIC FEVER. See *Fevers, Surgical.*

HEMERALOPIA, (from ἡμέρα, a day, and ὄψομαι, to see.) A defect in the sight, which consists in being able to see in the day-time, but not in the evening. The following is Scarpa's description of this curious disorder.

"*Hemeralopia*, or *nocturnal blindness*, (says Scarpa) is properly nothing but a kind of imperfect periodical amaurosis, most commonly sympathetic with the stomach. Its paroxysms come on towards the evening, and disappear in the morning. The disease is endemic in some countries, and epidemic at certain seasons of the year, in others.

"At sunset, objects appear to persons affected with the complaint, as if covered with an ash-coloured veil, which gradually changes into a dense cloud, which intervenes between the eyes, and surrounding objects. Patients with hemeralopia have the pupil, both in the day and night-time, more dilated, and less moveable, than it usually is in healthy eyes. The majority of them, however, have the pupil more or less moveable in the day-time, and always expanded and motionless at night. When brought into a room faintly lighted by a candle, where all the by standers can see tolerably well, they cannot discern at all, or in a very feeble manner, scarcely any one object; or they only find themselves able to distinguish light from darkness; and at moon-light their sight is still worse. At day-break they recover their sight, which continues perfect, all the rest of the day, till sunset."

This disease (according to Scarpa) may commonly be completely cured, and oftentimes in a very short time, by treating it on the same plan by which the imperfect amaurosis is remedied; (see *Amaurosis,*) viz. by employing emetics, the resolvent powders, and pills, and a blister on the nape of the neck; and, topically, the vapours of the caustic volatile alkali: lastly, by prescribing, towards the end of the treatment, bark conjoined with valerian. In cases, in which the disease has been preceded by plethora, and suppressed perspiration, bleeding and sudorifics are also indicated.

In this manner, Scarpa has succeeded in curing three subjects, affected with the complaint. The first was a boy, fourteen years old, who, for several weeks, had, in vain, made use of the fumigation of a sheep's liver, which had been fried. The second was a waterman; the third a countryman, living in the rice-fields in the vicinity of Pavia. The two last were between thirty and forty years of age, and emaciated,

with bloated, sallow countenances. After the boy had vomited a good deal, in consequence of taking, at repeated doses, in the space of two hours, a grain and a half of tartar emetic, dissolved in four ounces of water, he took on the following days, the resolvent powders, mentioned in *Amaurosis*. They produced nausea, and two or three copious stools, regularly every day. On the evening of the fifth day, the patient began to discern surrounding objects by the faintest light of a lantern. Even since the emetic was administered, he continued the topical use of the vapours of the spirit of sal-ammoniac, and, on the sixteenth day, was perfectly cured. The waterman thrice vomited up a considerable quantity of a yellowish, viscid matter. Afterwards, he took the resolvent powders, which made him vomit again on the third day, and, in the day-time, he regularly exposed his eyes, every four hours, to the action of the ammoniacal vapours. It was not till the eleventh day, that he began to distinguish objects in the night-time by a weak candle-light. The countryman vomited only once copiously, but afterwards experienced considerable nausea during the nine following days, on which he took the resolvent powders, and he daily discharged by stool a considerable quantity of greenish matter. From the beginning, this patient also employed the ammoniacal vapours, as a topical application, and, on the evening of the fourteenth day, he began to see by candle-light. From this period, he continued to regain the faculty of seeing objects in the night-time regularly more and more, until he was completely cured. Towards the conclusion of the treatment, Scarpa gave these patients bark and valerian.

But, the most expeditious cure was that which Scarpa effected on Mauro Bonini, a robust husbandman, of Donalasco, aged two-and-twenty. This man began in March to perceive, that, at sunset, he could only distinguish objects very imperfectly. The complaint increased to such a degree, that, in the beginning of May, he was almost totally blind in the evening. On the tenth of May, he came to the hospital at Pavia. Having examined both his eyes in the day-light, Scarpa found both the pupils very much dilated, and almost motionless. In the evening, he repeated the examination, and assured himself, that the patient could not see objects, which were visible to the bystanders, consequently, that he was affected with hemeralopia. He also complained of bitterness in the mouth, heaviness in his head, and his tongue was foul.

On the eleventh, Scarpa ordered him an emetic, which did not produce so much effect as was expected, and therefore a stronger one was prescribed the next day. It was composed of a dram and a half of ipecacuanha, and two grains of tartar emetic. This dose made him vomit up a considerable quantity of yellow, greenish matter. The patient found his head relieved immediately afterwards, and the bitterness in his mouth was no longer perceptible; the pupils of his eyes contracted a little, and became somewhat moveable in a vivid light. The ammoniacal vapours were now externally applied. The same evening, the patient's sight seemed amended, and, on the thirteenth, all internal medicines were discontinued, the vapours alone being used.

On the fourteenth, the patient complained again of bitterness in his mouth, and his tongue appeared furred. Scarpa ordered him to take the resolvent powders every three hours. These produced nausea, and some evacuations from the bowels. The use of the vapours was continued. In the evening, Scarpa exposed the patient to the same degree of light, as when the preceding examinations were made, and the patient was able to distinguish all objects which were presented to him, exceedingly well. On the 16th, the symptoms of foulness in the stomach entirely disappeared, and the pupil of each eye contracted in a moderate light, as in healthy persons. The man left the hospital, on the 17th, perfectly cured.

Scarpa notices, that the ancients have strongly recommended, for the cure of this disease, the fumigations of a sheep's liver roasted. These were directed against the eyes through a funnel; and the liver, thus prepared, was also directed to be eaten. Even in Italy, according to Scarpa, this remedy in general obtains confidence, not only with the vulgar, but also with surgeons. Some writers add, that it is productive of wonderful success among the Chinese, who are said to be very liable to this complaint. Scarpa says, he has no observation of his own to offer in support of this account; but, the

case of the above mentioned boy seems to be repugnant to it. If, however, the efficacy of this remedy should be a matter of fact, surgeons will possess another means of curing nocturnal blindness, besides that which we have been explaining.

Celsus, in the chapter on Mydriasis, has the following words: *Quidam sine ullâ manifestâ causâ subitò obcæcati sunt. Ex quibus nonnulli, cùm aliquandiù nihil vidissent, repentinâ profusione alvi lumen recuperant. Quò minùs alienum videtur, et recenti re, et interposito tempore medicamentis quoque moliri dejectiones, quæ omnem noxiam materiam per inferiora depellant.* This passage, Scarpa thinks, refers not only to the treatment of the dilated pupil, but also to that of the imperfect amaurosis, which occurs suddenly; and it appears to him to merit the attention of practitioners.

The first part of what Celsus has stated, viz. that persons who have been for some time affected with amaurosis, have regained their sight on being attacked by a diarrhœa, seems to Scarpa to be corroborated by the case, related by Doctor Pye. (*Med. Obs. and Inq. Vol. I.*) A man, forty years of age, says he, had been affected for two months, with periodical amaurosis, which, for a certain time, had occurred regularly every evening, but afterwards came on irregularly, at different intervals, with considerable dilatation of the pupil, and such obscuration of sight on the approach of night, that even the light of a candle could not be discerned. The man was seized with a diarrhœa. Doctor Pye ordered him to take, for eight successive days, a potion with the kali præparatum; then he prescribed an electuary, composed of bark, nutmeg, and sirup of orange-peel. The two latter ingredients were added to the bark, on account of the continuance of the diarrhœa. The second day after the electuary was taken, the diarrhœa increased, and the patient vomited copiously; after which he suddenly recovered his sight, so as to see equally well by day and by night. As the diarrhœa continued, the electuary was omitted, after having been taken two days. A violent fever succeeded the diarrhœa, and, it was remarked that, during the highest stage of the former, the patient became rather deaf, but without losing his sight in the night or day time. Doctor Pye does not mention what steps were taken to moderate the fever, which proved fatal to the patient. At all events, adds Scarpa, it is fact, that this spontaneous laxness of the bowels entirely freed the man from the imperfect periodical amaurosis. Scarpa entertains no doubt, that, by looking attentively into the numerous collection of medical observations, one might find in them a great many facts similar to the preceding one, shewing the influence of what he terms morbific gastric stimuli over the organ of sight, and, consequently, the great utility of a spontaneous looseness of the bowels in the cure of the imperfect amaurosis.

But, says Scarpa, even if such examples of the incomplete amaurosis being dissipated in consequence of spontaneous vomiting, or copious evacuations from the bowels, produced entirely by nature, were rare, and noticed by few, we now have so many observations, evincing the successful cure of this disease by means of such evacuations, artificially produced by emetics, and internal resolvents, that no doubt whatever can be entertained, concerning the accuracy of the second part of Celsus's admonition, relative to the present view of the imperfect amaurosis: *et recenti re, et interposito tempore, medicamentis quoque moliri dejectiones, quæ omnem noxiam materiam per inferiora depellant.* Of this Scarpa remarks, we undoubtedly have numerous, satisfactory proofs, in the accurate observations, related by Schmucker and Richter; but our confidence, says Scarpa, in the above method of curing the imperfect and periodical amaurosis, must increase, when we take notice, that the most respectable practitioners of past times, have, in the majority of cases, cured this disease only by means of emetics, and internal resolvents, though, in their writings, they may have imputed the success of the treatment to other causes, or the efficacy of other remedies, which they prescribed conjointly with emetics, and resolvents.

Scarpa, after several valuable remarks on amaurosis in general, refers to the *Mercure de France*, for February, 1756, where is an account of the cures performed by Fournier, on several subjects, affected with hemeralopia. The first were three soldiers, to whom an emetic was administered, after bleeding them. The next day, as they also complained of a heaviness in their head,

and nausea, the bleeding and emetic were repeated. This expedient removed all the above symptoms, and these three soldiers were no longer unable to see in the night time. Fournier met with equal success, in treating eight other soldiers upon the same plan, who were affected with the same disease, and belonged to the same garrison.

Scarpa notices, that Pellier* cured Captain Micetti of an hemeralopia by repeated doses of tartar emetic, a seton in the nape of the neck, and cooling, aperient beverages. The same author† assures us, that he has several times cured the recent imperfect amaurosis, by means of small doses of tartar emetic, and topical aromatic fumigations. (See *Scarpa sulle Malattie degli Occhi. Venezia*, 1802.)

HEMORRHAGE, (from αἷμα, blood, and ῥήγνυμι, to break out.) *Hæmorrhagia. Bleeding.*

This is doubtless one of the most important subjects in Surgery. The fear of hemorrhage in fact retarded the improvement of our Profession for ages; for the ancients, ignorant how to stop bleeding, were afraid to cut out the most trivial tumour, or they did so with terror. They generally performed operations slowly and imperfectly, by means of burning-irons, or ligatures, which the moderns execute quickly and safely with the knife. If the old surgeons ventured to amputate a limb, they only did so, when it had mortified, by dividing the dead parts, and so great was their apprehension of bleeding, that they only dared to cut parts which could no longer bleed. (*John Bell's Principles of Surgery, Vol.* 1. *p.* 142.) But, not only as a consequence of surgery, is hemorrhage to be feared; it is also one of the most alarming accidents, which surgery is called upon to relieve. "*Un sentiment naturel attache à l'idée de perdre son sang; une terreur machinale, dont l'enfant, qui commence à parler, et l'homme le plus décidé, sont également susceptibles. On ne peut point dire, que cette peur soit chimérique. Si l'on comptoit ceux, qui perdent la vie dans une bataille, on verroit, que les trois quarts ont péri par quelque hémorrhagie; et dans les grandes opérations de chirurgie cet accident est presque toujours le plus formidable.* (*Morand. Mem. de l'Acad. Royale de Chirurgie, Vol.* 5. 8*vo.* See *Jones on Hemorrhage.*)

As the blood circulates in the arteries with much greater impetus and rapidity, than in the veins, it necessarily follows, that their wounds are generally attended with much more hemorrhage, than those of the latter vessels, and that such hemorrhage is more difficult to suppress. However, as the blood also flows through veins, of great magnitude, with great velocity, bleedings from them are frequently highly dangerous, and sometimes unavoidably fatal. When an artery is wounded, the blood is of a bright scarlet colour, and gushes from the vessel *per saltum*, in a very rapid manner. The blood issues from a vein in an even, unbroken stream, and is of a dark purple red colour. It is of great practical use to remember, these distinguishing differences, between arterial and venous hemorrhage, because, though the oozing of blood may be in both cases equal in quantity, yet, in the latter instance, one is often justified in bringing the sides of a wound together, without taking farther means to suppress the bleeding, while it would not be proper to adopt the same conduct, were there an equal oozing of arterial blood.

Dr. Jones has favoured the world with a matchless work, on the present subject; and as one grand object of this Dictionary is to convey a concise account of all the latest improvements in surgical science, I shall first endeavour to make the reader acquainted with the more accurate ideas, which this gentleman has lately published, relative to the doctrines of hemorrhage. Afterwards, we shall consider the surgical means to be practised in different cases.

The sides of the arteries are divisible into three coats. The *internal one* is extremely thin and smooth. It is elastic, and firm, (considering its delicate structure) in the longitudinal direction, *but so weak in the circular as to be very easily torn by the slightest force applied in that direction.* Its diseases shew, that it is vascular, and it is also probably sensible.

The *middle coat* is the thickest, and is composed of muscular fibres, all arranged in a circular manner; they dif-

* Recueil de Mem. et Obs. sur l'Œil. Obs. 132. † Ibid. Observ. 136, 138.

fer, however, from common muscular fibres in being more elastic, by which they alone keep a dead artery open, and of a cylindrical form. As this middle coat has no longitudinal fibres, *the circular fibres are held together by a slender connexion, which yields readily to any force, applied in the circumference of the artery.*

The external coat is remarkable for its whiteness, density, and great elasticity. *When an artery is surrounded with a tight ligature, its middle and internal coats are as completely divided by it, as they could be by a knife, while the external coat remains entire.*

Besides these proper coats, all the arteries, in their natural situations, are connected, by means of the fine cellular substance, with surrounding membranous sheaths. *If an artery be divided, the divided parts, owing to their elasticity, recede from each other, and the length of the cellular substance, connecting the artery with the sheath, admits of its retracting a certain way within the sheath.*

Another important fact is: *that when an artery is divided, its truncated extremities contract in a greater, or less, degree, and the contraction is generally, if not always, permanent.*

Arteries are furnished with arteries, veins, absorbents, and nerves; *a structure, which makes them susceptible of every change to which living parts are subjected in common; enables them to inflame, when injured, and to pour out coagulating lymph, by which the injury is repaired, or the tube permanently closed.* (See Jones on Hemorrhage.)

M. Petit, the surgeon, was the first, who, in 1731, endeavoured to explain the means, which nature employs for the suppression of hemorrhage. He thought, that bleeding from a divided artery is stopped by the formation of a coagulum of blood, which is situated partly *within*, and partly *without* the vessel. The clot, he says, afterwards adheres to the inside of the artery, to its orifice, and to the surrounding parts; and, he adds, that when hemorrhage is stopped by a ligature, a coagulum is formed above the ligature, which only differs in shape, from the one, which takes place when no ligature is employed. His opinion leads him to recommend compression to support the coagulum.

In 1736, M. Morand published additional interesting remarks. He allowed, that a coagulum had some effect in stopping hemorrhage; but, contended, that a corrugation, or plaiting, of the circular fibres of the artery which diminished its canal, and a shortening and consequent thickening of its * *longitudinal ones*, which nearly rendered it impervious, had some share in the process. He thought, that the cavity of an artery might be obliterated, by the puckering, or corrugation, when *circular pressure, as that of a ligature, is made.*

Morand erred chiefly in explanation; for, the *contraction* and *retraction* of divided arteries are indisputable facts, and, as Dr. Jones remarks, this does not affect the truth of his general conclusion, *that the change produced on a divided artery, contributes with the coagulum to stop the flow of blood.*

Mr. Samuel Sharp (*2d Edit. of Operations of Surgery*, 1739,) supported the same doctrine. "The blood-vessels, immediately upon their division, bleed freely, and continue bleeding, till they are either stopped by art, or at length contracting, and withdrawing themselves into the wound, their extremities are shut up by coagulated blood."

Pouteau (*Mélanges de Chirurgie*, 1739,) denied that a coagulum is always found after an artery is divided; and, when it is, he thought it only a feeble and subsidiary means towards the suppression of hemorrhage. He contended, that the retraction of the artery had not been demonstrated, and could not be more effectual, than a coagulum. His theory was, that the swelling of the cellular membrane, at the circumference of the cut extremity of the artery, forms the principal impediment to the flow of blood; and that a ligature is useful in promoting a more immediate and extensive induration of the cellular substance.

Gooch, White, Aikin, and Kirkland, all oppose Petit's doctrine of coagulum. The first blends some of Pouteau's theory with his own, by observing, that "when a small artery is totally divided, its retraction may bring it under the

* *Anatomists do not acknowledge that such exist.*

surrounding parts, and with the natural contraction of the diameter of its mouth, assisted by the compressive power of those parts, increased by their growing tumid, the efflux of blood may be stopped."

White was convinced, from what Gooch had suggested, and Kirkland confirmed, that the arteries, by their natural contraction, coalesce, as far as their first ramification.

Dr. Jones admits, that an artery contracts after it has been divided, and his experiments authorize him to say, that the contraction of an artery is an important means, but certainly not the only, nor even the chief means, by which hemorrhage is stopped. The impetuous flowing of the blood through the wound of the artery would resist the contraction of the vessel in such a degree, that would, in almost every instance be attended with fatal consequences, when the artery is above a certain size, were it not for the formation of a coagulum. (*Jones.*)

Mr. J. Bell thinks, that when hemorrhage stops of its own accord, it is neither from the retraction of an artery, nor the constriction of its fibres, nor the formation of clots, but, by the cellular substance, which surrounds the artery, being injected with blood.

We must refer the reader to Dr. Jones's work for a complete exposure of the inconsistences and absurdities in Mr. Bell's account of his own theory. (See *P.* 25, *&c.*)

Dr. Jones very accurately concludes his criticisms on Mr. Bell with observing, that if this gentleman really means to confine his doctrine of the natural means of suppressing hemorrhage to the injection of the cellular substance, round the artery, with blood, he dwells improperly on one of the attendant circumstances to the exclusion of the retraction, and contraction of an artery, and the formation of a distinct clot, all primary parts of the process.

The blood, besides filling the cellular substance round the artery, also fills the cellular substance at the mouth of the artery in a particular manner; for, the divided vessel, by its retraction within its cellular sheath, leaves a space of a determinate form, which, when all the circumstances necessary for the suppression of hemorrhage operate, is gradually filled up by a distinct clot. (*Jones.*)

MEANS OF NATURE IN STOPPING BLEEDING FROM DIVIDED ARTERIES.

Dr. Jones has given a faithful and accurate detail of a series of experiments on animals, which demonstrate "that the blood, the action, and even the structure of the arteries, their sheath, and the cellular substance connecting them with it," are concerned in stopping bleeding from a divided artery of moderate size, in the following manner: "An impetuous flow of blood, a sudden and forcible retraction of the artery within its sheath, and a slight contraction of its extremity, are the immediate, and almost simultaneous, effects of its division. The natural impulse, however, with which the blood is driven on, in some measure counteracts the retraction, and resists the contraction of the artery. The blood is effused into the cellular substance, between the artery and its sheath, and passing through that canal of the sheath, which had been formed by the retraction of the artery, flows freely externally, or is extravasated into the surrounding cellular membrane, in proportion to the open, or confined state of the wound. The retracting artery leaves the internal surface of the sheath uneven, by lacerating, or stretching the cellular fibres that connected them. These fibres entangle the blood, as it flows, and thus the foundation is laid for the formation of a coagulum at the mouth of the artery, and which appears to be completed by the blood, as it passes through this canal of the sheath, gradually adhering and coagulating, around its internal surface, till it completely fills it up from the circumference to the centre." (*Jones, p.* 53.)

The effusion of blood into the surrounding cellular membrane, and between the artery and its sheath; but, in particular, the diminished force of the circulation from loss of blood, and a speedy coagulation of this fluid in this circumstance, most essentially contribute, says Dr. Jones, to the desirable effect.

It appears then, that a coagulum, which Dr. Jones calls the *external* one, at the mouth of the artery, and within its sheath, forms the first complete obstacle to the continuance of bleeding, and though it seems externally like a

continuation of the artery, yet, on slitting open this vessel, its termination can be plainly observed, with the coagulum shutting up its mouth, and contained in its sheath. (*Jones, p. 55.*)

No collateral branch being very near the impervious mouth of the artery, the blood just within it is at rest, and usually forms a slender conical coagulum, which neither fills up the canal of the artery, nor adheres to its sides, except by a small portion of the circumference of its base, near the extremity of the vessel. This coagulum is distinct from the former, and what Dr. Jones calls the *internal* one.

The cut end of the artery next inflames, and the vasa vasorum pour out lymph, which fills up the extremity of the artery, is situated between the internal and external coagula, is somewhat intermingled with them, or adheres to them, and is firmly united all round to the internal coat of the vessel. Dr. Jones further states, that the permanent suppression of the hemorrhage chiefly depends on this coagulum of lymph; but, that the end of the artery is also secured by a gradual contraction, which it undergoes, and by an effusion of lymph between its tunics, and into the surrounding cellular substance; whereby these parts become thickened, and so incorporated with each other, that one cannot be discerned from the other. Should the wound in the integuments not heal by the first intention, the coagulating lymph, soon effused, attaches the artery firmly to the subjacent and lateral parts, gives it a new covering, and entirely excludes it from the outward wound. (*Jones, p. 55.*)

The same circumstances are also remarkable in the portion of the vessel, most remote from the heart. Its orifice, however, is usually more contracted, and its external coagulum smaller, than the one which attaches itself to the other cut end of the artery. (*Jones on Hemorrhage, p. 56.*)

The impervious extremity of the artery, no longer allowing blood to circulate through it, the portion, which lies between it and the first lateral branch gradually contracts, till its cavity is completely obliterated, and its tunics assume a ligamentous appearance. The external coagulum, which, in the first instance, had stopped the hemorrhage, is absorbed in a few days, and the coagulating lymph, effused around it, and by which the parts were thickened, is gradually removed, so that they resume again their cellular texture. (*Jones, p. 57.*)

At a still later period, the ligamentous portion is reduced to a filamentous state, so that the artery is as it were, completely annihilated from its cut end to the first lateral branch. Long, however, ere this final change is accomplished, the inosculating branches have become considerably enlarged, so as to establish a free communication, between the disunited parts of the main artery. (*Jones, p. 58.*)

When an artery has been divided *at some distance from a lateral branch*, three coagula are formed: one of blood externally, which shuts up its mouth; one of lymph, just within the extremity of its canal; and one of blood, within its cavity, and contiguous to that of lymph. But, when the artery has been divided near a lateral branch, no internal coagulum of blood is formed. (*Jones, p. 63.*

The external coagulum is always formed, when the divided artery is left to nature; not so however, if art interferes, for under the application of the ligature it can never form. If agaric, lycoperdon, or sponge, be used, its formation is doubtful, depending entirely upon the degree of pressure, that is used; but, the internal coagulum of blood will be equally formed, whether the treatment be left to art, or nature, if no collateral branch is near the truncated extremity of the artery; and lastly, effused lymph, which, when in sufficient quantity, forms a distinct coagulum, just at the mouth of the artery, will be always found, if the hemorrhage is permanently suppressed. (*Jones, p. 74.*)

MEANS, WHICH NATURE EMPLOYS FOR SUPPRESSING THE HEMORRHAGE FROM PUNCTURED, OR PARTIALLY DIVIDED ARTERIES.

The suppression of hemorrhage by the natural means is much more easily accomplished, when an artery is completely divided, than when merely punctured, or partially divided. Completely dividing a wounded artery was one means practised by the ancients in order to stop hemorrhage: the moderns frequently do the same thing, when bleeding from the temporal artery proves troublesome.

Dr. Jones has related many experiments, highly worthy of perusal, and which were undertaken to investigate the present part of the subject of hemorrhage. This gentleman, however, owns, that, in regard to the temporary means by which bleeding from a punctured artery is stopped, he has but little to add to what Petit has explained, in his third publication on hemorrhage. (*Mem. de l'Acad. des Sciences;* 1735.) The blood is effused into the cellular substance, between the artery and its sheath, for some distance, both above and below the wounded part; and when the parts are examined, a short time after the hemorrhage has completely stopped, we find a stratum of coagulated blood between the artery and its sheath, extending from a few inches below the wounded part to two, or three inches above it, and somewhat thicker, or more prominent over the wounded part, than elsewhere.

Hence, rather than say the hemorrhage is stopped by a coagulum, it is more correct to say, that it is stopped by a thick lamina of coagulated blood, which, though somewhat thicker at the wounded part, is perfectly continuous with the coagulated blood lying between the artery and its sheath. (*Jones*, p. 113.)

When an artery is punctured, the hemorrhage, immediately following, by filling up the space, between the artery and its sheath, with blood, and consequently distending the sheath, alters the relative situation of the puncture in the sheath to that in the artery, so that they are not exactly opposite to each other; and by that means a layer of blood is confined by the sheath over the puncture in the artery, and, by coagulating there, prevents any further effusion of blood.

But, this coagulated blood, like the external coagulum of a divided artery, affords only a temporary barrier to the hemorrhage; its permanent suppression is effected by a process of reparation, or of obliteration.

Dr. Jones's experiments shew, that an artery, if wounded only to a moderate extent, is capable of reuniting and healing so completely, that, after a certain time, the cicatrization cannot be discovered, either on its internal, or external surface; and that even oblique and transverse wounds, (which gape most,) when they do not open the artery to a greater extent, than one fourth of its circumference, are also filled up and healed by an effusion of coagulating lymph from their inflamed lips, so as to occasion but little, or no obstruction to the canal of the artery. The utmost magnitude of a wound, which will still allow the continuity of the canal to be preserved, is difficult to be learnt; for, when the wound is large, but yet capable of being united, such a quantity of coagulating lymph is poured out, that the canal of the vessel, at the wounded part, is more or less filled up by it. And when the wound is still larger, the vessel becomes either torn, or ulcerated completely across, soon afterwards, by which its complete division is accomplished.

The lymph, which fills up the wound of an artery, is poured out very freely both from the vessel and the surrounding parts, and it accumulates around the artery, particularly, over the wound, where it forms a more distinct tumour. The exposed surrounding parts at the same time inflame, and pour out coagulating lymph, with which the whole surface of the wound becomes covered, and which completely excludes the artery from the external wound. This lymph granulates, and the wound is filled up and healed in the usual manner. (See *Jones on Hemorrhage, p.* 113, *&c.*)

SURGICAL MEANS OF SUPPRESSING HEMORRHAGE.

It must be plain to every one, who understands the course of the circulation, that pressure, made on that portion of a wounded artery, which adjoins the wound towards the heart, must check the effusion of blood. The current of blood in the veins, running in the opposite direction, requires the pressure to be applied to that side of the wound, which is most remote from the heart. As pressure is the most rational means of impeding hemorrhage, so it is the most effectual; and almost all the plans, employed for this purpose, are only modifications of it. The tourniquet, the ligature, the application of a roller and compresses, even agaric itself, only become useful in the suppression of hemorrhage, on the principle of pressure, the cautery, caustics, and styptics excepted.

MEANS EMPLOYED BY THE ANCIENTS.

In order to prevent a wounded person from dying of hemorrhage, Celsus advises the wound to be filled with dry lint, over which is to be laid a sponge dipped in cold water, and pressed on the part with the hand. If, notwithstanding this, the hemorrhage should continue, he recommends repeatedly applying fresh lint, wet with vinegar; but, he is against the use of corroding escharotic applications, on account of the inflammation, which they produce; or only sanctions the employment of the mildest ones. When the hemorrhage resists these methods, *he advises two ligatures to be applied to the wounded part of the vessel, and then to divide the portion situated between them:—* "*Quod si illa quoque profluvio vincuntur, venæ, quæ sanguinem fundunt, apprehendendæ, circaque id, quod ictum est, duobus locis deligandæ, interciendæque sunt, ut et in se ipsæ coeant, et nihilominus ora præclusa habeant.*" *Lib. 5. cap.* 26. When the ligature is impracticable, he proposes the actual cautery, if the wound should bleed sufficiently, and there should be no nerves, nor muscles at the bleeding part.

Galen also mentions tying the vessels to stop the hemorrhage from wounds: and there are some traces of the same information in other authors, who lived before him, as Archigenes, and Rufus. However, it is more than probable, that, in their days, the ligature was very little used, as we must infer from the multitude of topical astringents, caustics, and other applications, which they have advised for stopping bleeding, and in which they would have put less confidence, had they been familiarly acquainted with the use of the ligature. No one can doubt, that they would very soon have tied the vessels after amputations, had they had many opportunities of seeing the advantages of the ligature; but, so far were they from adopting such practice, that, Albucasis, a long while afterwards, refused to amputate a wrist, lest he should see his patient bleed to death.

Paré passes for the first, who employed the ligature after amputation. His method having been attacked, he modestly defends it in the part of his works, intitled, *Apologie*. He takes great care to impute the origin of it to the ancients, and cites many of them, who have made mention of it. However, he thinks its utility in amputations of such high consequence, that he considers himself as inspired by the Deity in having first adopted this practice.

The method, in which the ancients placed most confidence, for stopping hemorrhage after the amputation of a limb, was the cauterization of the cut vessel, and part of the surrounding flesh. The parts, thus affected by the heat, formed an eschar, of greater, or less thickness, which blocked up the opening of the vessel, and hindered the blood from escaping. The separation of the eschar, however, which frequently took place too soon, occasioned a return of the hemorrhage, and rendered it the more dangerous, as its suppression became more difficult, than before the cautery was applied. The instrument being too much heated, even, sometimes, immediately brought away with it the eschar, which it had just formed. At the present time, the cautery is never employed, as a means of suppressing hemorrhage, or, at most, only in a few very unusual cases, in which neither compression, nor the ligature can be made use of. In Great Britain, the cautery may be said to be entirely exploded; but, in France, the best hospital surgeons now and then employ it to stop bleedings from the antrum, and the mouth.

It was once a practice to apply pledgets, dipped in boiling turpentine, to the mouths of the bleeding vessels: of this it is only necessary to say, that the method now has long been most justly abandoned.

ASTRINGENTS, STYPTICS, &c.

Le Dran, in his treatise on the operations of surgery, says, that a button of vitriol, or alum, applied, and properly confined on the extremity of the vessel, is sufficient to stop the hemorrhage in amputations. Heister recommends the application of vitriol, in preference to the ligature, in the amputation of the fore-arm. Great praises have also been conferred on agaric, and sponge, for their styptic properties. Solutions of iron, and all the mineral acids in various forms, have been recommended to the public, as remedies of the same kind, and possessing great efficacy.

The ancients, indeed, had already exhausted this class of remedies in such a degree, that the pretended discoveries of the moderns, in this way, may almost all be met with in their writings; and the little success, attending their practice, especially, when bleeding from a considerable artery was to be suppressed, clearly shews what little reliance we ought to place on means of this description. (*Encyclopédie Méthodique; Partie Chirurgicale.*) Styptics do, indeed, possess the power of stopping some hemorrhages from small arteries; but, they ought never to be trusted, when large ones are concerned.

There is no doubt, that cold air has a styptic property; by which expression I mean, it promotes the contraction of the vessels, for, no styptics can contribute to make the blood coagulate, though such an erroneous idea is not uncommon. We frequently tie, on the surface of a wound, every artery, that betrays the least disposition to bleed, as long as the wound continues exposed to the air. We bring the opposite sides of this wound into contact, and put the patient to bed. Not an hour elapses, before the renewal of hemorrhage necessitates us to remove the dressings. The wound is again exposed to the air, and again the bleeding ceases. This often happens in the scrotum, after the removal of a testicle, and on the chest, after the removal of a breast. The proper conduct, in such cases, is not to open the wound unnecessarily, but, to apply wet linen to the part so as to produce such an evaporation from its surface, as shall create a sufficient degree of cold to stop the bleeding. As all styptics irritate, judicious practitioners seldom apply them to recent wounds. It is sometimes, however, very proper to employ them to suppress hemorrhages from many diseased surfaces, where the vessels seem to have lost their natural disposition to contract.

COMPRESSION.

We have already remarked, that all the best means of checking hemorrhage, operate on the principle of pressure, the actual and potential cautery, and some styptics excepted; the two first of which act by forming a slough, which stops up the mouths of the vessels; while the latter operate by promoting their contraction. Let us next consider the various modifications of pressure.

M. Petit endeavours to shew, in a dissertation on the manner of stopping hemorrhage, printed in the *Mem. de l'Acad. de Sciences, annee* 1731, that the different things which have been praised as infallible specifics, would seldom, or never, have succeeded without compression. It was always requisite, even when caustics were employed, to apply compresses, which were bound on with sufficient tightness to resist the impulse of the blood in the artery, and the premature separation of the eschar, occasioned by the actual or potential cautery. Had this precaution not been taken, there would have been reason to have feared hemorrhage, almost invariably, and which, indeed, did recur but too frequently, when the eschar was detached, notwithstanding the pains taken to avert it by suitable compression. M. Petit has noticed, that the end of the finger, gently compressing the mouth of a vessel, is a sufficient means of stopping hemorrhage from it, and that nothing else would be necessary, if the finger and stump could always be kept in this posture. Hence, he endeavoured to obviate these difficulties by inventing a machine which securely and incessantly executes the office of the finger. This instrument is a double tourniquet, which, when applied, compresses, at once, both the extremity of the divided artery and its trunk above the wound. The compression on the end of the vessel is to be permanent; that on the trunk is only to be made at the time of dressing the wound, or when it is necessary to relax the other. An engraving and particular description of the instrument are to be found in Petit's memoir.

Surgeons used formerly to fill the cavities of the wounds with lint, and then make pressure on the bleeding vessels, by applying compresses and a tight roller over the part. The practitioners of the present day are too well acquainted with the advantages of not allowing any extraneous substance to intervene between the opposite surfaces of a recent wound, to persist in the above plan. They know, that the sides of the wound may be brought into contact, and that compression may yet be adopted, so as both to restrain particular hemorrhages, and rather

promote, than retard the union of the wound.

When the blood does not issue from any particular vessel, but from numerous small ones, compression is preferable to the ligature. The employment of the latter would render it necessary to tie the whole surface of the wound. The sides of the wound are to be brought accurately together, and compresses are then to be placed over the part, and a roller to be applied with sufficient tightness to make effectual pressure, but not so forcibly as to produce a danger of the circulation in the limb being completely stopped.

If compression can ever be safely trusted in bleedings from large arteries, it is when these vessels lie immediately over a bone, against which they can be advantageously compressed. Bleedings from the radial and temporal arteries are of this kind. Compression is sometimes tried, when the brachial artery has been wounded in phlebotomy. Here it is occasionally tried, in preference to the ligature, because the latter cannot be employed without an operation to expose the artery.

When there is a small wound in a large artery, the following plan may be tried: a tourniquet is to be applied, so as to command the flow of blood into the vessel. The edges of the external wound are next to be brought into contact. Then a compress, shaped like a blunt cone, and which is best formed of a series of compresses, gradually increasing in size, is to be placed, with its apex exactly on the situation of the wound in the artery. This *graduated compress*, as it is termed, is then to be bound on the part with a roller.

In this manner, I lately healed a wound of the superficial palmar arch, in a young lady in Great Pulteney-street. The outward wound was very small, and though the hemorrhage was profuse, I conceived, that it might be permanently stopped, if compression could be so made as to keep the external wound incessantly and firmly covered for the space of a day or two. At first, I tried a compress of lint, bound on the part with a roller; but this proving ineffectual, I took some pieces of money, from the size of a farthing to that of a half-crown, and, wrapping them up in linen, put the smallest one accurately over the wound, so as completely to cover it. Then the others were arranged, and all of them were firmly confined with a roller, and the arm kept as quiet as possible in a sling. They were taken off after three days, and no hemorrhage ensued.

It is to be observed, that the palmar fascia, in this instance, would prevent the compression from operating on the vessel; but the case shews, that this artery, when wounded, is capable of healing, if the blood be completely prevented from getting out of the external wound by the proper application of compression. Were the outer wound too large to admit of this plan, it would probably be necessary to dissect for the ends of the artery, in order to tie them. This operation, however, is by no means easy; and, perhaps, upon the whole, it might be better to cut down, at once, to the ulnar artery, and put a ligature round it, though this would only certainly stop the bleeding from one end of the vessel in the hand.

Besides compressing the wounded part of the artery, some surgeons also apply a longitudinal compress over the track of the vessel above the wound, with a view of weakening the flow of blood into it. Whatever good effect it may have in this way, is more than counterbalanced by the difficulty which it must create to the circulation in the arm. If the graduated compress be properly arranged, an effusion of blood cannot possibly happen, and pressure along the course of the artery must at all events be unnecessary.

After relaxing the tourniquet, if no blood escape from the artery, the surgeon (supposing it to be the brachial artery wounded) should feel the pulse at the wrist, in order to ascertain, that the compression employed is not so powerful as entirely to impede the circulation in the fore-arm and hand. The arm is to be kept quietly in a sling, and, in forty-eight hours, if no bleeding take place, there will be great reason to expect that the case will do well. In the *First Lines of the Practice of Surgery*, I have given an engraving and description of an instrument, invented by Plenk, for making pressure on the wounded brachial artery, at the bend of the arm, without pressing upon the whole circumference of the limb, and consequently stopping the circulation. (See *page* 56, *plate* 1.) No one, however, would prefer compression when large arteries are injured, except in the kind of cases, to which we have just

adverted, or in those in which the wounded vessel can be firmly compressed against a subjacent bone. The compresses sometimes slip off, or the bandages become slack, so that a fatal hemorrhage may arise. Hence, when this method is adopted, the tourniquet should always remain loosely round the limb, ready to be tightened in an instant. Sometimes the external wound heals, while the opening in the artery remains unclosed, and an aneurism is the consequence. This is particularly apt to occur, when the pressure has not been powerful enough; and, when too great, mortification is apt to come on: such are the objections to placing much confidence in compression, except when the vessels are not of considerable size.

TOURNIQUET.

When hemorrhage takes place from a large artery in one of the limbs, where the vessel can be conveniently compressed above the wound in it, a tourniquet, judiciously applied, never fails in putting an immediate stop to the bleeding.

Before the invention of this instrument, which did not take place till the latter part of the 17th century, surgery was really a very defective art. No important operation could be undertaken on the extremities, without placing the patient in the most imminent peril; and the want of the aid, afforded by the tourniquet, made many wounds mortal, which otherwise would not have been attended with the least danger.

As the first invention of this instrument has been claimed by different surgeons, and even different nations, we shall not take upon us to determine where it had its origin. But whoever was the inventor, it was first presented to the public in a form exceedingly simple; so much so, indeed, that it seems extraordinary, that its invention did not happen sooner. A small pad being placed on the principal artery of a limb, a band was applied over it, so as to encircle the limb twice Then a stick was introduced between the two circles of the band, and twisted: thus the pad was made to compress with quite power enough completely to stop the flow of blood into the lower part of the vessel.

Although, in the *Armamentarium Chirurgicum* of Scultetus, there is a plate of a machine, invented by this author for compressing the radial artery, by means of a screw, M. Petit is universally allowed to be the first who brought the tourniquet to perfection, by combining the circular band with a screw, in such a manner that the greatest pressure operates on the principal artery.

The advantages of the modern tourniquet are, that its pressure can be regulated with the utmost exactness; that it operates chiefly on the point where the pad is placed, and where the main artery lies; that it does not require the aid of an assistant to keep it tense; that it completely commands the flow of blood into a limb; that it can be relaxed, or tightened in a moment; and that, when there is reason to fear a sudden renewal of hemorrhage, it can be left slackly round the limb, and, in case of need, tightened in an instant. Its utility, however, is confined to the limbs, and as the pressure necessary to stop the flow of blood through the principal artery, completely prevents the return of blood through the veins, its application cannot be made very long without including mortification. It is only of use also in putting a sudden stop to profuse hemorrhages for a time, that is, until the surgeon has put in practice some means, the effect of which is more permanent.

LIGATURE.

The ancients were quite unacquainted with the use of the tourniquet, and though some of the writers have made mention of the ligature, they do not seem to have known how to make proper use of it, nor to have possessed any other certain means of suppressing hemorrhage from wounds. In modern times, it is easily comprehensible, that, when any great operation was undertaken, while surgery was so imperfect, there was more likelihood of harm, than good being done to the patient. Nor can it be wondered at, that the old practitioners should have taken immense pains to invent a great many topical astringents. But now that the ligature is known to be a means which is safe, easy, and much less painful than

former methods, we need no longer search for such remedies.

It may, indeed, be set down, as a rule in surgery, whenever large arteries are wounded, never to trust to any styptic application whatsoever; but to have immediate recourse to the ligature, as being, when properly applied, the most simple and safe of all methods.

In order to qualify the reader to judge of the best mode of applying ligatures to arteries, I shall first explain to him their effect on these vessels, as related by Dr. Jones.

This gentleman learned from Mr. J. Thomson, of Edinburgh, that, in every instance in which a ligature is applied around an artery, without including the surrounding parts, the internal coat of the vessel is torn through by it, and that this fact has been originally noticed by Desault. Mr. Thomson shewed to Dr. Jones, on a portion of artery taken from the human subject, that the internal and middle coats are divided by the ligature. (*Jones, p.* 126.)

This led Dr. Jones to make some experiments on the arteries of dogs and horses, shewing, that when a ligature is applied with sufficient tightness round an artery to cut through its internal and middle coats, although it be immediately afterwards removed, the vessel always becomes permanently impervious at the part which was tied, as far as the first collateral branches above and below the obstructed part. Dr. Jones thinks it reasonable to expect, that the obstruction produced in the arteries of dogs and horses, in the manner he has related, "might be effected by the same treatment in the arteries of the human subject; and, if it should prove successful, it might be employed in some of the most important cases in surgery. The success of the late important improvements which have been introduced in the operation for aneurism, may perhaps appear to most surgeons to have rendered that operation sufficiently simple and safe; but, if it be possible to produce obstruction in the canal of an artery of the human subject, in the above mentioned manner, may it not be advantageously employed in the cure of aneurism; inasmuch as nothing need be done to prevent the immediate union of the external wound?" Dr. Jones next questions, whether this mode of obstructing the passage of blood through the arteries may not also be advantageously practised in cases of bronchocele? (*p.* 136.)

From Dr. Jones's experiments, it appears, that the first effects of a ligature upon an artery are, a complete division of its internal and middle coats, an apposition of its wounded surfaces, and an obstruction to the circulation of the blood through its canal. There must be a small quantity of stagnant blood, just within the extremity of the artery; but this does not, in every instance, immediately form a coagulum, capable of filling up the canal of the artery. In most cases, only a slender coagulum is formed at first, which gradually becomes larger by successive coagulations of the blood; and hence, the coagulum is always at first of a tapering form, with its base at the extremity of the artery. But, as Dr. Jones remarks, the formation of this coagulum is not material; for, soon after the ligature has been applied, the end of the artery inflames, and the wounded internal surface of its canal being kept in close contact by the ligature, adheres, and converts this portion of the artery into an impervious and, at first, slightly conical sac. It is to the effused lymph, that the base of the coagulum adheres, when found to be adherent. Lymph is also effused between the coats of the artery, and among the parts surrounding its extremity. In a little time, the ligature makes the part, on which it is directly applied, ulcerate; and, acting as a tent, a small aperture is formed in the layer of lymph effused over the artery. Through this aperture, a small quantity of pus is discharged, as long as the ligature remains; and, finally, the ligature itself also escapes, and the little cavity, which it has occasioned, granulates and fills up, and the external wound heals, leaving the cellular substance a little beyond the end of the artery, much thickened and indurated. (*Jones, p.* 159, 161.)

In short, when an artery is properly tied, the following are the effects, as enumerated by Dr. Jones:

1. To cut through the internal and middle coats of the artery, and to bring the wounded surfaces into perfect apposition.

2. To occasion a determination of blood to the collateral branches.

3. To allow of the formation of a coagulum of blood just within the artery, provided a collateral branch is not very near the ligature.

4. To excite inflammation on the internal and middle coats of the artery, by having cut them through, and, consequently, to give rise to an effusion of lymph, by which the wounded surfaces are united, and the canal is rendered impervious; to produce a simultaneous inflammation on the corresponding external surface of the artery, by which it becomes very much thickened with effused lymph; and, at the same time, from the exposure and inevitable wounding of the surrounding parts, to occasion inflammation in them, and an effusion of lymph, which covers the artery, and forms the surface of the wound.

5. To produce ulceration in the part of the artery, around which the ligature is immediately applied, viz. its external coat.

6. To produce indirectly a complete obliteration, not only of the canal of the artery, but even of the artery itself to the collateral branches on both sides of the part which has been tied.

7. To give rise to an enlargement of the collateral branches. (*Jones, p.* 163, 164.)

Every part of an artery is organized in a similar manner to the other soft parts, and its coats are susceptible of the same processes of adhesion, ulceration, &c. as the other parts are. Hence, the precautions taken to secure the adhesion of other parts, should be observed for the same purpose, with regard to an artery. The vessel is put in a state to admit of adhesion by the ligature, which, when properly applied, cuts through its internal and middle coats, keeps their cut surfaces in contact, and affords them an opportunity of uniting by the adhesive inflammation, as other cut surfaces do. The immediate stoppage of the bleeding is merely the incipient and temporary part of what the ligature has to accomplish; it has also to effect the adhesion of the internal and middle coats of the artery, which being the thing on which the permanent suppression of the hemorrhage depends, is the most important. The size and form of the ligature, whether completely flat, or irregular, have not been, as Dr Jones remarks, sufficiently attended to; nor is the degree of force employed in tying the artery, often considered. Some surgeons, wishing to guard against the ligature's slipping off, tie it with a very considerable force; while others, apprehensive lest they should cut through the artery, or occasion too early a separation of the ligature, draw it only sufficiently tight to prevent the escape of any blood. A broad flat ligature is not likely to make such a wound in the internal and middle coats of the artery, as is most favourable to adhesion, because it is scarcely possible to tie it smoothly round the vessel, which is very likely to be thrown into folds, or puckered by it, and, consequently, to have an irregular bruised wound made in its middle and internal coats. By covering also a considerable space of the external coat, it may destroy the very vessels which pass on it in their way to the cut surfaces of the inner coats, and thus render them incapable of inflaming. Even supposing the wound to unite, still such a ligature may cover that part of the external coat, which is directly over the newly-united part, and, consequently, as soon as it has produced ulceration through the external coat, it will cause the same effect on the newly-united parts, and, of course, secondary hemorrhage. (*Jones, p.* 168.)

When a ligature is of an irregular form, it is apt to cut through the internal and middle coats of an artery more completely at some parts than others; but these coats must be perfectly cut through, in order to produce an effusion of lymph from the inside of the vessel, which seems to adhere only at its cut surfaces.

Also, when the ligature is not applied with sufficient tightness, the inner coats of the artery will not be properly cut through. Dr. Jones thinks, the ligature being sometimes put on so as to deviate from a circle, has a tendency to produce secondary hemorrhage.

Dr. Jones thinks ligatures are best, when they are round, and very firm, and, he adds, that though a very slight force is necessary to cut through the internal and middle coats of an artery, it is better to tie the vessel more tightly than is necessary merely to cut through its inner coats, because the cut surfaces will thus be more certainly kept in contact; the separation of the ligature expedited; and the danger of ulceration spreading to the newly cicatrized part diminished. The external coat will never ulcerate through, before the inner ones have adhered. The limb, however, should be kept in a perfectly quiet state.

I am sincerely glad to find, that so accurate an observer as Dr. Jones, has refuted the idea, that ligatures occasionally slip off the vessels, in consequence of the violent impulse of the blood. In fact, the blood does not continue to be impelled against the extremity of the artery with the same impetuosity with which it circulated through the vessel before it was tied. The blood is immediately determined into the collateral branches, nor is there any pulsation for some way above the ligature.

Dr. Jones much more rationally imputes this occasional occurrence, either to the clumsiness of the ligature, which prevents its lying compactly and securely round the artery; or to its not having been applied with sufficient tightness; or to its having that very insecure hold of the vessel, which the deviation from the circular application must occasion. (*P.* 173.)

Dr. Jones is of opinion, that, in cases of aneurism, in which the artery has only been tied with one ligature, and left undivided, and in which secondary hemorrhage has arisen, that this has most probably been owing, either to a diseased state of the artery; to various contrivances for compressing a large portion of the vessel, or having a loose ligature above the one, which is tied; or, lastly, to not tying the artery sufficiently tight to cut through the internal and middle coats, so as to fit them for adhesion, but, so as to cause a gradual ulceration through them, and, of course, bring on hemorrhage, which returns with greater violence, as the ulceration advances. (*P.* 176.)

Dr. Jones seems to consider, that the advantage of the retraction of the *divided* artery within the cellular membrane, is compensated, in the case of the *undivided* artery, by the speedy and profuse effusion of lymph, which takes place over and round the vessel, at the tied part, and even covers the ligature itself. However, he admits the objection, urged by Mr. Abernethy, to using only one ligature, viz. that the vessel cannot be tied, where it lies among its natural connexions, or if tied in this manner either at the upper, or lower part of the wound, the hemorrhage will proceed from that part of the vessel, which has the detached portion of the artery for its extremity. This gentleman concludes this point, with allowing it to be *safest and best to apply two ligatures, and to divide the artery between them.* P. 179. *See Aneurism.* Another cause of secondary hemorrhage is by including other parts in the ligature, together with the artery, by doing which, the division of the inner coats of the vessel may be prevented.

In the valuable publication of Dr. Jones's, to which we have so freely adverted, some secondary hemorrhages are also imputed to the hidden separation, or laceration of the recently united parts of an artery, by premature and extraordinary exertions of the patient. Hence, he strongly insists on keeping a limb, in which a large artery has been tied, perfectly at rest.

We shall conclude our remarks on the ligature with a few practical rules.

1. Always tie a large artery, as separately as possible, but still let the ligature be applied to a part of the vessel, which is close to where it lies among its natural connexions.

Besides the reasons for this practice, already specified, we may observe, that including other substances in the ligature causes immense pain, and a larger part of a wound to remain disunited. The ligature is also apt to become loose, as soon as the substance between it and the artery sloughs, or ulcerates. Sometimes the ligature thus applied, forms a circular furrow in the flesh, and remains a tedious time, incapable of separation.

The blood-vessels being thus organized like other parts, the healing of the wounded artery can only take place favourably, when the part of the vessel, which is immediately contiguous to the ligature, continues to receive a due supply of blood through its vasa vasorum, which are ramifications of the collateral arteries. Hence, the disadvantage of putting a ligature round the middle of a portion of an artery, which has been separated from its surrounding connexions. Hence, the utility, however, of making the knot, as closely as possible to that part of the vessel which lies undisturbed among the surrounding flesh.

Small arteries neither allow nor require these minute attentions to the mode of tying them.

2. When a divided artery is large, open-mouthed, and very visible, it is best to take hold of it, and raise its extremity, a little way above the surface

of the wound with a pair of forceps. When the vessel is smaller, the tenaculum is the most convenient instrument.

3. While one surgeon holds the vessel in this way, another is to place the noose of a ligature round it, and tie it according to the above directions. In order that the noose may not rise too high, and even above the mouth of the artery, when it is tightened, the ends of the ligature must be drawn as horizontally as possible, which is best done with the thumbs. A knot is next to be made.

4. Ligatures always operating in wounds as extraneous bodies, and one end of each being sufficient for its removal, the other should always be cut off close to the knot, and taken away.

5. When a large artery is either partially divided, or completely divided, two ligatures, one to the upper, the other to the lower part of the vessel, are commonly necessary, in consequence of the anastomosing branches conveying the blood so readily into the part of the artery most remote from the heart, as soon as the first ligature has been applied.

6. When a large artery is only punctured; when compression cannot be judiciously tried; and when the hemorrhage continues; the vessel must be first exposed by an incision, and then a double ligature introduced under it, with the aid of an eye-probe. One ligature is to be tied above; the other below the bleeding orifice; with due attention to the principles already advanced.

7. Ligatures usually come away from the largest artery ever tied, in about a fortnight, and from moderate-sized ones in six or seven days. When they continue attached much beyond the usual period, it is proper to draw them very gently every time the wound is dressed, for the purpose of accelerating their detachment. Great care, however, is requisite in doing this; for, as Dr. Jones remarks, as long as the ligature seems firmly attached, pulling it rather strongly must act, more or less, on the recently cicatrized extremity of the artery, which is not only contiguous to it, but is still united to that portion of the artery, (the external coat,) which detains the ligature. (*Jones, p.* 162.)

For information concerning hemorrhage, consult *Petit's Memoirs, among those of l'Acad. des Sciences for the years* 1731, 1732, 1735: *Morand sur le Changement, qui arrive aux Arteres coupées*, 1736; *Pouteau's Melanges de Chirurgie: Gooch's Chirurgical Works, Vol. I: Kirkland's Essay on the Method of suppressing Hemorrhages from divided Arteries: White's Cases in Surgery: John Bell's Principles of Surgery, Vol. I: Partie Chirurgicale de l' Encyc. Méth.: and, particularly, Jones on the Process employed by Nature, in suppressing the Hemorrhage from divided and punctured Arteries*, 1805.

HEMORRHOIDS, (from αἷμα, blood, and ῥέω, to flow.) *Hæmorrhoides. Piles.* The etymological meaning of the word is evidently only a discharge of blood. Surgeons, however, sanctioned by long custom, always imply by the term, *hemorrhoids*, either a bleeding from the veins of the lower part of the rectum, or else a considerable distention of these vessels, so as to form tumours, but quite unattended with hemorrhage. When the dilated veins do not bleed, the swellings are called *blind piles*; but, when they are attended with occasional discharges of blood, they are named *open piles*. These tumours vary in number, size, form, and situation: some are *external*, others *internal*. In general, the inconvenience which they occasion, is very supportable; but, sometimes they bring on very serious complaints, either by bursting and discharging blood so profusely as dangerously to reduce the patient; or by exciting inflammation of the adjacent parts, and causing abscesses and fistulæ; or, lastly, by becoming strangulated by the contraction of the sphincter ani, so as to occasion very acute pain. Piles, which bleed but little, are not of much consequence; but those which bleed profusely, cause violent pain, or which induce inflammation, and all its effects, demand the greatest attention. Lieutaud makes mention of a person, who lost three quarts of blood from some open piles in the course of a couple of days; and the heretic Arius, and the celebrated philosopher Copernicus, are said to have bled to death in this manner.

When piles are situated far up in the rectum, they are commonly less painful, than when low down. In the former case, the veins are surrounded by soft and yielding substances, which do not make any painful pressure on the swellings; but, piles, situated towards the anus, are apt to suffer a very pain-

ful constriction from the action of the sphincter muscle. Hence, when such tumours are very high up in the rectum, the patient has sometimes no warning of his disorder, till he discharges blood from the rectum, and, so violent a bleeding may at once ensue, as to prove fatal.

With regard to the causes of hemorrhoids, any thing capable of retarding the return of blood through the hemorrhoidal veins, may occasion the disease. The pressure of the gravid uterus, costiveness, and the frequent retention of hardened fæces in the rectum, are very frequent causes. Persons, who lead sedentary lives, are often troubled with the complaint. From what has been stated, we may easily discern the reason, why women are more subject to piles, than men are, though the disease is so common, that the latter are also very frequently troubled with it.

The pressure of an enlarged liver, or of water accumulated in the cavity of the peritonæum, is said sometimes to be the occasion of piles.

When these tumours are produced by the pressure of the gravid uterus, no cure can be expected till after delivery, when one generally follows spontaneously. Also, when piles are an effect of dropsy, they can only get well, after the pressure of the fluid in the abdomen has been removed by tapping. Gently laxative medicines, and an horizontal position of the body, commonly alleviate the uneasiness resulting from hemorrhoids. The application of an ointment, composed of equal parts of the powder of oak-galls, and of elder-ointment, or hog's lard, contribute to the same beneficial effect. Applying warm water to the tumours, by means of a bidet, or semicupium, is also frequently productive of great ease. When piles are constricted by the sphincter ani muscle, the pain thus arising, may often be at once removed, by pushing the swellings with the finger a little higher up the rectum. Leeches applied to the vicinity of the anus, and puncturing the dilated hemorrhoidal vessels with a lancet, for the purpose of taking away blood, are measures occasionally employed to procure ease. Mr. Ware seems to give the preference to leeches; Petit preferred the lancet.

When the number and size of hemorrhoids are so considerable, as materially to obstruct the discharge of the feces; when they are very painful, and subject to profuse bleedings; when the patient is disabled from following his usual occupations; and when all the above means are not of sufficient avail; the surgeon should recommend the removal of the tumours.

Extirpating piles with the actual cautery and caustics, as practised by the old surgeons, is now very properly altogether relinquished by modern practitioners. The only plan ever followed in the present state of surgery, is either to cut the tumours off with a pair of scissars or knife, or to apply a tight ligature round their bases, so as to make them slough away.

When piles are to be cut off, and they are not sufficiently visible, the patient must first strain, as at stool, in order to make the swellings more apparent. With the aid of a pair of dissecting forceps, the skin, covering the hemorrhoids, is then to be separated from them with the knife, but not cut away, and the tumours are to be removed Sabatier states, that saving the skin is very essential; for, any hemorrhage which may arise, can then be more easily suppressed; and, when there are several hemorrhoids to be extirpated, the loss of substance about the anus will be less, and, of course, the patient will not be so liable to a contraction of this part which is sometimes a very great affliction.

Mr. Ware thinks it unnecessary to remove all the swellings, when there are several of them. He remarks, that though the number of hemorrhoidal tumours, protruded through the anus, is often considerable, yet the pain which the patient suffers, is not produced equally by all of these; but, that he will point to one, or at most to two, of the tumours, whence all his pain proceeds. These will be found to be much harder and more inflamed than the rest; but, generally, smaller and less prominent, protruding only just low enough to be compressed by the sphincter muscle.

Hence, Mr. Ware contends, that cutting off the whole number of hemorrhoids with a scalpel, or scissars, and tying a ligature round them, in order to make them die and fall off, are unnecessary. He says, we have only to direct our attention to the hard inflamed tumour, which is the cause of the pain, and which is not unfrequently situated in the centre of the rest. This

is often not larger than the end of the little finger, and the removal of it almost instantly abates the pain, and soon makes the rest of the tumours collapse and disappear. Mr. Ware operates as follows: having secured with a common dissecting-hook, or forceps, the little hard tumour, which is often in the middle of the rest, and much darker coloured, he snips it off, as close to its basis as possible, with a sharp pair of curved scissars. The pain is trifling, and the hemorrhage so slight, that Mr. Ware says, he has rarely had occasion to use any application to check it. If the hemorrhoids are constantly protruded, the operation may be performed at any time; but, if they only appear after the feces are voided, that opportunity must be taken.

When the pain of hemorrhoids is not violent, but there is a constant distressing uneasiness, with frequent returns of a profuse debilitating hemorrhage, Mr. Ware states, that his method of operating will frequently produce a radical cure.

The excision of piles is occasionally followed by a very dangerous bleeding, as a case, related by M. Petit, confirms. A patient had some hemorrhoids, which were supposed to be external ones, though in fact they were not, and had only become protruded. Almost immediately after they had been cut off, the skin, which had supported them, became drawn inward. An inward hemorrhage ensued, which could not be suppressed, and proved fatal in less than five hours. The rectum and colon were found full of black, coagulated blood.

After the operation, Mr. Ware advises a thick compress to be applied, wet either with cold brandy and water, or with a cold saturnine lotion, and retained on the part with the T bandage. The patient should be kept quietly in a cooler temperature than usual, and be enjoined to eat or drink nothing of a stimulating quality.

Certainly, if the bleeding should prove troublesome, and proceed from vessels within the rectum, the best plan would be to distend the gut with a suitable piece of sponge, so as to make pressure on the wound, observing to adopt at the same time the means above recommended.

Tying hemorrhoids is free from the danger of hemorrhage; but, still it has its inconveniences, though they are not constant ones. Petit frequently practised this method, without any ill effects. In other instances, he had reason to repent having adopted it. A woman, for whom he had tied three hemorrhoids with narrow pedicles, which were favourably situated for this operation, did not at first experience a great deal of pain. However, five hours afterwards he was informed, that she suffered violent colic pains, which extended along the colon. The woman was bled four times, without relief. At last, Petit cut the ligatures, which could not be loosened, in consequence of their being concealed so deeply in the substance of the swollen parts. The pain very soon subsided. The ligatures had only been applied four and twenty hours, but the piles had become black, and the skin covering their bases was cut through. Petit removed them, without the least effusion of blood.

M. Petit also relates a case, in which a patient, after having some piles tied, died of symptoms resembling those, which take place in cases of strangulated herniæ, notwithstanding the ligatures were cut as in the foregoing instance. After these two cases, Petit abandoned the plan of curing hemorrhoids by tying them.

I believe, on the whole, that it is best to remove hemorrhoids with a knife, unless they are situated high up in the rectum, where the veins are of large size, and likely to bleed profusely. If a tumour so situated should absolutely require removal, a ligature might be put round its base with the aid of a double cannula, in the way we shall relate in speaking of *Polypi*. When the base of the tumour, however, is large, admits of being brought into view, and the surgeon prefers tying it, he should pass a needle, armed with a strong double ligature, through the root of the hemorrhoid, and tie one part of this ligature firmly over one side of the swelling, and the other over the opposite one. When the base of the tumour is narrow, and the ligature is preferred, the part may be tied at once, without passing a double ligature through its middle.

As piles very seldom prove fatal, an opinion has commonly prevailed, that they are of a salutary, or critical nature. They have not unfrequently been regarded, as an evacuation, by which some peccant, or morbific mat-

ter, is thrown off from the body; and hence, patients have frequently been taught to submit to all the pain, and uneasiness, which the disease occasions, rather than seek a cure. This opinion, however, is neither founded upon impartial and mature observation, nor upon solid reasoning; for, granting that there was any morbific matter in the body, it is impossible to explain why it should be collected in the blood, which fills the dilated veins about the rectum, more than any where else.

For information on hemorrhoids, consult *L'Encyclopédie Méthodique; Partie Chirurgicale. Sabatier, De la Médicine Opératoire, Tome 2. Latta's System of Surgery, Vol. 2. Ware on the Treatment of Hemorrhoids.*

END OF VOLUME I.

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